The China forest products trade: overview of Asia-Pacific supplying countries, impacts and implications

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SUMMARY

Over 70 % of China's timber product imports are supplied by countries in the Asia Pacific region, and China is the dominant forest product market for many of these countries. Unsustainable harvesting practices, illegal logging, and negative impacts on community livelihoods plague many of these supplying countries. The countries may be divided into those still harvesting and exporting timber from natural forests on a large scale and those which have gone past their highest levels of natural forest timber harvesting and are now more aggressively pursuing plantation development and processing. Apart from Russia, China's top Asia Pacific timber suppliers could at best maintain current supply, with natural forest resources being depleted in less than 20 years. Resource limits also constrain expansion and/or long-term continuation of processed product export to China. Greater attention and action on the part of governments, market leaders, and international organizations is needed to address negative impacts, shifting supply to a sustainable, legal, and equitable basis and to determine from where China's long-term supply will come.

Keywords: China, Asia Pacific, forest product exports, livelihoods, policy issues

INTRODUCTION

China's forest product imports have grown dramatically in recent years pushing the country into a leading global role in the sector. Rapid expansion of manufacturing (often for re-export) and domestic consumption, in a nation with very limited per capita forest resources, have fueled the rise in imports[1]. While China's increased forest product demand has affected supplying countries worldwide, impacts are particularly marked in the Asia Pacific region. Forest-rich Asia Pacific countries are seeing increasing amounts of their resources heading for China. In many cases, increasing trade flows are associated with issues such as

unsustainable harvesting, corruption, and lack of satisfactory livelihood opportunities for forest-dependent communities.

Identification of priority issues and possible solutions, however, requires a clear understanding of the status and trends of the forest sectors and forest product trade of these countries. In 2003 and 2004, Forest Trends and CIFOR, supported by the United Kingdom Department for International Development (DfID), worked with partners across the region to fill information gaps and build a knowledge base on the forest industry and export trade of China's Asia Pacific supplying countries. This article is a synthesis of more detailed studies by co-authors focused on the particular supplying countries which are published on the Forest Trends website, www.forest-trends.org[2].

This paper begins with a summary of the characteristics of supplying countries' forest sectors and then examines overall export trends and trade with China. The paper ends with a review of key issues associated with the China trade. The Asia Pacific supplying countries covered are, in order of decreasing volume of forest product exports to China, Russia, Indonesia, Malaysia, Thailand, Papua New Guinea (PNG), Myanmar, Vietnam, Cambodia, and Laos[3].

FOREST SECTORS OF ASIA PACIFIC SUPPLYING COUNTRIES

Common characteristics of the forest sectors of China's Asia Pacific supplying countries include uncertainties in forest area and forest sector production data, state ownership of forestlands, harvesting primarily through a concession model, and (often extensive) deforestation trends. Although, the state of forest resources, harvesting, and development of the processing and plantation sectors varies amongst the countries, they fall into two distinct groups. In the first group are countries that, while generating some concern about future supply, are producing timber on a large scale, often at peak volumes in their history, and putting relatively little emphasis on processing. These countries (e. g. Russia, Myanmar and PNG), tend to have fairly limited plantation area, having less motivation to develop alternative timber sources. They tend to have less developed processing sectors, as they can depend on high volumes of log and simple sawn wood exports for revenue. In contrast, other supplying countries (e. g. Thailand, Laos, Vietnam and Cambodia) have clearly passed peak harvesting periods in natural forests and are pursuing (or at least

TABLE 1 *Resource base in Asia Pacific supplying countries and regions: current best estimates*

Country or region	Natural forest area	Natural forest area available for wood supply	Tree plantation area	Annual industrial roudwood production	Rough estimate of years of mature natural forest remaining at current cutting rates
		000 000 ha		000 000 m^3	Years
Russian Far East	280.0	96.0	0.77	12.2	> 20
Indonesia	95.0	74.2	2.00	55.0	NA
Malaysia	18.3	NA	1.75	17.9	NA
Thailand	12.0	0.0	2.80	7.8	NA
PNG	26.5	11.2	0.06	2.1	13 - 16
Myanmar	33.9	20.4	0.50	5.5	10 - 15**
Vietnam	8.1	3.1	1.71	4.2	NA
Laos	12.4	5.7	0.09	0.4	NA
Cambodia	9.2	3.9	0.09	0.1	4 - 9

** in Kachin areas supplying China

Sources and notes: Country reports prepared by authors for Forest Trends and CIFOR in 2004 (see references). Proceedings of internal Asia Pacific Partners meeting in June 2004. FAOSTAT data 2004. EC-FAO Partnership Programme 2002. FAO. Global Forest Resources Assessment 2000. World Bank 2004. Asian Development Bank 2004. World Bank 2001. MIDAS Agronomics *et al.* 2003. Gary Bull *et al.* 1998. Industrial roundwood production figures are for 2002, except for Vietnam, for which data is from 2000, and Indonesia, for which the figure given is a current (2003) authors' estimate.

[1] Hardwood imports come largerly from Southeast Asia, Latin America, Africa, and the US and are most commonly used in furniture and building interior applications. Softwoods, largerly from Russia and New Zealand, are most commonly used as construction materials and therefore are more fully destined for domestic end use.

[2] These more detailed studies include: ‚Overview of the Forest Sector in the Russian Far East: Production, Industry, and Illegal Logging,' Alexander Sheingauz 2004; ‚Status and Trends in Forest Product Exports from the Russian Far East and Eastern Siberia to China,' Alexey Lankin 2004; ‚Siberian and Russian Far East Timber Market for China,' Anatoly Lebedev 2004; ‚Navigating the Border: An Analysis of the China-Myanmar Timber Trade,' Fredrich Kahrl, Yufang Su, and Horst Weyerhaeuser 2004; ‚China's Impact on PNG's Forestry Industry,' Yati Bun, Timothy King, and Phil Shearman 2004; ‚Cambodia's Forest Sector and Supply to China,' Keith Barney 2004; ‚Thailand's Forest Sector and Supply to China,' Keith Barney 2004; and ‚Vietnam's Forest Sector and Supply to China,' Keith Barney 2004.

[3] Individual studies were conducted for Russia, Indonesia, Thailand, PNG, Myanmar, Vietnam and Cambodia; and the paper thus focuses on these countries. Data is included, however, for Malaysia and Laos as well. Ranking od countries for volume of forest product exports to China is based on official data from China Customs. If the illegal sector and transshipments were included, Cambodia, and even possibly Laos, might move ahead of Vietnam in the rankings.

exploring) increased processing and/or plantation development to enhance their forestry sectors. Indonesia, despite high industrial roundwood production, has experienced declining harvesting levels and has developed an extensive processing industry and thus trends towards this latter group as well. Finally, while Malaysia's roundwood production continues to be substantial, the nation is similarly past its natural forest harvesting peak, with its increasingly productive plantations facilitating continued high yields.

Forest resources

Table 1 summarizes the current status of the forest resource base in countries and regions supplying China, providing estimates of natural forest area, natural forest area available for wood supply, plantation area, annual industrial roundwood production, and rough estimates of years of natural forest resource remaining at current cutting rates. While a great deal of uncertainty is associated with these statistics, the table provides an indicative picture of the current status of these countries' resource bases and their potential for continuing to supply China in the future[4].

With 280 million ha of natural forest area, the forest resources of the Russian Far East (RFE) alone dwarf those of China's other Asia Pacific supplying countries (The RFE and the five provinces of Southeastern Siberia provide the bulk of Russia's timber exports to China and are thus the focus of our analysis of Russia's forest industry and trade). Indonesia, with 90-100 million ha of natural forest area, ranks second. Myanmar, PNG, and Malaysia make up a middle group in terms of natural forest area and that available for wood supply, while Thailand, Vietnam, Laos, and Cambodia make up a post-logging peak group with the most limited ability to supply wood from natural forests. With over 20 years of natural forest remaining at current cutting rates, areas of Russia supplying China are expected to have more long-term natural forest potential than any of the other supplying countries studied. Among China's other major log suppliers, for example, PNG is expected to have fully allocated its forestlands within 3 to 6 years and essentially exhausted its natural forest timber resources after another 10 years of harvesting at current rates. Similarly, industry insiders have estimated that, at current harvesting rates, the Myanmar border areas responsible for supplying timber to China have between 10 and 15 years of economically accessible resource remaining.

Plantation development or plans for such have been most marked in supplying countries or regions recognizing a decline in their industrial roundwood supply, while those not yet ‚past-peak' in natural forest production have expended less effort in this area. Apart from the case of Thailand, however, plantations represent a much smaller resource base than natural forests in each country. Indonesia (with 5.3 million ha allocated to plantations, but less than 2.0 million ha planted) and Thailand (with 4.9 million ha of plantations, of which 2.8 million ha are non-rubberwood ‚tree plantations') lead the group in tree plantation development. In Thailand, the primary source of industrial roundwood is eucalyptus (*Eucalyptus sp.*) and rubberwood (*Hevea brasiliensis*) from small-holder plantations. According to FAO statistics, Malaysia and Vietnam each have over 1.7 million ha of tree plantations. Cambodia, with only 90 000 ha of plantations at present, has ambitious plans for plantation development (Barney 2004a). Given the strong ‚pre-peak' status of their natural resource bases, forest plantations have been much less of a priority for Russia, PNG, and parts of Myanmar supplying China. In the RFE, only about 0.5 % of forest area is considered plantation. Plantation area in PNG is only 61 000 ha. Finally, while Myanmar does have about 500 000 ha of plantations, over a third of which are teak (*Tectona grandis*), plantation area in the main regions supplying China is extremely limited.

Additional information on the status of forest resource bases is provided, by country, below:

Russia: While Russia's timber production peaked in the mid-1980s, the subsequent drop in production was a result of economic factors rather than resource exhaustion, so that we include Russia among the countries of our analysis that are not yet ‚past peak.' The extent of logging relative to resource base appears to be less in Russia than in other supplying countries. Official figures put harvesting in the RFE at 18.2 % of the accessible annual allowable cut (AAC), while inclusion of illegal logging estimates raises this proportion of AAC actually logged to roughly 25 % (Sheingauz 2004).

While the AAC is not exceeded overall in the RFE, substantial forest degradation is occurring. High grading (the extraction of the best timber and best species only) is a significant factor in this degradation. In addition, permits to conduct intermediate thinnings (ostensibly to restore forest maintenance functions) are commonly abused and officially sanctioned ‚thinnings' now supply a significant share of Russia's hardwood product, particularly of species for which cutting is either prohibited or limited (Sheingauz 2004).

Natural factors are also leading to forest degradation. Catastrophic forest fires, which have recently consumed an area equivalent to about four times the area harvested annually, are considered the main cause in a reduction in forest area that has been occurring over the past five years. Poor forest harvesting and slash treatment practices have exacerbated fire conditions (Sheingauz 2004).

Indonesia: Despite its very high industrial roundwood production (ranging from 47 million to 75 million m^3 per year since the mid-1990s), the vast majori-

[4] Uncertainties are due both to lack of data and definitional problems, such as the minimum density of resource to be included in ‚normal forest area' or the type of forestland to be defined as ‚available for wood supply'.

ty of which is channeled to the nation's massive wood processing sector, we classify Indonesia as ‚past-peak.' In recent years, logging in the nation has declined precipitously in many areas as the more accessible forests are rapidly being exhausted. It is now widely recognized that Indonesia's natural forests will not be able to sustain the country's wood processing sector at current capacity levels for much longer and that industrial plantation development will need to accelerate considerably in order to maintain current levels of wood supply. Although estimates vary, deforestation in Indonesia is generally believed to be occurring at a pace of at least 1.6 million ha annually, with a significant portion resulting from conversion to large-scale estate crops and timber plantations.

Thailand: Thailand is clearly a country past its peak in natural forest production, with rapid deforestation having occurred over the previous 20 to 30 years. However, with increasing environmental awareness and government bans on logging deforestation has now dropped off. Reflecting the weak status of its natural forests and demand of its relatively developed processing sectors, Thailand has made strong efforts to develop plantations, which (including rubber trees) now account for about a quarter of tree-covered area in the nation. Plans for expansion of planted areas remain ambitious, and there have been Chinese overtures towards investment in this sector. Yet, past initiatives in plantation development have met with low success rates, as a large portion of farmers involved in plantation programs have decided not to maintain plantings. Further, community conflict is stymieing current expansion efforts (Barney 2004b).

PNG: Production from PNG's 26.5 million ha of natural forests is currently high (over 2 million m^3 in 2002) and appears to be peaking. The bulk of the country's high volume and accessible forest has already been allocated to concessionaires and harvested. Recent satellite imagery suggests that the intensity of logging over the past seven years has been greater than in the past. Repeated harvesting of previously logged areas combined with large fires and drought in such areas may be resulting in a much larger extent of non-regeneration than previously anticipated (Bun *et al.* 2004).

Myanmar: Myanmar, with an estimated 33.9 million ha of natural forest area and an estimated 5 million m^3 of industrial roundwood production (2002), is rich in forest resources and currently a major source of timber in the region. Deforestation is severe; and production in border areas serving China is thought to be peaking (Kahrl *et al.* 2004).

Vietnam: Like Thailand, Vietnam also appears to be a formerly forest-rich country that has passed its natural forest logging peak. According to some analysts, serious deforestation trends occurring from 1980 to 1995 have since stabilized. Addressing the decline of its natural forests, Vietnam has begun to place an emphasis on plantation development, but productivity of plantations established to date has been poor and ambitious targets for further development lack specificity and actionable plans (Barney 2004c).

Cambodia: As with its neighbours Thailand and Vietnam, Cambodia appears to have passed its natural forest logging peak, albeit somewhat more recently. Some analysts indicate that little of the remaining forest in Cambodia is commercially viable. While logging continues, the rate is thought to be much slower than in the mid- and late 1990s, when illegal activity was at its height. The nation hopes to develop a substantial plantation sector; and some Chinese investors have already become active in this area (Barney 2004a).

Natural forest ownership and management

Natural forests in supplying countries are predominantly state-owned and administered, thus offering weaker community access than in the case of either private ownership or public ownership with administration by community or indigenous groups. In Russia, Indonesia, and Myanmar, for example, 99-100 % of forestlands are both publicly owned and (according to official data) administered by the Government[5]. PNG, where customary ownership rights predominate and 97 % of forestland is privately owned by communities, is the main exception to state ownership among the countries studied (White and Martin 2002). The Government in PNG, however, still exerts much greater control in determining the fate of the nation's forests than do local communities.

As is common worldwide in countries with extensive forest resources, concession granting to harvesting companies for large-scale logging is the most common mechanism through which forest access is transferred to end users in the region. Logging concessions account for the majority of forestland allocated in Russia, Indonesia (58 % of forestland), Cambodia (64 % of forestland), PNG (where the government plays a role in brokering deals between concessionaires and local communities), and regions of Myanmar serving the China market (White and Martin 2002).

Despite these trends of state control and the concession model, signs of a shift to greater community access, albeit on a limited scale, have emerged. For example, in Vietnam, while the majority of the most productive forestland is allocated to state-owned enterprises 1.43 million of the nation's over 9 million ha under forest cover was allocated to households and cooperatives in 1999; and new regulations passed in 2002 facilitate further recognition of community ow-

[5] In the case of Myanmar, the term ‚government' here is applied somewhat broadly, with insurgent groups tending to control the main forest areas supplying China.

nership. In Indonesia, a new regulatory process through which community ownership can be recognized was established in 2000. The country currently has 600 000 ha of forest area reserved for community administration. In Laos, a pilot program granting concessions to local communities rather than logging firms is being tested and has improved forest management. Finally, in Russia, indigenous people are also beginning to gain greater rights to state-owned forests (White and Martin 2002).

Commercial timber producers

Asia Pacific supplying countries have reached different levels of logging company privatization. In Russia, state-owned logging units have been essentially privatized, though the state may retain some shares; and a great number of new completely private logging firms have emerged (Sheingauz 2004). In Vietnam, state logging firms dominate, being the only harvesters allowed to commercially log during the nation's six to seven-year logging ban (Barney 2004c). In Laos, three state owned enterprises, all under the Ministry of Defence, dominate harvesting (World Bank 2001). by Russian companies, but involvement of Chinese companies in harvesting is increasing. In Cambodia, Asia Pulp and Paper and other players in the region are making logging and plantation investments.

Finally, the scale of commercial timber producers varies from country to country. The average volume of harvesting operations in the RFE, for example, has dropped precipitously, reflecting proliferation of logging companies in the 1990s and a concurrent drop in overall production (Sheingauz 2004)[7]. In contrast, 80 % of PNG's log exports are controlled by just five companies (Bun *et al.* 2004).

Wood processing

Table 2 provides data on Asia Pacific supplying countries' wood processing sectors, including country production figures for each of sawnwood, plywood, veneer, fiberboard, wood chips and particles, wood pulp, and paper. Despite substantial uncertainties, the data overall are strong enough to facilitate identification of basic trends among countries and within each country's industrial structure.

TABLE 2 *Primary timber product and pulp and paper production in Asia Pacific supplying countries: best estimates (2002 data, unless otherwise noted)*

Country or region	Sawnwood	Plywood	Veneer	Fiberboard	Wood chips and particles	Wood pulp	Paper
	000 000 m^3 Roundwood Equivalence						
RFE	1.19	0.00	NA	NA	NA	0.02	0.09
SE Siberia	2.92	0.32	NA	NA	NA	6.07	0.79
Russia total	27.51	4.55	0.200	1.880	5.76	24.42	16.74
Indonesia	20.00	16.22	0.110	0.770	0.81	21.73	19.59
Malaysia	6.56	10.85	1.790	2.200	0.73	0.49	2.38
Thailand	0.42	0.30	0.008	0.440	3.74	3.68	6.83
PNG	0.10	0.23	0.180	NA	NA	NA	NA
Myanmar	0.54	0.05	0.003	NA	NA	NA	0.12
Vietnam	4.22	0.09	NA	0.002	3.03	0.92	1.07
Laos	0.26	0.03	NA	NA	NA	NA	NA

Sources and notes: Country reports prepared by autohors for Forest Trends and CIFOR in 2004 (see references). FAOSTAT data 2004. CIFOR 2004. Production data is for the year 2002, with the following exceptions: all Vietnam data (2000); Indonesia plywood and sawnwood data (2003), fiberboard and chips data (2000) and pulp and paper data (2001); Malaysia fiberboard and chips data (2001) and pulp and paper data (2000); Thailand veneer, fiberboard, chip, pulp and paper data (2001); PNG plywood data (2000); Myanmar veneer data (2000) and paper data (2001); Laos plywood data (2001); all Cambodia data (2001). Conversion factors used (m^3 → m^3 RWE): sawnwood 1.43, plywood 2.5, veneer 2.5, chips 1.8 (metric tons → m^3 RWE): mechanical wood pulp 3, chemical wood pulp 4, semi-chemical wood pulp 3.3, paper and paperboard 2.8. Note: Lacking breakdown on the type of pulp for RFE and Siberia, a weighted average conversion factor of 3.8 (m^3 RWE per metric ton), derived from the pulp type mix of Russia as a whole, was used.

Foreign ownership and foreign workers are a trend associated with commercial timber producers in some Asia Pacific supplying countries. PNG and Myanmar offer the most extreme cases. In PNG, all but one of 29 concessions is operated by foreign companies, with Malaysian ownership and foreign staff predominating (Bun *et al.* 2004).[6] In Myanmar, the vast majority of China-bound timber is harvested by Chinese logging companies staffed with Chinese citizens working in areas outside of the military regime's control (Kahrl 2004). In Russia, logging is carried out mainly

Comparison of Table 2 data with roundwood production figures in Table 1 indicates that countries or regions which have not passed their natural forest harvesting peaks (e. g. RFE, Myanmar, and PNG) put relatively less emphasis on processing, while those

[6] Rimbunan Hijau, a Malaysian company, is the largest supplier of logs from PNG. It is also the top supplier of logs exported from the RFE (Bun *et al.* 2004).

[7] In the RFE's Primorsky Krai (a province), for example, the average output of typical logging enterprises in 2001 was only 22,700 m^3 (Sheingauz 2004).

past peak (e. g. Indonesia, Thailand, and Vietnam) add value to a much higher proportion of their logs. Within the group of Asia Pacific supplying countries and regions, Indonesia and Malaysia are the top producers of primary timber products (defined to include sawnwood, panels, and chips), while Indonesia and Thailand are the top producers of pulp and paper. Indonesia, which has the largest processing sector of all the countries and regions studied (including the RFE and SE Siberia, but not Russia as a whole), also has the highest production of sawnwood, plywood, and wood pulp. Malaysia is the second largest producer of sawnwood and plywood and the top producer of veneer (for which it surpasses all other producers by far) and fibreboard. Thailand and Vietnam are the top wood chip producers in the region. Indonesia, followed by SE Siberia and Thailand, is the top wood pulp producer, while Indonesia and Thailand are the top paper producers (in both cases not including Russia as a whole).

Additional information on processing in the region is given by country below:

Russian areas supplying China: The level of processing in the RFE is particularly low. Sawnwood production was less than 10 % of industrial roundwood production in 2002. No plywood was produced in the RFE that year; and pulp production was less than 5 000 tonnes. Russia, particularly as reflected in the RFE, presents a special case among the nations studied of a country that once had a relatively advanced processing sector for which production has since dropped substantially. Domestic market shrinkage and difficulties competing internationally in quality and cost have resulted in numerous mill closures and in the share of processed wood in overall forest production in the RFE dropping from 56 % in 1990 to less than 17 % in 2000. Southeastern Siberia, with its main processed products being sawnwood and pulp, has experienced more positive trends recently, including the development of new sawmills and growth in exports of pulp and wood chips (Sheingauz 2004).

Indonesia: Indonesia's massive processing sector represents a major shift from its earlier role as a major log exporter, responsible for over 40 % of the world market's tropical log exports in 1979. Processed products now play the dominant role in the nation's forest product exports. Due to resource constraints, however, all of Indonesia's major processing sectors are operating far under capacity.

The size of Indonesia's wood processing industry can be attributed in part to active government promotion of export-oriented wood processing since the early 1980s and introduction of a log export ban in 1985. Throughout the late-1990s, Indonesia supplied about 70 % of the world's tropical plywood exports, though production has dropped substantially over the past decade as large-diameter logs have become increasingly scarce. The country reportedly has 110 operating plywood mills, with a total production capacity of 11.3 million m^3 per year, but 2003 production of only 6.5 million m^3.

Since the early-1990s, Indonesia's pulp and paper production have grown very rapidly, following over US$ 15 billion of investment in the sector. Although the nation's pulp producers have made substantial investments in fast-growing plantation development, most of the country's pulp mills continue to rely heavily on ‚mixed tropical hardwoods' harvested from natural forests.

Malaysia: In addition to its top role in veneer and fiberboard and second place standing in sawnwood and plywood produced in the region, Malaysia produces substantial amounts of paper (851 000 tonnes in 2000), though wood pulp production lags (123 000 tonnes).

Thailand: Like Indonesia and Malaysia, and as a country far past its natural forest logging peak, Thailand has progressed along the forest product value-added chain. In addition to its main products of wood chips, wood pulp, and paper, Thailand also has about 2 million m^3 (3 million m^3 RWE) of particleboard capacity.

Vietnam: While Vietnam has a smaller and generally lower value-added processing sector than the countries covered above, it does have significant production of sawnwood and wood chips/particles, with wood chip production on the rise. Pulp and paper production are also significant (240 000 and 384 000 tonnes, respectively, in 2000), though previously anticipated growth is not expected to materialize in the short term. In the area of finished wood products, Vietnam has become a center of outdoor wood furniture production (competing with China), with further growth likely. As in China, much of the wood used in furniture production is not locally sourced (Foreign Agricultural Service 2003).

Other countries: The remaining countries of Cambodia, PNG, Myanmar, and Laos have very low processing capacities. Veneer and plywood are key products in Cambodia's forest product sector. Given restrictions on cutting, however, low capacities are unlikely to increase in the near future. PNG's wood processing industry is extremely small. At present, the country has just three major processing facilities, one wood chip mill, one sawmill, and one veneer mill. Aside from these, there are a number of small and medium sized sawmills. The country has no pulp and paper production, though individual households do produce balsa (Bun *et al.* 2004).

The main parts of Myanmar supplying China, Kachin State and Northern Shan State have extremely limited processing industries, reflecting the dearth of processing facilities outside of Myanmar's capital, Yangon. Myanmar's military regime has reportedly suggested that the main insurgent group controlling

Kachin State seek foreign investment in the processing sector, but potential investors, the Chinese logging companies, are deterred by the lack of political stability and basic power infrastructure. Thus, while some crude sawmilling work is done on the Myanmar side of the border, no other processed forest products are produced in the main areas supplying China (Kahrl *et al.* 2004).

Characteristics of processing enterprises

A trend of a large number of small, privately owned mills is found in several of the countries and regions studied, though it is often a smaller group of large mills that can attain the quality necessary for export. Russia, Indonesia, PNG, and Chinese-Myanmar border areas all have numerous small-scale processors. Indonesia is believed to have between 2 300 and 3 500 operating sawmills, the vast majority of which are small-scale units and/or unlicensed operations. For the RFE's province of Khabarovskiy Krai alone, official 2002 statistics indicate 104 wood processing enterprises, with annual average production per facility of only 35 000 m^3. In Russia, primary processors range from large-scale now-privatized processing factories and subsidiary mills of large commercial harvesters to primitive sawmills in RFE border areas, sometimes operating in open air (Sheingauz 2004). In PNG, sawmills are predominantly small, privately owned entities serving the domestic market, though the largest processing facilities are owned by concessionaires (Bun *et al.* 2004). Finally, Chinese border areas near Myanmar have numerous small-scale mills handling preliminary processing. In Tengchong County, for example, there are reportedly over 500 timber processing companies, only a few of which are of significant scale (Kahrl *et al.* 2004).

The trend of a smaller group of large mills serving export markets is particularly true in pulp and paper, with often just a few key players controlling a small number of large-scale export-oriented facilities in the sector. With recent industry consolidation, the Thai pulp and paper industry is quickly moving to domination by two major integrated firms; Siam and Advanced Agro (Barney 2004b)[8]. Both firms are also pursuing regional expansion[9]. Indonesia's small number of large-scale export-oriented pulp and paper mills, all concentrated geographically on the island of Sumatra, are also dominated by just a few key players. Finally, while the pulp and paper industry is less developed in Vietnam, the state-owned Vietnam Paper Corporation (Vinapimex) represents the only major industrial player. It has 20 subsidiaries, but three mills account for 50 % of production (Barney 2004c).

Most of the countries studied evidence a significant level of foreign investment in their processing sectors, with Chinese investment activity recently on the rise in several cases. As with its logging sector, PNG's processing sector, though much smaller, offers one of the most prominent cases of foreign control. While smaller mills, as mentioned, may serve the domestic market, the few large mills in the country and those that produce product for export, are foreign-controlled (Bun *et al.* 2004)[10]. Vietnam's wood chip operations, geared mainly towards export, involve investment from Japan, Korea, and Taiwan, also the top export destinations for wood chips (Barney 2004c).

Russia, Thailand, Cambodia, and Indonesia are examples of countries where large Chinese companies are investing or planning investments in the processing sectors. In addition, numerous small Chinese firms have established ventures in border areas of Russia. Reports from Primorskiy Krai indicate that Chinese processing enterprises in the province are small (enterprises investigated range from 7 to 15 employees), fully staffed fully Chinese labor, and purchase timber mainly from illegal loggers (Lebedev 2004). At the other end of the spectrum, three Chinese companies, Star Paper, Zhuhai Zhenrong, and Huacheng International, have signed a memorandum of understanding to jointly invest US$ 278 million in a wood processing project in Chitinskaya Oblast that is to eventually process 1.5 million m^3 of logs annually and produce 300 000 m^3 of timber products and 400 000 tons of pulp (Lankin 2004).

Like other plantation and pulp projects in the region, planned and in-progress Chinese-invested projects in this sector have met with community resistance. The in-progress Pheapimex-Fuchan pulp project in Cambodia, to be the nation's first major pulp mill, is a joint venture between Cambodia's largest concession holder, Pheapimex, and the China Cooperative State Farm Group. The project has resulted in local community-level protest since at least 2001, slowing plantation development (Barney 2004a). Recently, several individuals were injured in a grenade blast, as a group of 600 protesters attempted to block bulldozers that had begun clearing the forest for an acacia plantation. (Associated Press 2004). In Indone-

[8] Siam has purchased Thai Cane Paper (full purchase completed in 2004) and a controlling stake in Phoenix (in 2002). Phoenix has now been de-kisted from the Thai SET and may now be a full subsidiary of Siam.

[9] Siam has purchased a controlling share of United Pulp and Paper of the Philippines (raised to 86 % in July of 2003) and is exploring opportunities to acquire the assets of troubled Indonesian pulp and paper firms. Advanced Agro, which is owned by the Soon Hua Seng Group, has pursued plantation projects in China.

[10] PNG's main wood chip mill is owned by Japan and Niugini Timbers (JANT), a subsidiary of Hongshu Paper in Japan. Rimbunan Hijiau of Malaysia, the country's largest timber concessionaire, owns the nation's only veneer factory and its largest sawmill, as well as a number of other sawmills (Bun *et al.* 2004).

sia, the United Fiber System pulp mill project in Kalimantan, with majority investment from a Chinese company, has also stirred controversy. In Thailand, Soon Hua Seng's Advanced Agro has held high-level discussions since 1997 with a Chinese company for a proposed eucalyptus and pulp/paper venture that would reportedly produce 700 000 tonnes of pulp annually, mostly for export to China. Many are doubtful, however, that this project will be realized due to the lack of land available for concessions, the complexity and cost of establishing out-grower schemes, and the social protest likely to develop (Barney 2004b).

stination for RFE timber and, given that 80 % of RFE timber production is exported, is a major force in the RFE timber market overall (Lankin 2004). China accounts for 40 % of all Russian log exports and 12 % of the nation's industrial roundwood production (2002). The China market is rapidly coming to have a decisive influence on the small country of PNG, with Chinese exports growing from 35 % of PNG's industrial roundwood production in 2000 to 58 % in 2002 (Bun *et al.* 2004). Malaysia, second in the region only to Russia in total log exports, ships 41 % of its log exports or 12 % of its industrial roundwood production to China. Of the major log producers in the region, only Indonesia,

TABLE 3 *Role of China in Asian Pacific supplying country log markets (2002 data, unless otherwise noted)*

Country	Industrial roundwood production	Log exports	Log exports to China	Percent of log exports to China	Percent of log production to China
		000 000 m^3		%	
RFE	12.20	10.3000	NA	–	–
SE Siberia	15.10	NA	NA	–	–
Russia total	118.60	36.8000	14.8000	40	12.4
Malaysia	17.90	5.1800	2.1200	41	11.8
PNG	2.00	1.8000	1.1500	64	57.5
Myanmar	5.54	0.8800	0.6100	69	11.0
Indonesia	55.00	0.5000	0.2500	50	0.5
Vietnam	4.18	NA	0.0160	–	0.8
Laos	0.39	0.0630	0.0110	17	2.8
Thailand	7.80	0.0031	0.0025	81	7.4
Cambodia	0.12	0.0001	0	0	0

Sources and notes: Country reports prepared by autohors for Forest Trends and CIFOR in 2004 (see references). FAOSTAT data 2004. China Customs data for 2002. Data for the year 2002, except for Vietnam roundwood production (2000), Indonesia industrial roundwood production (authors' estimate: 2003), Cambodia log exports (2000), and Laos log exports (2001).

EXPORT TRENDS

Export trends of Asia Pacific supplying countries are generally congruent with the findings on forest resources and production outlined above. That is, forest rich countries, still harvesting at high levels, export and provide China, in particular, with a large amount of logs, while most countries past their natural forest logging peaks either supply China mainly with processed product or have a low level of forest product exports to China. Analysis of remaining forest resources in conjunction with export trends suggests that most Asia Pacific supplying countries will at best maintain current export levels to China for the medium term (less than 20 years), with only Russia presenting the potential of significantly increased and/or longer-term supply to China.

Log exports

Comparison of log exports to China with overall log exports and domestic production of Asia Pacific supplying countries shows that China is playing a critical role in the log export trade and in many cases overall log markets of most of the major producers (see Table 3). China, surpassing Japan in 2001, is the top export destination for RFE timber and, given that 80 % of RFE timber production is exported, is a major force in the RFE timber market overall (Lankin 2004). China accounts for 40 % of all Russian log exports and 12 % of the nation's industrial roundwood production (2002). The China market is rapidly coming to have a decisive influence on the small country of PNG, with Chinese exports growing from 35 % of PNG's industrial roundwood production in 2000 to 58 % in 2002 (Bun *et al.* 2004). Malaysia, second in the region only to Russia in total log exports, ships 41 % of its log exports or 12 % of its industrial roundwood production to China. Of the major log producers in the region, only Indonesia, congruent with its emphasis on value added products, exports just a small proportion of its very high industrial roundwood production. While about half of its official 500 000 m^3 in log exports (2002) went to China, log exports to the P. R. C. represented less than 3 % of the nation's industrial roundwood production.

For Myanmar, Cambodia, Laos, Vietnam, and Thailand, the role of the China trade in overall log production and exports is clouded by lack of accurate statistics, smuggling, and/or transshipments. Based on China Customs data, only Myanmar among these countries is a major log supplier to China. While Myanmar's military regime reports extremely low exports to China, Chinese customs statistics are generally more dependable and include exports from regions not controlled by the regime.

Processed forest product exports

As indicated by Sun *et al.* (in this issue), China is shifting towards importing unprocessed forest products as it moves forward in developing its own manufacturing capacity. The trend of lower value-added imports is particularly apparent in comparison to the low levels of plywood imports to high levels of log and sawnwood imports, and in comparison to stag-

nant paper imports compared to growing pulp imports.

Analysis of China's imports from a regional supply perspective (namely, assessing the proportion of key Asia Pacific producers' processed forest product exports purchased by China) indicates that exports to China play a dominant role in several product segments. China is particularly dominant in absorbing the sawnwood and pulp exported in the region, again confirming its emphasis on lower value-added imports. China also plays a very significant role, however, in the proportion of top regional producers' veneer and paper exports that it purchases. China's role in purchasing plywood from the region's top plywood exporters is much weaker. Table 4 offers a comparison, by supplying country and processed product, of exports to China, total exports, and total production. While figures for total exports and production are rough estimates in some cases, the data offers insight on trends in the region. These trends are also summarized, by product segment, below.

Sawnwood: Top sawnwood exporters in the region include Russia (9.0 million m^3 exported in 2002), Malaysia (2.6 million m^3), Indonesia (2.0 million m^3), and Thailand (1.6 million m^3). The data indicates that China plays a particularly significant role in the case of Indonesia (importing 70 % of Indonesian sawnwood exports or 22 % of total sawnwood production) and substantial roles in the cases of Thailand and Malaysia.

TABLE 4 *Processed product exports to China and comparison to overall exports and overall production of Asia Pacific supplying countries (2002 data, unless otherwise noted)*

Country	Sawnwood	Plywood	Veneer	Pulp	Paper
	000 000 m^3 Roundwood Equivalence				
Russia					
Exports to China	0.790	0.005	0.002	3.60	0.820
Total exports	12.900	2.900	0.048	7.20	6.600
Total production	28.100	4.600	0.200	24.40	16.700
Indonesia					
Exports to China	2.000	1.100	0.030	4.50	1.800
Total exports	72.900	13.800	NA	9.00	6.900
Total production	20.000	16.220	0.110	21.70	19.600
Malaysia					
Exports to China	0.700	0.250	0.370	0.00	0.130
Total exports	3.600	9.000	1.500	0.00	0.420
Total production	6.600	10.900	1.800	0.49	2.400
Thailand					
Exports to China	0.850	0.007	0.005	0.36	0.700
Total exports	2.200	0.095	0.005	0.76	2.200
Total production	NA	0.300	0.008	3.70	6.800
PNG					
Exports to China	0.003	0.000	0.021	0.00	0.000
Total exports	0.041	0.008	0.090	0.00	0.000
Total production	0.100	0.023	0.180	NA	NA
Myanmar					
Exports to China	0.330	0.000	0.001	0.00	0.000
Total exports	0.390	0.200	NA	0.00	0.000
Total production	0.550	0.480	1.800	NA	0.116
Vietnam					
Exports to China	0.015	0.000	0.008	0.00	< 0.001
Total exports	0.022	0.017	0.019	0.00	0.005
Total production	4.200	0.093	NA	0.92	1.100
Cambodia					
Exports to China	0.008	0.024	0.097	0.00	< 0.001
Total exports	NA	0.035	NA	0.00	NA
Total production	NA	0.035	NA	NA	NA
Laos					
Exports to China	0.008	0.000	0.000	0.00	0.000
Total exports	0.190	0.011	0.002	0.00	0.000
Total production	0.260	0.033	NA	NA	NA

Sources and notes: See sources and notes to Table 2 for references, conversion factors used, and notes on production data. Additional reference: China Customs Data 2002. Additional exceptions to use of 2002 data are: use of 2001 data for Cambodia and Laos sawnwood, plywood, and veneer exports, for Thailand and PNG plywood exports, and for Malaysia paper exports; use of 2000 data for Vietnam plywood and Thailand veneer exports.

Plywood: The top exporters of plywood in the region are Indonesia (5.5 million m^3 exported in 2002) and Malaysia (3.6 million m^3). Although both of these nations export a much higher proportion of the plywood they produce than of the sawnwood they produce, China purchases a lower proportion of these countries' plywood production than of their sawnwood, reflecting China's demand for less processed products. According to the data, China imported only 8 % of Indonesia's plywood exports (6 % of production) and 3 % of Malaysia's (2 % of production).

Veneer: Malaysia is by far the top exporter of veneer in the region (601000 m^3 exported in 2002). China imported 25 % of Malaysia's veneer exports in 2002, or 22 % of its total veneer production.

Pulp: Top exporters of pulp in the region are Indonesia (2.2 million tonnes exported in 2002), Russia (1.8 million tonnes), and Thailand (191 000 tonnes). China is clearly dominant in importing pulp exported from within the region. Based on available data, China imported 50 % of Indonesia's pulp exports (21 % of total production), 50 % of Russia's (15 % of production), and 48 % of Thailand's (10 % of production) in 2002.

Paper: The top exporters of paper in the region are Indonesia (2.5 million tonnes exported in 2002), Russia (2.3 million tonnes), and Thailand (787 000 tonnes). China's role in importing paper exported in the region is substantial, though not as dominant as for pulp, again showing China's relatively higher demand for less processed products. In 2002, China imported 27 % of Indonesia's paper exports 13 % of Russia's, and 32 % of Thailand's.

Potential for future export of logs and processed product to China

While projections of China's future forest product consumption will require a better understanding of demand drivers and implications of the nation's low per capita demand, analysis of Asia Pacific country forest resource bases and recent export trends offers an insight into the potential for these countries to supply China with log exports over the next two decades. Apart from Malaysia, countries past their natural forest logging peaks, such as Vietnam, Laos, Cambodia, and Thailand do not export large volumes of logs to China and are unlikely to have the resources to do so in the upcoming two decades. Despite its large natural forest area and sizable timber harvest, Indonesia, which exported 116 000 m^3 of logs to China in 2003, is also past its logging peak and, focusing on its own domestic processing industry, is not likely to substantially increase its raw log exports to China over the next few decades.

Instead, those countries from the region currently supplying China with the most substantial amount of logs (Russia, Malaysia, PNG, and Myanmar) should continue to be its main regional log suppliers in the next ten years. Given rough estimates on time to resource exhaustion at current cutting rates (13 to 16 years for PNG 10 to 15 years for Myanmar in areas bordering China, and over 20 years for Russia), however, it appears that only Russia will be a promising source of logs for China 20 years from the present. Projections 30 years into the future are much more difficult to make. Russia's ability to continue to supply China at current rates or the potential of other countries in the region to have either recovered their natural forest base or substantially expanded plantation area are not clear. In the shorter term (over the next few years), China's main Asia Pacific log suppliers will at best maintain current export levels to China, with only Russia presenting the potential of significantly increased supply.

Future potential for processed forest products exports to China from the region's supplying countries is closely linked to the log supply and forest resource trends discussed above. Given that China is already consuming a large proportion of the processed products exported from within the region, the question becomes whether supplying countries might expand their processing capacities. Given limits in log resources, most countries past their natural forest logging peaks would face substantial difficulties in expanding processing capacity unless they were able to secure logs from other sources. Indonesia's processing sector, for example, already has a shortage of raw materials, though continued expansion of its pulp and paper industry is expected in coming years. Large-scale plantation development presents a possible means of offsetting declines in natural forest production in such countries, though plantation efforts in both Indonesia and Thailand (the two supplying countries in the region with the greatest plantation activity to date) have met with limited success. Indeed, China is expected to soon follow Japan's lead in investing in large-scale plantation development in the region.

China's major log suppliers from the region at present (Russia, Malaysia, PNG, and Myanmar) could potentially expand processing capacity, keeping more raw logs in country for value-added production. Indeed, this is a policy option that has been raised in Russia, PNG, and Myanmar. Adoption of this strategy, however, would reduce logs available for China in most cases. While the location of processing would shift the total amount of processed product available to China might not change. Again, it is probably only Russia, given its strong natural forest resource base, which could increase export of processed product to China, while maintaining current levels of log exports to China over the next couple of decades.

TABLE 5 *Unsustainable practices, illegal logging, and other policy issues, with examples*

Lack of attention to conservation in main forest plans or codes
PNG: National Forest Plan
Unsustainable logging practices
PNG: - Annual logged area and intensity of logging rising: logging in unsuitable areas - 40-year cutting cycle not respected/average concession lifetime of 11 years - Second time harvesting as little as 10 years after initial logging event **Myanmar:** - Ecological impacts of logging may spread to Chinese side of border (e. g. pests, disease, etc.) - Annual allowable cut based on full area of country, but applied to area under central control
Legal and illegal players often the same
Cambodia: Concessionaires main players in both legal and illegal logging **PNG:** Concessionaires main players in both legal and (with local cohorts) illegal logging **Russia:** - Long-term harvesting companies also involved in illegal logging - Customs inspectors may ‚legalize' illegal product - Forest Guard staff enhance low salaries through ‚intermediate cutting'; many accept bribes to turn a ‚blind eye' to illegal logging **Myanmar:** Individuals working for forest protection units often carry out commercial illegal logging
Loss of revenue from illegal logging
Russia: Huge losses in tax revenues
Measures adopted to combat illegal and/or unsustainable logging
Indonesia: - Bilateral cooperation, including memorandum of understanding with China - Log export ban (also used to promote domestic processing industry) **Russia:** - Fixed checkpoints and patrolling brigade with decent salaries - Barcode system under development (all trees to be harvested would bear plastic barcode label) - Control of export sites and reduction in their number (has been effective) **Cambodia:** - Donor conditionality to promote forest sector reform - Logging moratorium (2002) **Thailand:** 1989 natural forest logging ban (has stabilized deforestation of previous 20 to 30 years) **Vietnam:** Partial logging ban and export quotas
The push for processing
Russia: Push to expand processed product exports to China not successful - China import policies (import tariffs, previous VAT) favor log imports over processed product - Chinese labor cheaper than Russian labor **Indonesia:** Aggressive policies to develop processing industry have led to overcapacity
Customs issues
Myanmar: Low customs compliance due to regime's lack of control over areas serving China **Russia:** - Lack of coordination between Russia and China customs (re: statistics, forbidden species, etc.) - Customs violations increasing on Russia side of China-Russia border - Corruption among customs inspectors allows large flow of illegal product
Rampant corruption
PNG: Evidence of corruption at highest levels of government; foreign concessionaires said to support political parties and individual politicians **Cambodia:** Patronage of concession system said to lead to highest levels of government
Non-compliance of concessionaires and issues of concession management
PNG: Concessionaires do not meet social obligations (e. g. leave promised roads unfinisteh, etc.) **Cambodia:** Concessionaires have failed to meet sustainability criteria and pay royalties due **Russia:** Chinese harvesting companies do not meet requirements to process wood/hire Russians **Myanmar:** Short (5 year) logging contracts with Chinese companies promote poor management

KEY ISSUES

The forest products industry and export trade in the Asia Pacific Region have enormous impacts on supplying countries, raising a host of policy issues. Serious ecological impacts across the region are linked with on-going unsustainable logging practices and, often, illegal logging, which also has negative economic impacts (Table 5). At the same time, other key policy issues merit attention (Table 5), and negative livelihood impacts (Table 6) occur in practically every supplying country, as people lose access to resources and as benefits accrue to some groups and not to others.

TABLE 6 *Key livelihood issues, with examples*

Insecure land tenure
Thailand:
- Thai farmers lack full deed to land/vast areas of occupied land designated as forest reserve
- Loss of farmland plantation development
- Upland minorities denied land rights/lack citizenship
Laos:
- Villager access to swidden farmland lost and upland groups impoverished through Land and Forest Allocation Program
Cambodia:
- Conflict due to denied access and reduction in resources caused by logging (e. g. villager-plantation company conflicts)
Inequitable distribution of benefits within country
PNG:
- People own land (traditional tenure), but government does not support development of forest resources by local people
- Non-logging development alternatives not included in National Forest Plan
- Illiterate people cheated by local elites
- Benefits for local communities as negotiated with concessionaires not realized
Myanmar (areas serving China):
- Much of benefit used military spending of insurgent groups
- Elites benefit, while communities lack electricity, roads, and other basic infrastructure
- Roads built by logging companies are fragmented/do not meet needs of communities
Transfer of livelihood benefits outside od country
Russia:
- Low benefits to Russian side in China log trade/most value-add in China
PNG:
- Predominantly foreign concessionaires/mostly foreign staff
Myanmar (areas serving China):
- Logging companies Chinese/staffed by Chinese only

Unsustainable practices

In those producer countries still harvesting large volumes of logs, continuation of current export levels to China is a concern from an ecological standpoint, due to unsustainable logging practices. Unfortunately, forest codes and plans, such as PNG's National Forest Plan, often do not contain conservation clauses. Further, rules that exist are often not well implemented. For example, the required 40-year cutting cycle in PNG is generally not respected; and average concession life from 1993 - 2000 was only eleven years, indicating cutting rates far in excess of sustainable harvesting. The annual logged area and intensity of logging have been rising in PNG, with satellite imagery indicating that some areas are being harvested for the second time, as little as ten years after initial logging and with much more destructive ecological impacts. Given that most of PNG's logs are exported (with China as the top destination), then, current export trends imply a direct threat to the sustainability of the nation's forests and the critical sector of the economy that they support (Bun *et al.* 2004).

Unsustainable practices in parts of Myanmar serving China also suggest a direct link between ecological impacts and trade in forest products with China. Given that most of the logging in Myanmar serving China has been concentrated within a (sometimes now fully clearcut) 50 to 150 km radius from the border, ecological effects of over-logging in Myanmar are expected to spill over into China's Yunnan Province through shared ecosystems. Concerned about impacts in areas such as wildlife, pest, and disease management, Yunnan's Science and Technology Bureau began to assess ecological and socioeconomic change along the border in 2003. The short duration (1 to 5 years) of contracts awarded to Chinese logging companies leads to forest degradation, as hills are logged quickly before concessions change hands. Finally, given Myanmar's complex political situation, forestry departments do not have the authority needed to monitor and regulate most of the logging serving China and also end up applying an annual allowable cut based on the country's full area to only that fraction under the military regime's control (Kahrl *et al.* 2004).

Countries past their logging peaks have adopted some policies to counter high levels of unsustainable harvesting, though problems remain, with Indonesia and, probably, Cambodia, continuing to face ongoing deforestation problems. Logging in Thailand, how-

ever, has declined to such an extent that deforestation is thought to have stabilized. The Cambodian Government put a moratorium on logging in January 2002, because of concessionaires' continued failure to meet forest sustainability criteria. While conditions put on donor loans to Cambodia have likely been the primary force in the nation's forest sector reform, the effectiveness of reforms has been questioned (Barney 2004a). Critics point to the failure of donor conditionalities to address corruption and the flawed concession system and call for its dismantling and overhaul. Logging and log export bans have also been instituted in Thailand, Vietnam, and Indonesia, though export bans may also aim at promoting domestic processing industries, as in the case of Indonesia.

Illegal logging

Illegal logging is extensive in most Asia Pacific supplying countries and thought by many to be linked with ecological deterioration. ‚Legal' logging, however, may also create negative impacts and, in the case of Russia, it is not obvious that illegal practices are more damaging than legal ones. Illegal logging of commercial scale in supplying countries often involves parties linked with legal commercial logging. In Russia, for example, long-term harvesting companies are involved in illegal logging, and customs inspectors may also be involved in the ‚legalization' of illegal product (Sheingauz 2004). In Vietnam, illegal logging is often carried out by individuals who work for forest protection units (Barney 2004c).

In the RFE and Southeastern Siberia, illegal logging is particularly severe. Alexander Sheingauz (2004) has estimated that 38 % of all logging in the RFE is illegal. One driving force in illegality is the potential for Forest Guard staff to enhance their low salaries through intermediate cuttings (which, as a result, may not always have a legitimate silvicultural basis) and bribes from illegal loggers. While illegal logging in Russia is probably linked most closely to domestic social and economic ills, Sheingauz (2004) indicates that areas with stronger exports have a higher level of illegal logging. He further notes that smuggling of illegal product is probably most common in the case of China, given that the land border facilitates export of contraband by truck, rather than ship.

Sheingauz (2004) also suggests that the substantial magnitude of illegal logging does not necessarily imply over-harvesting of the RFE as a whole or of any of its provinces, given that legal logging falls so short of the annual allowable cut. In some areas, however, the cut volume is closer to the full annual allowable cut. At the site level, illegal logging generally has the same consequences as legal logging, but may have some additional impacts. Most significantly, fully illegal loggers create damage through disregard of silvicultural requirements (i. e. selective cutting or reforestation), while large and medium size (legal) logging firms in Russia tend to comply.

Reflecting concern for the sustainability of the industry and the huge losses in tax revenues, governments at both the federal and provincial levels in Russia have taken a number of measures to prevent illegal logging. Some provinces have set up fixed checkpoints as well as patrolling brigades provided with decent salaries. At the federal level, the Ministry of Natural Resources is developing a barcode system, whereby every tree destined for harvesting would have a plastic label with barcode (Sheingauz 2004).

The link between illegal logging and environmental damage is more obvious in other supplying countries, given their more limited resource bases. In PNG, the main players in legal logging, the concessionaires, are also responsible for the bulk of illegal logging. While all the necessary laws and policies to prevent illegal logging are in place, there is a lack of political will and enforcement capacity. Government officials may in fact support these activities (see discussion of corruption below), and local cohorts are usually involved as well (Bun *et al.* 2004). In Cambodia, as in PNG, the illegal (as well as the legal) sector is thought to be controlled by the concessionaires. In the mid to late 1990s, extensive illegal exports from Cambodia to Thailand, Laos, and Vietnam were documented by Global Witness, though the current status of such activities is less clear (Barney 2004a).

Indonesia has developed bilateral cooperation with a number of countries to combat illegal logging. In particular, the nation has signed a memorandum of understanding with China that is targeted at reducing the trade in illegal forest product. Analysts report, however, that these agreements have yet to make an impact.

Livelihood implications

The livelihood implications of the forest industries and China trade for the people in Asia Pacific supplying countries are immense and critically linked to the sustainability of the forest industry in the region. Insecure land tenure, inequitable distribution of benefits within each country, and the transfer of livelihood benefits outside of the supplying country are key livelihood-related trends occurring across the region (Table 6) and demanding the attention of policy makers. While positive livelihood impacts also occur, beneficiaries are generally not the neediest or those that are losing traditional access to resources. Livelihood impacts, of course, are not due solely to the role of the China market, particularly for countries whose export levels to China are low. Thus, while the China trade may in many cases present an entry point for addressing livelihood issues, national-level initiatives in supplying countries will clearly be needed as well. In addition, action in countries to which China ships finished forest products may also be relevant.

Insecure land tenure, in the face of industry expansion, has led to displacement, loss of farming land, conflict, and loss of access to resources by forest-dependent peoples. Such property issues impede the sound development of the industry, and their resolution is a prerequisite to sustainability. Insecure tenure and its negative impact on the industry and local peoples is a particularly evident in Thailand, where only a small proportion of farmers hold full deed to their land. Vast areas of the nation are designated as forest reserve (44.7 % of total land area), though much is neither forested nor unoccupied. Loss of farmland through plantation development has resulted in scandals and successful resistance to further plantation development. Finally, Thailand's forest policy has resulted in hard line treatment of upland minorities practicing swidden agriculture in protected areas. Many of these minorities lack Thai citizenship and are denied land rights (Barney 2004b).

In Laos, implementation of the Land and Forest Allocation Program (LFAP), promoted in combination with a policy aimed at ‚stabilizing' shifting cultivation, has been identified as a primary source of new poverty creation and food insecurity in the countryside (Lao Government State Planning Commission 2001). Under the program, national territory is demarcated into village land and state production forestry or biodiversity conservation land, and village territories are also internally zoned into forest and agricultural land use areas. While the overall goals of the program are commendable in terms of promoting village tenure security, the end effect has been to unduly squeeze villagers' access to crucial swidden farmland and to create severe hardships and impoverishment for upland groups, particularly ethnic minorities.

In Cambodia, issues of access to resources and tenure security are particularly acute, as forests represent crucial sources of livelihoods for most of the nation's rural communities. Case studies have indicated that forest degradation in Cambodia has impacted livelihoods, forcing villagers to meet their forest product needs from areas farther away (McKenny and Tola 2002). Conflicts between villages and plantation companies are becoming more and more common. Prime Minister Hun Sen has even indicated that land issues could spark a ‚peasant revolution', and in October 2004 called for a review of land concessions (Associated Press 2004). The potential for such unrest is rising as Asia Pulp and Paper and other major players in the region make investments in logging and plantations in Cambodia.

Inequity in the distribution of benefits of the logging trade is common in the region. Often, poor communities most closely tied and dependent upon forestlands lose out, as local elites and/or industrial concerns absorb most of the benefits. For example, while land in PNG belongs to local people through traditional tenure and local communities must consent to any major development of their resources, these often illiterate people are frequently cheated by local elites, who benefit disproportionately from bringing logging companies into the area. In addition, negotiated benefits from concessionaire harvesting are generally not realized; and local people are often left with unfinished buildings, roads, and bridges. Finally, the government does not support local landowners in the development of their own forest resources. PNG's National Forest Plan does not address non-logging forest development alternatives, and local peoples were not consulted before the plan designated their land for logging (Bun *et al.* 2004).

In Myanmar, the benefits of timber exports accrue to only a small segment of the population and are often used for military spending. Concessionary logging combined with the drug trade has created an elite class among insurgent groups controlling border areas, while many parts of Kachin State still lack electricity, roads, and other basic infrastructure components. Roads built by Chinese logging companies, despite claims to the contrary, do not generally support the transport needs of local people as such roads are scattered and fragmentary (Kahrl *et al.* 2004).

In many cases, the direct benefits of the forest product trade are seen either to be leaving the producer country or to be accruing to foreigners in residence, impeding the potential for developing a sustainable forest industry that bolsters local livelihoods. In Myanmar, few local people are involved in the China log trade. All logging for this trade is carried out by Chinese companies, which are generally staffed exclusively by Chinese employees (Kahrl *et al.* 2004). In PNG, predominantly foreign-owned concessionaires often employ mostly foreign staff. Researchers in PNG have found, for example, that 90 % of the insured workforce at Rimbunan Hijau, the nation's largest logging company, are Malaysian, Indonesian, Chinese, or Filipino (Bun *et al.* 2004). In the case of Russia, disproportionate livelihood opportunities associated with the log trade are thought to be accruing to the Chinese side of the border, particularly because of the emphasis on raw log imports and processing by low-cost labor in China. Chinese companies are also becoming active in the forest product trade on the Russian side of the border. Some reports indicate that such companies process logs minimally in Russia to avoid the requirement of a harvesting permit to export logs, do not pay any taxes, and employ only Chinese staff (Lebedev 2004).

Other policy issues

Other forestry-related policy issues in supplying countries meriting attention include a push for increased processing in a number of countries, customs issues, non-compliance of concessionaires, and rampant corruption problems. Some desirable forest-related poli-

cies have been identified in supplying countries, but implementation is often a problem. Finally, lack of funding for government-supported organizations associated with management of the sector and natural forest protection is another important policy issue.

Efforts in countries such as Russia and Indonesia to promote greater processing of logs to increase the value-added of exports have met with varying levels of success. Russia's push to expand lumber and other processed exports to China has not borne significant results. China's import policies are thought to encourage the import of raw logs from Russia. China institutes a full import duty and value-added tax (VAT) on lumber, but has no import duty and, up until August 2004, had a 50 % VAT reduction on logs imported through border trade. In addition, given inexpensive labor in China, Russian sawn wood production costs are at least twice those in China. The raising of Russian duties on log exports to promote processing is still under discussion, though it is feared such a measure might merely increase illegal activity (Lankin 2004). Indonesia, in contrast, has met its processing ambitions through aggressive policies, but perhaps has taken these too far and is now suffering from excess processing capacity, thought to have resulted from excessive Government licensing (without periodic confirmation of raw material availability) and hidden subsidies.

Customs issues in the regional forest trade are substantial and represent a possible leverage point for addressing trade in illegal products. Gaps between forest product imports reported by China and exports reported by supplying countries are high, particularly for Indonesia and Myanmar. Myanmar's Government requires that all teak logs and all processed hardwood product bound for export pass through the capital, Yangon, but, in practice, only a small proportion of the substantial amount of hardwood lumber bound for China takes this indirect route (Kahrl *et al.* 2004).

Lankin (2004) has indicated that there is still no contact between Russian customs and Chinese customs for harmonizing national customs statistics and coordinating on species forbidden for export. Customs violations on the Russian side have gone up with increasing exports to China. Despite Russia's complex system of checking, stamping, etc., corruption among inspectors allows large amounts of illegal products to pass into China. Lankin notes that, of the counter-measures Russia has implemented, control of export sites and reduction of their number have been the most effective.

Noncompliance of concessionaires or leasing parties with regulations or agreements is common in the region. As mentioned, concessionaires in PNG often do not fulfill agreed social obligations, leaving unfinished buildings, roads, and bridges across the country (Bun *et al.* 2004). In Cambodia, a halt in transport of concession logs for which royalties have not been paid is being adopted to increase compliance (Barney 2004a). In Russia, Chinese companies involved in harvesting are said to have failed to meet provincial requirements of investment in processing and hiring of Russian employees. Several instances of Chinese companies violating concession agreements have been noted in Myanmar, as well, with examples including broken agreements by Chinese companies to provide electricity and various other services to rural communities (Global Witness 2004).

Illegal logging and other forest sector problems are often linked to government corruption. In PNG, there is strong evidence that corruption exists at the highest levels of Government and throughout the bureaucracy in association with the foreign-owned logging industry. The industry is thought to be a major source of funds for political parties and individual politicians, and national-level permits or licenses for logging concessions are said to be issued outside of the established legal process to the company that is willing to pay the right price (Bun *et al.* 2004). In Cambodia, according to Global Witness, the concession system is also linked to a high degree of corruption, with patronage leading directly to the highest levels of state (Barney 2004a).

CONCLUSION

The China forest product trade is clearly having a dramatic impact on the forests, economies, and peoples of supplying countries in the Asia Pacific Region. With strong and growing demand in China and a lack of adequate domestic supply, it is likely that the trends identified in this paper will continue for some time. Indeed, while further work is needed on demand drivers and the implications of low per capita wood consumption in China, growth in Chinese demand is expected in the short to medium-term, despite the inability of Asia Pacific supplying countries, aside from Russia, to expand overall supply of logs and processed products sustainably. As such, China may be faced with the need of developing a strategy to secure greater access to Russian resources. Given the possibility that even Russian supply may not meet its needs in the longer term, China's strategy may need to encompass other potential sources. Options might include stronger development of collective forests at home, with attention to the supply of not only softwood, but also hardwood species, and more innovative and flexible application of conservation policies in these areas. Another alternative is encouraging private investment in sustainable natural forest management and plantation development in supplying countries in the region. In the shorter term, however, China will likely continue to make use of forest products from current suppliers as much as possible, and thus may wish to formulate policies to minimize negative ecological

and livelihood impacts in these countries. At the same time, given that China's timber product exports (most in the form of furniture and other finished wood products) are 50 % by RWE volume of the logs and other timber product it imports, final destination countries benefiting from China's low-cost manufacturing may have a role to play[11]. Supplying countries may also wish to develop policies minimizing negative impacts. Initiatives might emphasize, for example, the gravitation of small-scale producers toward niche markets where they can find comparative advantage, rather than direct competition with China's highly efficient and well-financed supply and manufacturing chains.

The negative impacts associated with this trade merit the focused attention and dedicated energy of governments, industry, researchers, and conservation groups around the region. The combined efforts of all of these stakeholders, through both international cooperation on shared problems and domestic initiatives, will be needed to address the underlying policy and institutional problems generating the negative impacts. Forward-thinking and proactive solutions should utilize the China trade to create incentives for investment in and the protection of forests, both in China and in supplying countries, by taking advantage of new and growing markets, new partnerships to supply capital, new technologies to lower cost of sustainable production, and better organization and empowerment of local producers. Such solutions should further enable forestry to make stronger contributions to the economic development of the region's poor people both within and outside China.

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[11] In 2003, China's forest product exports by RWE volume were 25 % of its forest product imports. Timber product (i. e. including logs and solid wood products, but excluding pulp and paper) exports that year, however, at 20.0 million m^3 RWE were about half of timber product imports (40.3 million m^3 RWE).

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