COMMENTS

Economic incentives exist to support measures to reduce illegal logging

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SUMMARY

Three studies of the global economic implications of eliminating illegal logging are summarized. Processors of illegally sourced wood would lose from the elimination of illegal logging through high prices for logs and decreased production of wood products. Associated with these changes could be losses in employment and income. Beyond these losses to the processing industry, eliminating illegal logging has positive effects on sustainable forestry practices, and economic, environmental and social values in countries with illegal logging. The effects of illegal logging also extend beyond the countries in which illegal logging occurs. In almost all countries without illegal harvests the elimination of illegal logging is predicted to lead to significant increases in the price and production of wood products. This suggests that an economic incentive exists for legitimate producers in all countries to support measures to reduce illegal logging.

Keywords: illegal logging, international trade, policy, wood products, modelling

Des encouragements économiques existent pour soutenir les mesures visant à réduire la coupe de bois illégale

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Ce commentaire est une synthèse de trois études sur les implications économiques globales de l'élimination de la coupe de bois illégale. Les traiteurs de bois provenant d'une source illégale perdraient à l'élimination de la coupe de bois illégale par les prix élevés des rondins et la production décrue de produits du bois. Des pertes d'emploi et de revenus pourraient être associés à ces changements. Au delà de ces pertes pour l'industrie de traitement, l'élimination de la coupe de bois illégale a des effets positifs sur les pratiques durables de foresterie et les valeurs économiques, sociales et environnementales dans les pays où cette coupe existe. Les effets de la coupe de bois illégale s'étendent également au delà des pays dans lesquels elle s'effectue. Il est prévu que dans pratiquement tous les pays sans récolte illégale, la suppression de la coupe illégale conduira à une augmentation des prix et de la production des produits du bois. Cela suggère qu'un encouragement économique existe pour les producteurs légitimes dans tous les pays pour soutenir les mesures visant à réduire la coupe de bois illégale.

Incentivos económicos para apoyar medidas para limitar la tala ilegal masiva

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Este artículo resume tres estudios sobre las implicaciones económicas mundiales de la eliminación de la tala ilegal masiva. La eliminación de la tala ilegal perjudicaría a las empresas procesadoras de madera procedente de fuentes ilegales porque llevaría a un aumento en el precio de troncos y un declive en la producción de productos madereros, y esto podría causar pérdidas de empleo e ingresos. Aparte de estas pérdidas en la industria del procesamiento de madera, la eliminación de la tala ilegal en los países en cuestión tiene efectos positivos sobre las prácticas de gestión forestal sostenible y los valores económicos, ambientales y sociales. Los efectos de la tala ilegal también se extienden más allá de los países donde sucede, y en casi todos los países donde no existe la tala ilegal se prevé que la eliminación de ésta cause un aumento significativo en el precio de los productos madereros. Esto sugiere la existencia de un incentivo económico para apoyar medidas para reducir la tala ilegal entre los productores legítimos de todos los países.

INTRODUCTION

Illegal logging has gained considerable attention in recent years as a critical issue of sustainable forest management (FAO 2007). Seneca Creek (2004) estimate that illegal logging represents 5 percent to 10 percent of global industrial roundwood production. Most of the illegally logged wood is used domestically (Seneca Creek 2004, NZFRI 1999), though the illegal log trade is estimated to be 12 percent of the global softwood roundwood trade and 17 percent of the hardwood roundwood trade (Seneca Creek 2004). Conservation groups, the forest industry, governments, and international organisations have all called for action and begun initiatives to address illegal logging, with a variety of policies to combat illegal logging and stop imports of illegal wood products already being promoted (G8 1998, United Nations Forum on Forests 2002, Brack 2006).

Illegal logging involves a wide range of activities, along the chain of transactions that delivers forest products to the end consumer, which violate national and/ or international laws (MAF 2006). Seneca Creek (2004) defined 'illegal' harvests specifically as (i) harvesting without authority in designated parks or forest reserves, (ii) harvesting without authorization or in excess of concession permit limits, (iii) failing to report harvesting activity to avoid royalty payments or taxes, and (iv) violating international trading rules and agreements.

There is however, no internationally agreed definition. Indeed what is 'illegal' depends on national laws (Seneca Creek 2004). There are practical difficulties involved with identifying the origin of traded forest products and the degree to which logging activities comply with a country's laws. As such, most of the estimates of illegal logging have been derived without the benefits of field research, instead relying on anecdotal or circumstantial evidence (Curtin 2007).

Assessments of illegal logging by non-governmental and governmental organisations tend to differ in what constitutes illegal, with NGOs including issues such as whether forests are managed 'sustainably' and whether royalties and fees have been levied at a fair market rate. Governmental organisations tend to focus on the extent that wood can be traced to an officially sanctioned logging operation (Turner *et al.* 2007a,b). Given these issues there is considerable variation, as well as uncertainty, in estimates of the magnitude of the illegal logging and trade of forest products. Estimates of the scale of illegal logging in the Russian Far East range from 15 percent to 50 percent (Seneca Creek 2004, Guertin 2003, Kotlobay 2003).

Economic, social, and ecological data on the effects of illegal logging are scarce, especially at the international level (e.g., Seneca Creek 2004). Here we focus on three quantitative studies of the impact of illegal logging on the global forest sector. The first was commissioned by the American Forest and Paper Association (Seneca Creek 2004) due to concerns about the impact of illegal logging on the United States forest products industry. The second study was commissioned by the New Zealand Ministry of Agriculture and Forestry, which was concerned about the impacts of illegal logging on the competitiveness of New Zealand wood products in domestic and export markets (Turner *et al.* 2007a,b). The third study (Li *et al.* 2007a) focused on the effects of illegal logging on the production, trade and price of wood products in the global forest industry.

All of the studies described here used estimates of illegal logging derived from Seneca Creek (2004); the most comprehensive, and widely quoted, review on illegal logging and trade. Their estimates generally fell between the extremes of the non-governmental and governmental sources. The effects of illegal logging were estimated by comparing a 'with illegal logging' scenario, with an alternative 'without illegal logging' scenario which made the same assumptions as the 'with illegal logging' scenario, except that the supply of industrial roundwood was reduced by the amount of illegal logging estimated in each country. This representation assumes that 'illegal' supply becomes unavailable at any log price, and fits with three of the four elements of the Seneca Creek (2004) definition of 'illegal' harvests above.

The three studies used an economic model of the international forest industry, the Global Forest Products Model (GFPM, Buongiorno *et al.* 2003), with some variation in the input data and parameters depending on the date of the study, to view illegal logging in its full international context. This ensured estimates of the impact of illegal logging that recognised the complex interactions among countries and industries in the global forest sector.

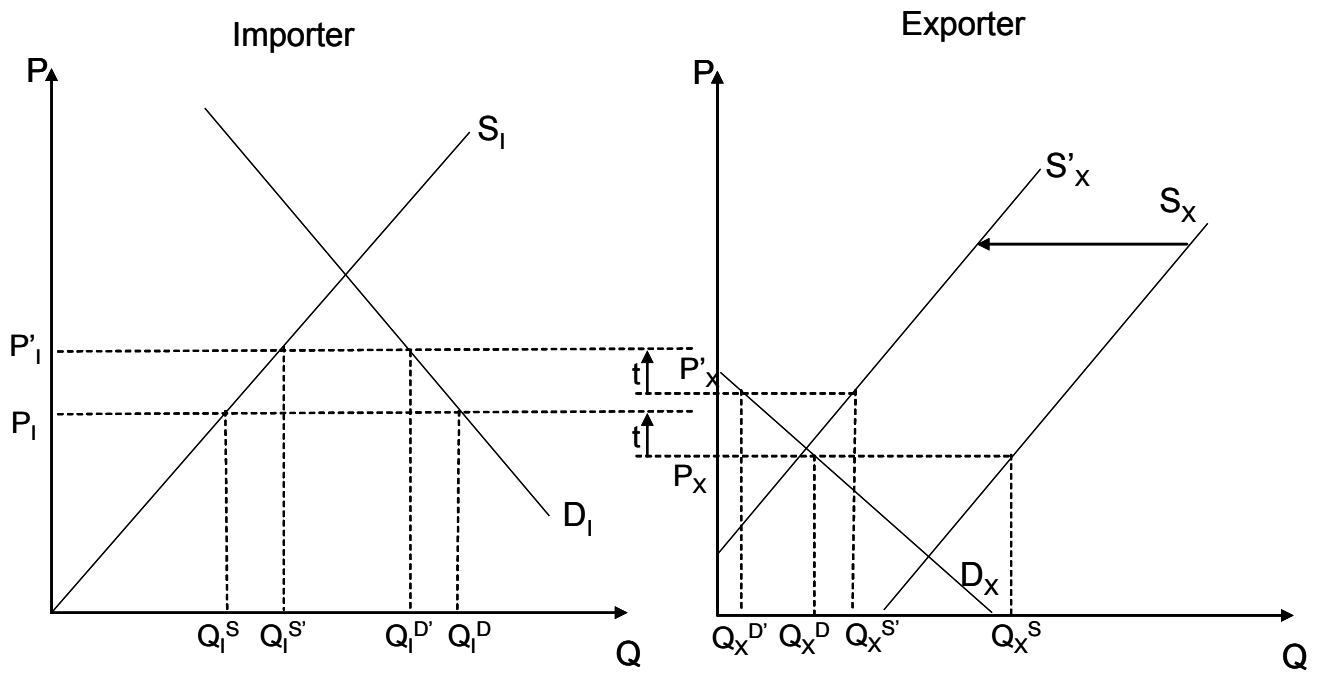
The GFPM has been widely used to analyse a variety of issues. They include (i) the global effects of accelerated tariff liberalisation (Zhu *et al.* 2001), (ii) United States waste paper recycling policy (Zhu and Buongiorno 2002), (iii) regional trade agreements involving New Zealand (Turner *et al.* 2001), (iv) the Free Trade Area of the Americas (Turner *et al.* 2005a), (v) the global competitiveness of the United States forest sector (Turner *et al.* 2005b), and (vi) the production and trade effects of exotic forest pests and phytosanitary regulations aimed at reducing the likelihood of arrival of these pests in the United States (Prestemon *et al.* 2006), New Zealand (Turner *et al.* 2007), and other countries (Li *et al.* 2007b).

THE ECONOMIC EFFECTS OF ELIMINATING ILLEGAL LOGGING

The theory of the economic impact of illegal logging embedded in the GFPM is sketched in Figure 1, which represents the demand for and supply of wood in regions where there is illegal logging (Exporter) and in the rest of the world (Importer). Two equilibrium states are shown: with illegal logging, and without illegal logging.

With illegal logging, the price of industrial roundwood in the importer region is P_I. At that price, the quantity supplied by the importer region, Q_I^S, is less than the quantity demanded, Q_I^D. In the exporter region the price is P_X, and the quantity supplied Q_X^S is more than the quantity demanded Q_X^D. At equilibrium, the importer price is equal to the exporter price

FIGURE 1 *World competitive equilibrium in international wood markets without and with illegal logging*



plus the unit transport cost: $P_I = P_X + t$, and the net trade of the exporter is the opposite of the net trade of the importer: $Q_I^S - Q_I^D = -(Q_X^S - Q_X^D)$.

As shown in Figure 1, the effect of eliminating illegal logging in the exporter region is to decrease harvests (a leftward shift of the supply curve from S_X to S'_X, reflecting the higher cost of legally sourced wood). This increases the price in the exporting region to P'_X, thus decreasing domestic wood consumption. In the importing region, the price increases to P'_I, resulting in higher harvests, but also lower consumption by processors. Net-trade decreases to $Q_I^{S'} - Q_I^{D'} = -(Q_X^{S'} - Q_X^{D'})$.

Consumers (processors) in the exporting and importing region therefore lose from the elimination of illegal logging through higher prices for industrial roundwood and decreased production of wood products. While loggers in the exporting country receive higher prices, they also decrease their harvests. Loggers in the importing country are, however, better off, due to higher prices and increased harvests.

The extent to which producers and consumers of wood in different countries are actually better or worse off depends on how supply, demand, trade, and prices of wood and its derived products (sawnwood, wood panels, pulp, and paper and paperboard) respond to changes due to the reduction in wood supply. It is in this detailed accounting that the Global Forest Products Model, which deals with 14 wood products in 180 countries, is particularly useful.

Who loses from eliminating illegal logging?

Li *et al.* (2007a) estimated the effects on various parts of the world forest sector, from 2007 to 2020, of a gradual elimination of illegal logging from 2007 to 2011. The world price of industrial roundwood was predicted to be an average 4.2 percent higher over the projected period, due to eliminating illegal logging, while the prices for wood products were 0.4 to 2.0 percent higher.

Li *et al.* (2007a) also estimated the effects on individual countries with illegal logging, such as Indonesia, or countries dependent on imported timber from illegal sources, such as China. They assumed that 50 percent of China's sawlog and pulp log supply was from suspicious sources. For Indonesia, they assumed that 80 percent of sawlog supply was illegal and 30 percent of pulp log supply. The effect on Chinese and Indonesian wood products production and trade of eliminating this supply are shown in Figure 2 and Figure 3.

Loggers in both countries were predicted to experience a large decrease in production. Other wood processors were also predicted to decrease production and exports. This was particularly the case for wood panel and pulp and paper producers in China and pulp and paper producers in Indonesia.

As a consequence of higher industrial roundwood prices and lower production the wood products industries in China and Indonesia were predicted to experience lower value added (the value of the end products minus the cost of the intermediate wood and fibre products). Russia, Brazil and Malaysia are other countries with harvests from suspicious sources where production and value added would decrease if illegal logging were eliminated (Li *et al.* 2007a).

Since illegal logging is the source of a considerable amount of wood for local industry and for exports, eliminating illegal logging could have associated losses in employment and income in countries where wood from suspicious sources is processed (Prestemon and Laarman 1989).

However, notwithstanding the losses to the wood products

FIGURE 2 *Changes in China's average annual production and trade from 2007 to 2020 due to the progressive elimination of illegal logging.*

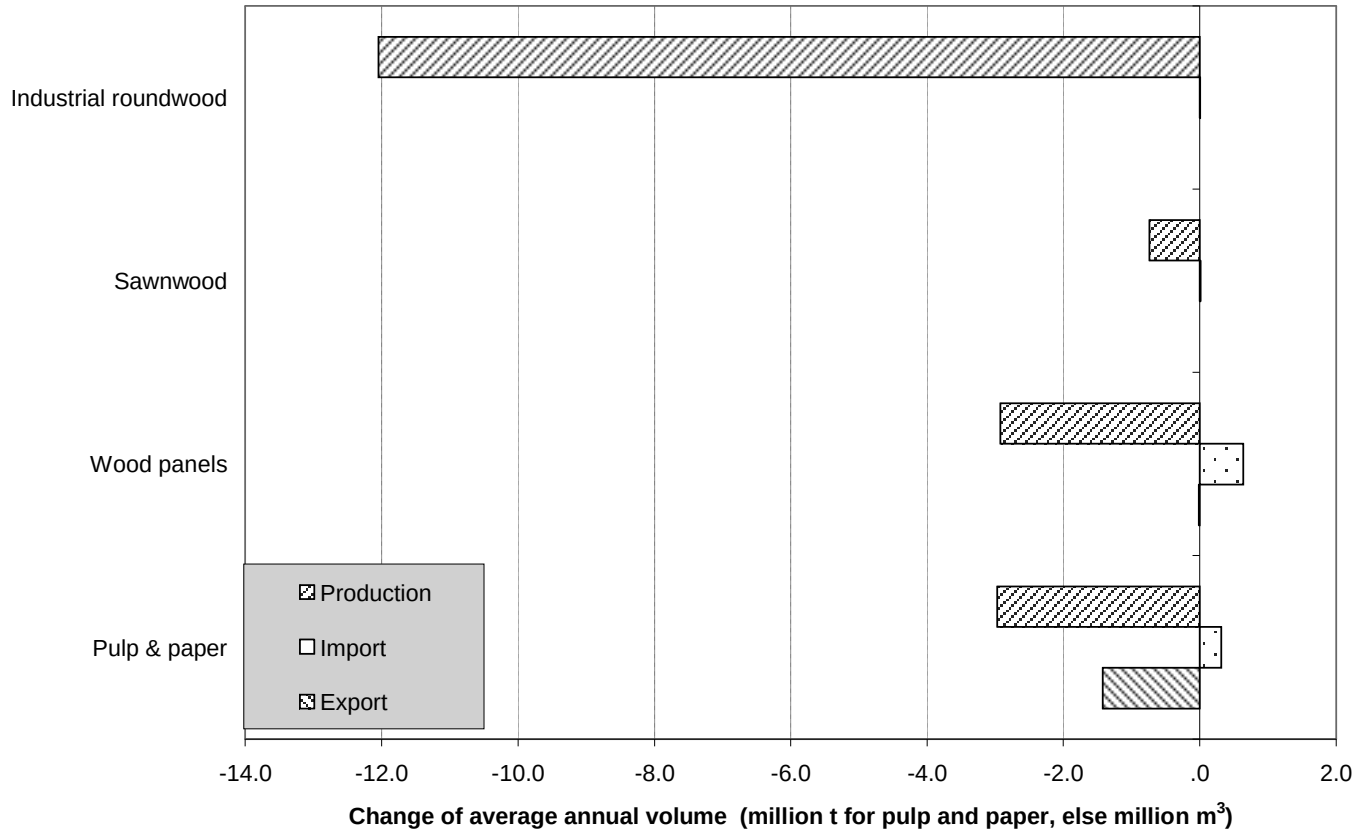
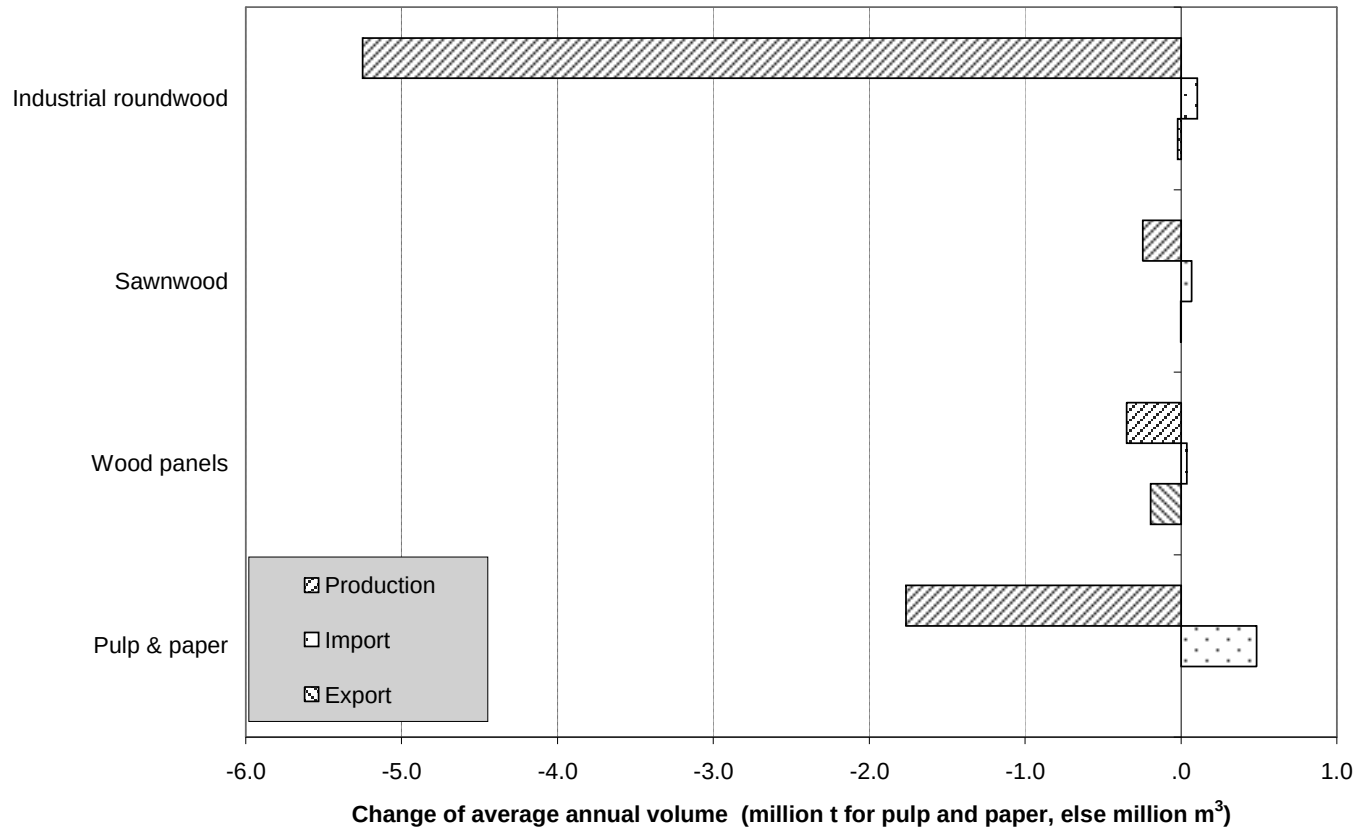


FIGURE 3 *Changes in Indonesia's average annual production and trade from 2007 to 2020 due to the progressive elimination of illegal logging.*



processing industry, eliminating illegal logging has positive affects on sustainable forestry practices, and economic, environmental and social values (Geist and Lambin 2002).

Because illegal logging largely occurs in tropical forests, it adversely affects globally important environmental services that come from them (Kinnaird *et al.* 2003, Bala *et al*. 2007). Increased illegal logging in central Africa threatens the habitat of the great apes (Walsh *et al.* 2003). Illegal logging of Ramin (*Gonstylus spp*), a hardwood native to Indonesia and Malaysia, is reducing the habitat of the orangutan and Sumatran tiger (Jepson *et al.* 2001, Nelleman *et al.* 2007). Eliminating illegal logging might reverse these trends, as the reduction in harvests from countries with illegal logging has been predicted to lead to increased forest stock (Li *et al.* 2007a).

The World Bank (2002) estimated that illegal logging reduces government revenues by about $US5 billion a year. An additional effect of the illegal log supply is the negative impact on the 'wood is good' image (Seneca Creek 2004). The elimination of these negative environmental, social and economic effects of illegal logging in countries with suspicious harvests could well outweigh the costs to wood processors in these countries.

Who gains from eliminating illegal logging?

The effects of eliminating illegal logging also extend beyond the countries in which illegal logging occurs or where illegal wood is processed. The trade distortions due to the illegal harvest and trade of logs lower wood product prices. This gives a competitive advantage to log and wood product (e.g., sawnwood, plywood, furniture, etc.) exports from countries utilising illegally harvested or traded material, and reduces the price that legal producers receive.

Turner *et al.* (2007a,b) predicted significant changes to New Zealand's export markets from the elimination of illegal logging, due to higher prices for species competing with New Zealand radiata pine in international markets. This was predicted to lead to increased demand and hence production and prices for radiata pine.

The study used the changes in international wood product prices predicted by the GFPM in an economic model of the New Zealand forestry sector, the Radiata Pine Market Model (Katz 1988). The RPMM was used to predict the specific effects of eliminating illegal logging on the New Zealand sector.

The most significant change for New Zealand would be a rise in volume, and prices of log exports, while sawnwood production and production of other wood products (wood panels, pulp, paper and secondary processed products) would be less affected. This was because New Zealand sawnwood is consumed largely in the domestic and Australian markets for structural products, where the proportion of wood products produced from illegal logs is relatively minor. Other markets (such as the United States mouldings market) also have a very low presence of illegal wood (Turner *et al.* 2007a).

The combined effect of these production and price changes was a predicted increase in New Zealand forestry and wood products sector producer revenues. Significantly, the New Zealand forest industry as a whole could gain US$177 million per year in increased revenue.

Seneca Creek's (2004) study of the effect of eliminating illegal logging on the United States forest sector found similar trends. United States wood product prices were predicted to increase by 2 percent to 4 percent, depending on the product. Other countries that could most benefit from the elimination of illegal logging are Canada, the United States, Sweden, and Germany (Li *et al.* 2007a).

DISCUSSION AND CONCLUSION

Illegal logging is irreconcilable with sustainable forest management, as it leads to deforestation and associated environmental losses. However, if costly policies are to be applied to reduce the rate of illegal logging, it is essential to evaluate their consequences.

Although total elimination of illegal logging may not be feasible, it could be decreased through concerted action. To that end, the results of the studies presented here should be useful in deciding whether policies that would reduce illegal logging should be considered. Some countries would clearly benefit economically (e.g., New Zealand, United States, Canada, Germany, Sweden), while others would lose (e.g., China, Indonesia, Russia, Brazil, Malaysia).

The studies by Turner *et al.* (2007a,b), Li *et al*. (2007a) and Seneca Creek (2004) found that the losses due to reducing illegal logging are concentrated in developing countries or countries in transition to market economies. In almost all countries without illegal harvests, however, the elimination of illegal logging is predicted to lead to significant increases in the price and production of wood products. This suggests that an economic incentive exists for legitimate producers in all countries to support measures to reduce illegal logging.

Beyond the direct economic benefits to the forest industry, illegal logging has potentially significant economic implications at the national level. It potentially lowers investment in forests and forest development and reduces other options for forest utilisation, such as specialty foods, gene banking, and tourism. At the global level, illegal logging discourages forest investment that could help to address global deforestation and climate change (Turner *et al.* 2007a).

Reducing illegal logging could be achieved by a variety of measures, such as expanding wood certification, improving concession management, improved enforcement of forest laws, and sanctions for violators (McElwee 2004). Protecting parks and preserves, addressing corruption, clarifying tenure, reducing forestland conversion, and improving information systems would also help (McCarthy 2002, Smith *et al.* 2003).

To be successful, however, policies must be widely adopted to ensure illegal supply is significantly reduced. Property rights for legitimate producers must be improved to enable them to capture benefits from reduced illegal logging. The costs for legitimate producers must not increase more

than those for illegal log producers. Otherwise, the cost differential would increase the incentive for illegal operators (Contreras-Hermosilla *et al.* 2007).

Economic models of the forest sector, such as the Global Forest Products Model and Radiata Pine Market Model, can be used to assess the relative efficacy of the different policy measures being proposed to address illegal logging, and help answer important questions, such as:

- Would expanding the country and product coverage of the European Union's Action Plan (2003) for Forest Law Enforcement, Governance and Trade be beneficial?
- How much would reducing the cost of compliance for legal harvests affect illegal harvests?
- Will compliance costs in natural forests increase relative to plantations, accelerating the move to timber production from plantations?
- Would a market for carbon increase the profitability of legal forest management?

The modelling approaches used in the studies reviewed above (Seneca Creek 2004, Turner *et al.* 2007a,b, Li *et al.* 2007a) allow policy-makers to observe the dynamics of global production and trade in wood products and the impacts that policy may have on all producers and consumers. Wood product producers are not producing, consuming and trading wood products in isolation but are a component of the global system. As with all economic models, the accuracy of the predictions depends on the data and the assumptions used in the models. Improved statistical information on forest production, consumption and trade, especially in developing producer countries, will lead to improved predictions about the impacts of illegal logging and policies to combat it.

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