Measuring the impacts of illegal logging

A new study shows strong economic incentives exist for legal producers of wood products to support measures to reduce illegal logging

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ILLEGAL LOGGING in many ITTO producer countries is known to adversely affect sustainable forestry practices, forest products trade, and other economic, environmental and social values. However the effects of illegal logging extend beyond the countries in which illegal logging occurs. With the exception of work conducted in the US (Seneca Creek, 2004), there have been few quantitative assessments of the impacts of illegal logging on producers of legal timber. New Zealand is only a minor importer of tropical timber (mainly processed) products and a net exporter of softwood products but the NZ Ministry of Agriculture and Forestry (MAF) has been sufficiently concerned about the global impacts of illegal logging on its own forestry sector to commission a study to determine the production, trade and price effects of trade distortions resulting from illegal logging on its forest industry. The recent study by James Turner, Andres Katz and Joseph Buongiorno (Turner et al., 2007) quantifies the effects of illegal logging on both prices and competitiveness of New Zealand wood products in domestic and export markets. It uses the Global Forest Products Model (GFPM) to view the New Zealand forest sector in its full international context and the Radiata Pine Market Model (RPMM) to provide more detailed information on the New Zealand forestry and sawmilling sectors. This article reports on the main findings of the study.

Assessments are complicated by differences in policies and institutions that govern forest utilization and hence establish the rules to apply in determining whether specific logging activities and wood products trade are legal.

Nature of illegal logging and trade

The study recognized the considerable variation and uncertainty in estimates of the magnitude of illegal logging and trade of wood products. Assessments are complicated by differences in policies and institutions that govern forest utilization and hence establish the rules to apply in determining whether specific logging activities and wood products trade are legal. Statistics on legal production and trade are often lacking or unreliable in many countries, making estimates of illegality more uncertain. Illegal logging was defined in the report as occurring when timber is harvested, transported, bought or sold in violation of national and/or international laws. Differences between NGO and government approaches to assessment were considered to explain much of the variation found in estimates of illegal logging. NGO assessments include issues such as logging concession award processes, whether forests are managed sustainably (according to often differing criteria), and whether taxes and fees have been levied at a fair or market rate. Government estimates, on the other hand, usually focus on the extent that wood can be traced to an officially sanctioned logging operation. The most comprehensive and widely quoted review of illegal logging and trade is Seneca Creek (2004), which derived estimates that generally fall between the extremes of NGO and governmental sources.

Recognizing the limitations of each source, the range of assessments was used in the study to derive 'low', 'most likely', and 'high' estimates *(Table 1)*, which form the basis for modeling the effects of trade distortions due to illegal logging. Due to the scope of the review and its widespread recognition, the Seneca Creek study was influential in the derivation of the 'most likely' scenario.

Wide-ranging suspicions

Table 1: Estimated rates of 2005 suspicious industrial roundwood harvests

	ILLEGAL HARVEST ESTIMATES (%)		
COUNTRY/REGION	LOW	MOST LIKELY	HIGH
WEST AFRICA[1]	20	30	40
BRAZIL	13	19	25
OTHER LATIN AMERICA[2]	6	8	11
CHINA	20	30	40
INDONESIA	50	60	80
MALAYSIA	3	5	35
OTHER ASIA[3]	12	17	23
OCEANIA[4]	50	75	80
ACCEDING EU[5]	7	10	13
RUSSIA	10	18	40

[1]Gabon, Cameroon, Ghana and Liberia; [2]excluding Brazil; [3]excluding Indonesia, Malaysia, and China; [4]Papua New Guinea and Solomon Islands; [5]Latvia and Estonia

Modeling approach

The detailed theoretical principles and assumptions underlying the economic models used in the study are available in the full report (Turner et al., 2007). Here a brief description of the methods is provided. The study used two economic models of the forest sector; the GFPM and RPMM. The GFPM is a dynamic spatial equilibrium model which predicts production, exports, imports and prices of 18 forest products (both commodity and secondary processed products) in 180 individual countries (Buongiorno, 2003; Turner et al., 2006). It allows an analysis of the repercussions that changes in illegal logging may have on the production, consumption, trade, and prices of forest products in other countries. The RPMM predicts production and prices of more detailed categories of New Zealand log grades and sawnwood as well as the influence of forest returns on plantation area development, reflecting price adjustments to changes in global supply and demand as predicted by the GFPM.

The study estimated the effects of eliminating illegal logging by comparing four sets of projections modeled by the GFPM and RPMM. A 'base' or 'with illegal logging' scenario, was compared with three alternative, or 'without illegal logging', scenarios ('low', 'most likely' and 'high') in which the supply

Up and down

Table 2: Change in industrial roundwood production and trade in 2020 from eliminating 'most likely' levels of illegal logging (selected countries)

	BASE SCENARIO			CHANGE					
	PRODUCTION	IMPORT	EXPORT	PRODUCTION	IMPORT	EXPORT	PRODUCTION	IMPORT	EXPORT
COUNTRY	('000 m³)			('000 m³)			(%)		
AFRICA	**49 077**	**694**	**7 818**	**161**	**78**	**-282**	**0.3**	**11.2**	**-3.6**
Nigeria	9 160	1	2	1	0	0	0.0	0.0	0.0
South Africa	18 738	1	3 088	1 047	0	828	5.6	0.0	26.8
NORTH/CENTRAL AMERICA	**797 163**	**5 833**	**29 450**	**18 904**	**447**	**2 748**	**2.4**	**7.7**	**9.3**
Canada	246 513	4 517	2 263	5 335	431	4	2.2	9.5	0.2
United States of America	530 691	1 162	27 126	14 402	1	2 748	2.7	0.1	10.1
SOUTH AMERICA	**202 601**	**52**	**2 266**	**-21 431**	**3**	**169**	**-10.6**	**5.8**	**7.5**
Argentina	7 421	9	12	-10	0	0	-0.1	0.0	0.0
Brazil	138 773	9	596	-20 181	0	-5	-14.5	0.0	-0.8
Chile	40 343	7	1 410	-889	0	174	-2.2	0.0	12.3
ASIA	**258 439**	**120 744**	**10 583**	**-26 469**	**2 022**	**-2 744**	**-10.2**	**1.7**	**-25.9**
China	119 003	65 636	621	-15 315	-1 833	1	-12.9	-2.8	0.2
Indonesia	40 293	250	735	-5 851	21	-298	-14.5	8.4	-40.5
Japan	20 632	34 137	52	445	2 730	3	2.2	8.0	5.8
Malaysia	16 528	676	4 437	-2 714	66	-1 497	-16.4	9.8	-33.7
India	29 224	2 286	13	-1 551	6	0	-5.3	0.3	0.0
OCEANIA	**55 809**	**93**	**19 875**	**496**	**0**	**-135**	**0.9**	**0.0**	**-0.7**
Australia	28 572	81	4 342	1 207	1	902	4.2	1.2	20.8
New Zealand	23 901	5	12 698	1 048	0	660	4.4	0.0	5.2
Papua New Guinea	2 435	0	2 121	-1 286	0	-1 243	-52.8	0.0	-58.6
Solomon Is	856	0	791	-636	0	-616	-74.3	0.0	-77.9
EUROPE	**749 025**	**87 590**	**144 694**	**-7 240**	**-15 533**	**-12 678**	**-1.0**	**-17.7**	**-8.8**
EU25	414 871	80 203	30 604	16 326	-15 753	3 540	3.9	-19.6	11.6
Finland	57 814	31 889	357	3 664	-11 668	3	6.3	-36.6	0.8
France	37 974	1 036	2 181	1 041	0	89	2.7	0.0	4.1
Germany	40 639	486	13 024	2 362	0	1 877	5.8	0.0	14.4
Sweden	79 127	17 217	384	3 654	-3 695	2	4.6	-21.5	0.5
United Kingdom	9 457	418	18	262	188	0	2.8	45.0	0.0
Russian Federation	250 165	304	102 406	-24 564	0	-16 296	-9.8	0.0	-15.9

of industrial roundwood was reduced starting in 2008 by the amount of illegal logging estimated for each country in Table 1.

Global impacts of illegal logging

Study predictions from the GFPM show that a variety of shifts in global wood products production and trade will occur with the elimination of illegal logging. Focusing on the 'most likely' scenario for illegal logging, in 2020 world industrial roundwood production is predicted to be 1.5 percent lower and the average log price 4.2 percent higher[1] with the elimination of illegal logging *(Tables 2 and 4)*. As would be expected, countries with significant 'suspicious' harvest, such as Russia, China, Indonesia, Papua New Guinea, and Brazil experience decreased production due to reduced wood supply from their own forests, and from other supplying countries and regions such as Papua New Guinea, the Solomon Islands and West Africa (Table 2). The report results suggest that reduced competition from these countries means that countries with lower levels of 'suspicious' wood, including New Zealand, United States, Canada, Finland, Sweden and Germany, experience higher production, export and prices for their wood products. In countries with high levels of illegal harvests and/or that process raw material from illegal harvests, comparative advantage in processing is dependent on both raw material and manufacturing costs. Countries that have low manufacturing costs, such as China and Indonesia, may remain competitive, even in the absence of illegal harvests.

The study found that the trade of industrial roundwood is affected more than production, due to the shift in harvesting from countries with high illegal logging to those without. Russia, Indonesia, Malaysia, and Papua New Guinea log exports are reduced by 16 percent to 59 percent, while the United States, Germany, South Africa, Australia and New Zealand increase their log exports.

[1] *All prices used in the study are real, ie. corrected for changes in inflation using 2006 as a base.*

The study also found that the elimination of illegal logging leads to lower global wood products production in developing countries, including in many of the ITTO producer countries *(Table 3)*. Global trade of all wood products is also lower, including in both ITTO producer and consumer member countries. The corresponding prices of all products are higher (Table 4). Exports of sawnwood and wood panels by developing economies are most affected (in percentage terms), reflecting the large proportion of these products produced in countries with high levels of suspicious harvests.

In terms of growing stock, the reduction in global harvests associated with the elimination of illegal logging results in. higher global forest stock (318 million m^3 or 0.1 percent higher in 2020), especially in countries with suspicious harvests. China and Indonesia's forest stock increases by 1.0 and 1.4 percent respectively in 2020. Forest stock is predicted to be lower in the United States, New Zealand and Sweden due to increased harvests. The report notes that the predicted increase in global forest stock is likely to be an underestimate because the GFPM does not consider the positive effect of higher industrial roundwood prices on investment in sustainable management practices, and increased relative returns to forestry that would lead to conversion of agricultural and other land to forests.

The reduction in global harvests associated with the elimination of illegal logging is dependent on the estimated extent of suspicious harvests. For the scenarios eliminating 'low' and 'high' levels of illegal logging, global industrial roundwood production is 0.9 percent to 2.6 percent lower, respectively, in 2020, compared with the base scenario. The world price of industrial roundwood is 2.6 percent to 8.4 percent higher, compared with the base scenario.

Impacts on New Zealand

The study predicted significant changes to New Zealand's export markets due to the elimination of illegal logging. The report results suggest that there will be higher prices for species competing with New Zealand radiata pine in international markets. Projections from the RPMM show that this will lead to increased demand and hence production and prices for radiata pine *(Table 5)*.

The RPMM results from the study found that the most significant change for New Zealand is an increase in volume and prices for log exports, while sawnwood production and production of other wood products (wood panels, pulp, paper and secondary processed products) is less affected. This is 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.

Focusing on the study's 'most likely' scenario, the price of New Zealand export logs is most affected by the elimination of illegal logging, being 10.6 percent higher, whereas the domestic log market shows a more modest 1.3 percent price rise. The combined effect of these production and price changes is that New Zealand forestry and wood products sector producer revenues are higher. Significantly, the New Zealand forest industry as a whole would gain US$177 million[2] per year in increased revenue. The study suggests that this impact is similar to the potential increase in producer revenue that would be realized with elimination of global tariffs on all wood products. The RPMM also predicts significant positive impacts on land value and plantation rates, stimulated by improved investor interest in forestry. In the 'most likely' scenario, land values increase by 7.6% (assuming a discount rate of 10%).

Conclusions

The study by Turner et al. (2007) and previous studies (Li et al., 2007; Seneca Creek, 2004) have shown that the elimination of illegal logging leads to significant increases in the price and production of wood products in almost all countries without illegal harvests. The report results suggest 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 identified in the study, the report suggests that illegal logging has potentially significant economic implications at the national level, in terms of lowering investment in forests

[2] *Assuming a 10 percent discount rate, 2008 onwards.*

Developing and developed

Table 3: Change in wood products production and trade in 2020 from eliminating 'most likely' levels of illegal logging

		BASE SCENARIO			CHANGE					
		PRODUCTION	IMPORT	EXPORT	PRODUCTION	IMPORT	EXPORT	PRODUCTION	IMPORT	EXPORT
REGION	PRODUCT	('000 m^3 or '000 t)			('000 m^3 or '000 t)			(%)		
DEVELOPING	Industrial roundwood	633 580	87 860	19 521	-53 350	-386	-5 383	-8.4	-0.4	-27.6
	Sawnwood	128 563	28 428	18 634	-7 670	-960	-4 977	-6.0	-3.4	-26.7
	Wood panels[2]	113 148	21 759	22 591	-9 860	-236	-4 466	-8.7	-1.1	-19.8
	Wood pulp[3]	48 001	22 464	10 809	-3 454	562	-613	-7.2	2.5	-5.7
	Paper[4]	188 421	33 614	11 288	-3 760	241	-913	-2.0	0.7	-8.1
DEVELOPED[1]	Industrial roundwood	1 665 129	128 571	195 864	18 345	-12 534	-7 538	1.1	-9.7	-3.8
	Sawnwood	367 314	108 944	121 304	3 750	-6 188	-2 171	1.0	-5.7	-1.8
	Wood panels	214 429	65 143	66 464	3 503	-3 918	311	1.6	-6.0	0.5
	Wood pulp	206 171	24 162	37 277	1 205	-1 496	-321	0.6	-6.2	-0.9
	Paper	319 774	73 884	101 779	982	-859	295	0.3	-1.2	0.3

[1] *South Africa, Canada, United States, Japan, Australia, New Zealand, Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom;*
[2] *Plywood and veneer, particleboard, and fibreboard;* [3] *Mechanical and chemical pulp;* [4] *Newsprint, printing and writing paper, and other paper and paperboard*

The bottom line

Table 4: Change in world wood product prices from eliminating 'most likely' levels of illegal logging

	BASE SCENARIO			CHANGE					
	2010	2020	2030	2010	2020	2030	2010	2020	2030
PRODUCT	(US$/ m³ or US$/ t)			(US$/ m³ or US$/ t)			(%)		
Industrial roundwood	60	55	49	1.7	2.3	3.2	2.8	4.2	6.5
Sawnwood	185	175	164	2.6	4.0	6.0	1.4	2.3	3.6
Wood panels	327	317	311	3.2	2.7	5.1	1.0	0.8	1.6
Wood pulp	352	336	319	4.7	7.1	10.5	1.3	2.1	3.3
Paper	681	664	652	4.0	4.2	5.3	0.6	0.6	0.8

and forest development. At the global level, illegal logging discourages forest investment that could help to address global deforestation and climate change.

The report concludes that policies aimed at reducing illegal logging must address three important issues:

1) they must be widely adopted to ensure illegal supply is significantly reduced;
2) property rights for legitimate producers must be improved to enable them to capture benefits from reduced illegal logging; and
3) the costs for legitimate producers must not increase more than those for illegal log producers, as an incentive for illegal logging comes from its lower cost.

A variety of measures to address illegal logging are being identified. The report proposes that economic models of the forest sector, such as the GFPM and the RPMM, can be used to assess the relative efficacy of these different measures. Such analyses could answer questions of relevance to ITTO producer countries such as:

- Would expanding the country and product coverage of the European Union's Action Plan (2003) for Forest Law Enforcement, Governance and Trade (FLEGT) 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 modeling approach used in this study allows 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. Tropical wood 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 is dependent on the data and the assumptions used in the models. Improved statistical information on forest production, consumption and trade, especially in ITTO producer countries, will lead to improved predictions about the impacts of illegal logging and policies to combat it.

References

Buongiorno, J., S. Zhu, D.Zhang, J. A. Turner, and D. Tomberlin. 2003. *The Global Forest Products Model: Structure, Estimation and Applications*. Academic Press, San Diego.

Li, R., J. Buongiorno, J.A. Turner, S. Zhu, and J. Prestemon. 2007. *Long-term effects of eliminating illegal logging on the world forest industries*. Department of Forest and Wildlife Ecology Internal Report. Forest and Wildlife Ecology, University of Wisconsin-Madison, Madison, WI (submitted).

Seneca Creek and Associates. 2004. *'Illegal' logging and global wood markets: The competitive impacts on the US wood products industry*. Prepared for American Forest and Paper Association by Seneca Creek and Associates and Wood Resources International.

Turner, J.A., J. Buongiorno, F. M. Maplesden, S. Zhu, S. Bates and R. Li. 2006. *World Wood Industries Outlook: 2005–2030*. Forest Research Bulletin 230. Scion, Rotorua, N.Z. 84pp.

Turner J.A., A. Katz and J. Buongiorno. 2007. *Implications for the New Zealand wood products sector of trade distortions due to illegal logging*. A report prepared for the New Zealand Ministry of Agriculture and Forestry by Scion. September 2007. www.maf.govt.nz/forestry/illegal-logging/trade-distortion-implications/index.htm

Kiwi effect

Table 5: Change in New Zealand log and sawnwood production and prices in 2020 from eliminating 'most likely' levels of illegal logging

	BASE SCENARIO		CHANGE			
PRODUCT	PRICE	PRODUCTION	PRICE	PRODUCTION	PRICE	PRODUCTION
	(US$/ m³)	('000 m³)	(US$/ m³)	('000 m³)	(%)	(%)
Sawlogs & small logs	39	12 356	0.5	33	1.3	0.3
Export logs	16	7 920	1.7	81	10.6	1.0
Peeler logs	37	1 549	0.5	5	1.5	0.3
Pulp & chip logs	4	4 506	0.3	25	5.9	0.6
TOTAL roundwood	26	26 331	0.8	145	3.1	0.6
Sawnwood	271	5 998	0.8	19	0.3	0.3
Sawmill operating margin[1]	79		-0.2		-0.3	

[1]*Operating margin is revenue minus fixed and variable operating costs*