

## Cut and run: the dramatic rise of transnational logging in the tropics

We live in an era of unprecedented economic globalization. In many developing nations, tariffs and trade barriers are falling, while new international free-trade agreements promote foreign investment, particularly in natural resource-based industries, such as timber, mining, agriculture and infrastructure development<sup>1-3</sup>. By increasing economic growth, these new agreements have the potential to improve the livelihoods of many people in the developing world.

Trade liberalization, however, has a darker side, as detailed in an exhaustive and much anticipated report<sup>4</sup> on tropical logging commissioned by the European Community (EC) and undertaken by the World Wide Fund for Nature (WWF). The report, which was originally drafted in 1997, was so explosive that it was only recently released, because the EC and WWF feared litigation from logging corporations and repercussions from tropical countries criticized in the report<sup>5,6</sup>. The final version has been sanitized but still paints an alarming picture of rain-forest logging.

### Disturbing trends

The peer-reviewed report describes a dramatic increase in foreign investment in tropical logging, especially by Malaysia, Indonesia, South Korea and other Asian nations. These nations are rapidly depleting their own timber supplies and have begun to tighten domestic controls on their aggressive logging corporations. These logging corporations are now moving overseas, to the Pacific, Latin America, the Caribbean and Africa, in search of new sources of timber.

The report concluded that tropical countries often become feeding grounds for foreign logging corporations. Many developing countries have severe economic problems, such as high inflation, unemployment and foreign debt, and are thus desperate to attract investment. These countries have weak environmental and social laws or have poor enforcement capabilities, and are thus highly attractive to foreign loggers. Bribery and corruption are severe problems because forest resources are often controlled by a few powerful individuals or clans that seem to regard logging as a prime opportunity for personal enrichment. In the Brazilian Amazon, for example, it is common knowledge that some decision makers have acquired extraordinary wealth after taking political office.

The profits from logging can be considerable. As a result of endemic corruption and weak taxation, however, the benefits often end up concentrated in the hands of a few. The report cited four countries (Papua New Guinea, the Solomon Islands, Belize and Cameroon) that are suffering especially rampant corruption, and the original version even named individuals and corporations known to be involved in bribery<sup>5,6</sup>. The names have now been removed, but it is widely known that half a dozen Malaysian corporations account for a lion's share of the world's tropical logging and have frequently been associated with corruption scandals.

The report concluded that, virtually without exception, commercial logging operations in the tropics are wasteful and careless, leading to excessive environmental damage (Box 1; Fig. 1) and sometimes to violent confrontations with local

communities. The present situation was regarded as being so dire that the report urged a temporary halt to logging in eleven countries (Cameroon, Gabon, Congo-Brazzaville, Central African Republic, Equatorial Guinea, Democratic Republic of Congo, Belize, Suriname, Guyana, Papua New Guinea and Solomon Islands) until bribery scandals are resolved and proper environmental controls are put in place.

### Recommendations

The report offers a variety of measures to help alleviate the litany of identified problems. These include combating corruption, strengthening regulatory capacities, and establishing incentives for long-term forest management in timber-producing countries, and promoting eco-friendly forest products, licensed by the Forest Stewardship Council (FSC), among timber-consuming nations. Although the FSC is becoming an increasingly important market force in Europe and North America, there is an urgent need to increase its influence in Asia – especially in Japan, China and South Korea, which are by far the most dominant consumers of tropical timber in the world.

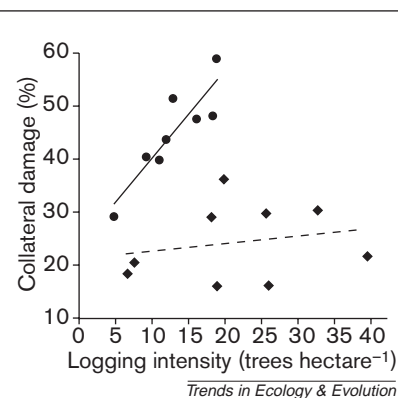
The report also urges international banks and development agencies, which have funded many tropical-logging operations in an effort to promote economic development, to be far more selective in the projects they support. The World Bank and International Monetary Fund were singled out for special criticism. These bodies have frequently imposed 'structural adjustment programs' on

### Box 1. Tropical logging

Each year, approximately six million hectares of tropical forest are logged – an area twice the size of Belgium<sup>10</sup>. Although only between 2 and 40 trees are harvested per hectare, 10–40% of the remaining forest biomass is killed or severely damaged during logging operations<sup>11,12</sup>. In new frontiers, often only prime timbers such as mahogany (*Swietenia* spp.) are taken; however, over time up to 150 species might be harvested<sup>13</sup>.

The main damage from logging results from the labyrinth of roads, bulldozer trails and small clearings in the forest. In most commercial operations, bulldozers kill many smaller trees (Fig. 1), damage and compact soils, and dramatically increase soil erosion and stream sedimentation. Even worse are the secondary effects: by greatly increasing access to forests, logging often leads to an influx of hunters, ranchers and slash-and-burn farmers<sup>9,14</sup>. In this way, logging can be a key driver of forest destruction in frontier areas.

Even when protected from colonists and hunters, logging sharply increases the vulnerability of forests to fire by rupturing the forest canopy and creating piles of dry, flammable debris. In the Amazon and Borneo, millions of hectares of logged forest were destroyed by wildfires during the 1982–1983 and 1997–1998 El Niño droughts<sup>15,16</sup>.



**Fig. 1.** Unregulated commercial logging can cause heavy forest damage. The relationship between harvest intensity and collateral damage in tropical forests subjected to unregulated (Southeast Asia; closed circles) and regulated (north Queensland, Australia; closed diamonds) logging is illustrated. Broken and unbroken lines were fitted by linear regressions. Collateral damage is defined as the percentage of nonharvested trees ( $\geq 10$  cm diameter) that were inadvertently killed during logging (data compiled from Ref. 17).

debt-ridden nations to increase government revenues via natural resource exploitation, foreign investment and exports, while simultaneously cutting government spending. Far too often, a dramatic influx of foreign capital for logging has not been balanced by an improved capacity to regulate loggers; this is a formula for disaster.

The bottom line, however, is that logging is usually the fastest way for corporations and investors to make lots of money quickly in the tropics. Although the Asian timber corporations are greatly vilified these days, it is important to remember that many European and North American companies have also had poor environmental records in the developing world. At present there seem to be two main hopes for promoting sustainable logging. The first is that, through education, the public will increasingly demand and buy only FSC-approved timber products. The second is that international aid and lending programs<sup>4</sup>, and carbon-offset funds<sup>7,8</sup>, could be used much more effectively to promote forest conservation and sustainable development in tropical regions. In addition, a promising new initiative called 'conservation concessions', in which environmental organizations buy timber leases to preclude logging and then fund sustainable development activities, might appeal to some developing countries (R.E. Rice, pers. commun.).

The stakes are high. In developing nations, forest tracts currently allocated for logging are at least 8–10 times larger than the limited areas set aside as parks and reserves<sup>9</sup>. The management or

mismanagement of these vast lands will have a profound influence on nature conservation in the tropics.

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## No question: seed dispersal matters

Every now and then, an insight changes a field. It happened 30 years ago when Janzen<sup>1</sup> and Connell<sup>2</sup> revolutionized ecological ideas of seed dispersal and its effects, with what became known as the Janzen–Connell hypothesis (hereafter, 'the hypothesis'). Seed dispersal has long been associated with invasion of open habitats (where species are absent), as occurs in range extensions<sup>3</sup> or ecological succession<sup>4</sup>. The hypothesis postulated that a major advantage to local seed dispersal is the removal of seeds and seedlings from density-dependent mortality from pathogens or seed predators near parent trees. Such mortality near parent trees opens up the habitat for recruitment of other species that would otherwise be

excluded by intense competition from the offspring of nearby trees. The hypothesis simultaneously offered: (1) a powerful selective advantage for an immense array of adaptations for local seed dispersal by wind, water, ballistic explosion, ants, bats, birds, monkeys or other agents; and (2) a plausible mechanism for the maintenance of species diversity in tropical rain forests. In the most significant field study on this issue in 30 years, Kyle Harms *et al.*<sup>5</sup> have unequivocally demonstrated both density-dependent mortality and its effects on seedling diversity in dozens of Panamanian tree species. A chapter in dispersal ecology has closed, but inviting new ones beckon.

#### Speculation and partial tests

Janzen and Connell's insight had an immense catalytic effect on studies of seed dispersal. A powerful selective rationale for structure and function launched speculative discussions of the roles played by different kinds of animals in seed dispersal<sup>6</sup>, and the hypothesis quickly entered prominent discussions of plant diversity<sup>7,8</sup>. The power of a plausible argument allowed the hypothesis to enter ecology textbooks long before its predictions were confirmed or rejected. Right or wrong, the hypothesis highlighted the importance, mechanisms and consequences of seed dispersal.

On a practical level, the idea of local advantages to seed dispersal forced ecologists to think about the reasons why seedlings located under parents almost always die, whereas those carried some distance away might not. These reasons include: (1) escape from density-dependent