PART 2

timber and wood-based panels

2.1 ANCIENT FOREST TIMBER AND PLYWOOD PRODUCT CONSUMPTION

Wood from ancient forests is used for countless products, including indoor and outdoor furniture, bridges, canal linings, sound walls, crates and pallets, stationery, toys, etc. However, its most important applications are, without doubt, family housing and office construction. Residential construction, repair and remodelling absorb some 45-70% of the total timber and wood-based panel consumption in the USA, Europe and Japan. Important uses of wood products in residential building are house framing, doors and window mouldings, flooring and exterior decoration. Plywood is also widely used for concrete moulding, especially in the construction of offices, hotels and other commercial buildings.

Global consumption of sawnwood and wood-based panels in 1996 was no less than 576 million m^3 (Table 2.1). The United States alone consumed one-third of this volume. Per capita consumption of timber and wood-based panels in the USA far exceeds that of the rest of the world.

Much of the sawn (soft) wood timber consumed in the United States is used for wood framing in house construction. Over 90% of the nearly 1.5 million new houses built in the USA every year are wood framed. Framing of walls, roofs and floors absorbs 70% of the wood required for each house. Wood frame building has environmental benefits compared to other materials such as concrete, brick, clay, plastic and steel. One such benefit is that wood framing is a "dry" method, as opposed to building with bricks or concrete. Dry building allows the application of other renewable building products without additives, such as insulation materials of flax, hemp or wool[32]. The obvious problem with wood framing in the United States is that much of the wood used originates from ancient forests, mainly from Canada.

2.2 BUILDING WITHOUT ANCIENT FOREST TIMBER

Given the high per capita consumption of ancient forest timber and wood-based panels, the introduction of new approaches to wood use and the use of new products would have great impact in the USA. Construction companies, architects, project developers and individual households have a range of options to reduce their consumption of ancient forest timber. The most important of these are described below.

Table 2.1 Major timber consuming markets, 1996 (sawnwood and wood-based panels, million m^3)

Markets	Sawn-wood	Wood-based panels	Total	Percentage of world consumption	Per capita consumption (m^3 p.p.p.y)
USA	147	45	192	33%	0.71
European Union	69	34	103	18%	0.28
Japan	36	14	50	9%	0.39
Other	175	56	231	40%	0.05
World	427	149	576	100%	0.10

Source: consumption derived from FAO Statistics, <http://apps.fao.org> as viewed on November 2nd 1998, population from Pulp and Paper International, Annual review 1997, July 1998.

32 Fraanje , 1998.

Extending the lifespan of buildings

By extending the life-time of buildings, timber can be saved for new constructions and maintenance. This involves designing and building durable houses or offices which are well constructed, well protected by a good roof and eaves structure, and with interior space which can be easily modified according to changing needs.

Rethinking wood use in constructions

Rethinking construction methods can significantly reduce the amount of wood required to achieve a given objective. High posted timber frames, for example, can reduce the volume of wood required, as conventional stick framed houses use 1.5 times more wood[33]. Non-wood building materials should sometimes, from an environmental point of view, be favoured over wood. This is not true of steel, aluminium or plastic, but is true such as straw-bale building, adobe clay and rammed earth (15% of the population of France today lives in houses made of these materials)[34]. An Alternative Building Sourcebook is available in the USA with a lot of information on this area (see sources). The Guide to Resource Efficient Building Elements, published by The Centre for Resourceful Building Technology, provides a comprehensive overview of suppliers of environmentally innovative building products.

A well thought through application of timbers often allows the use of lower quality timbers, possibly in combination with selective application of high quality timber where it is most needed. A good example of this is the building corporation Woondrecht in the Netherlands. In the 1990s, Woondrecht adopted a policy of reducing its tropical timber consumption. It implemented this through selective use of timber, thereby making the best use of the timber's durability. On the north side of its houses, it uses less durable softwoods for windows and doors as these are hardly exposed to the dynamics of the Dutch coastal climate. The south/southwest side, however, is exposed to great fluctuations in temperature, sunlight and moisture. Considering the high cost of maintenance and the need for early replacement of softwood constructions compared to hardwood, Woondrecht prefers to use tropical timber for window frames and doors on the south side of the houses. Woondrecht has supplied some of its renovation projects with doors made of FSC-certified kwila from the Solomon Islands.

Box 2.1 Fir & hardwood window frames: Doornenbal

In 1997, the timber manufacturer Doornenbal introduced its Rovu window frame onto the market. The Ruvo frame combines the best properties of fir wood and robinia. The highly durable hardwood robinia (mostly grown in Eastern Europe and France) is used only for the critical parts of the window frame - the lower parts, where fir would soon start rotting unless treated with preservatives. The rest of the frame is made of fir, which is available in greater quantities (as second growth) and at lower cost. The price of this window frame is comparable to one made of tropical hardwood.

The Ruvo window frame is sold with a 15 or 20 year control and maintenance guarantee (painting and repair works)[35].

Re-using timber and using recycled timber

There is an enormous wood resource in the "urban forest" - that is, the used timber frames in buildings constructed in the past. A growing number of companies in the USA sell salvaged timber, turning old wood constructions into new resources. Salvaged timber from the USA is even used in Europe. It can be re-sawn and made into window frames, which are more solid and stable than frames made from fresh wood. The decorative value and 'antique' look of recycled timber make it an attractive material for interior flooring and furniture. Smaller pieces of salvaged timber can be recycled as GLULAM (glued laminated timber) or other engineered wood products (see below). Matsuzaki Wright Architects Inc. in Vancouver in Canada, received a Professional First Place Award

OSB can replace many applications of tropical plywood

33 Timberframe, 1998.
34 Montangue, undated.
35 Hout en Toelevering 1997.

Box 2.2 Sunken logs: a temporary alternative?

One source of timber which does not have to be sustained is sunken logs. After years of river transportation, millions of logs have sunk to the bottom of the rivers and lakes of Canada, Siberia, the Amazon and the USA. Several companies have started to develop these wasted logs as a new, if temporary, resource.

Only 2% of the original forest of New Brunswick, Canada, remains today, but the province's rivers and lakes harbour an enormous number of logs which were lost when European colonists deforested much of the province and shipped off logs to Europe. The Canadian company Eco-Timber is now harvesting the lost logs. Regional demand is so great that Eco-Timber cannot even think of exports.

in 1997 for the design of the Institute of Asian Research in Vancouver. This energy efficient building was constructed with salvaged timber beams, re-used wood frames and bricks.

In Japan, the world's second largest softwood timber market, new housing dominates consumption. The Japanese tend to tear down and rebuild older houses rather than repair and remodel them, because they lack available land for new housing[36]. It is not clear what is done with the old timber and plywood, but there probably is much opportunity for re-use.

Reducing the need for new timber in the future

Clever design of products and new technologies which extend the life cycle of timber components can reduce the need for new timber in the future[37]. One example is the redesign of packaging used in transport (see Box 2.3).

Box 2.3 Cardboard Pallets[38]

Wooden packaging made from ancient forests, such as pallets, is often used to transport consumer goods around the globe from countries in Asia to Europe and from countries in North America to Asia.

A small number of manufacturing and food production groups have now switched to pallets made from cardboard for some loads. Among those that have made the change are the UK divisions of Proctor & Gamble, Kellogg's, Nestle, Glaxo Wellcome, Ricoh and RS Components.

The main environmental advantage of cardboard pallets is that they can be recycled, while wooden pallets may require costly disposal or have to be returned to their owners over great distance. Cardboard pallets cost about the same as wooden pallets but weigh two-thirds less than the wooden variety, making them cheaper to transport. They are about the same size as wooden ones and are reinforced to support loads up to two tonnes.

Three UK-based packaging companies are, between them, likely to produce about 500,000 cardboard pallets during 1999, from only a few in 1995. Bob Ferguson, business development manager for David S. Smith, the biggest UK maker of cardboard pallets, said the market was growing "exponentially". The other two makers are Weedon Holdings, a privately owned packaging company, and Smurfit, an Irish packaging concern. Weedon uses technology for its cardboard pallets which was devised in the USA in a joint venture between Smurfit and Stone Container, a big US packaging business.

Second growth timber for exterior applications

Wood frames are not normally exposed to the forces of climate and weather and therefore less durable timbers can be used, provided they are well protected. Doors, window frames, balconies and other outdoor constructions are often exposed to rain, wind and sun and therefore require durable timber species, many of which come from ancient forests (e.g. merbau/kwila, meranti, hemlock, oregon pine).

High quality, durable products for outer doors, window frames, etc., made from (sometimes partially engineered) pine or fir timber from secondary forests are now widely available in Europe. It is, however, wise to double check the origin of these products, which has become much easier as

36 Sustainable Forestry Working Group 1998.
37 IKEA 1998
38 Financial Times 1999.

several major forestry companies in Sweden (Störa-Enso, Assi Doman, SCA) have certified their Swedish forestry operations, according to FSC-standards. In Sweden, these companies do not log ancient forests nor do they purchase logs derived from such forests as part of the agreement on the Swedish FSC standard.

GLULAM for solid timber

GLULAM (glued laminated timber) was one of the first engineered wood products to enter the marketplace. The glulam production process is quite simple. Planks of a thickness of 50mm or sometimes more and lengths of 1.5-5m are kiln dried, pre-planed and strength graded, joined lengthways by glued finger joints and, after planing, laminated to the desired thickness. Finally the "endless" glulam beam is cut to the desired length and planed[39]. GLULAM is now widely used in the USA and exports to Japan and other countries are increasing rapidly. Glulam competes with ancient forest timber on two scores:

- Of a given number of trees, a higher percentage can be used for glulam than for solid sawn timber. There is less waste.

Box 2.4 Engineered wood products

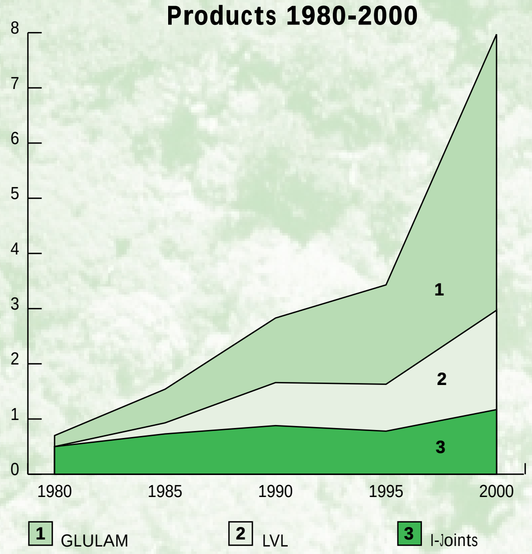
Prime grade timber from ancient forests is no longer required to manufacture quality products for housing applications such as windows, doors and plywood parts. Engineered wood products increase the opportunities for using small diameter logs from secondary growth forests and plantations, and even recycled timber and plywood[40]. Weyerhaeuser's Director of Materials Technology, Dr Neogi, concludes that the disappearance of old-growth timber is "the major driver behind the rapid growth of engineered wood products." [41]. See Figure 2.1.

Some engineered products require less solid wood to produce the same quality final product. The Rugby Group's joinery division in the UK estimates that it uses up to 60% less solid wood each year by using laminated MDF in its panelled door range, reducing the need for ancient forest (clear) timbers This has directly reduced its purchases of ancient forest timbers from countries like British Columbia and Asia.

The biggest company producing engineered wood products in the USA is Trust Joist MacMillan (TJM) with ten plants in the USA and three in Canada. TJM is a joint venture of Trust Joist Corporation and MacMillan Bloedel Limited (MBL). On engineered wood products, Vic Worthy, Senior Vice President of MBL's Composite Wood Group said in 1996: `These are the growth products of the future and we are locating plants close to the markets, to lower freight costs. In addition, MBL must look outside BC for opportunities for growth, as the timber supply in the province is declining.'[42]

Engineered wood products which depend on ancient forest wood for their production, also faces growing public resistance. Oriented Strand Board (OSB) producers Boise

Figure 2.1 Supply of Engineered Wood Products 1980-2000



Cascade in Chile is facing international protest, exactly for that reason. This leaves companies that aim to sell their engineered forest products as appropriate alternatives to ancient forest products should certify their sources and the chain of custody. Engineered wood products increases wood use efficiency as well as spares an enormous amount of roundwood.

Without the introduction of engineered wood products, the USA would have required 76 million m3 of roundwood in 1993. Engineered wood products required an input of 53 million m^3, thereby sparing 23 million m^3 (30%) in addition to the amount of former waste they incorporate, now about 9 million m^3 [43].

39 Colling, 1995.
40 FAO 1999.
41 Neogi 1998.
42 Barclay 1996.
43 Wernick et al. 1998.

- The strength properties of GLULAM beams are similar to or better than those of ancient forest timber because the defects in natural timber are eliminated. This allows more precise engineering of construction design, which can save wood.

Reconstituted wood products for solid timber

Laminated Veneer Timber (LVL), I-joists and Parallam are engineered wood products, but they are more intensively processed than GLULAM or plywood. This is why they are referred to as reconstituted wood products.

LVL is expected to replace increasingly scarce solid sawn timber in structural applications in future[44]. LVL is a product close to plywood, except that (most of) the veneers are glued parallel and that larger dimensions are available. It has better strength properties than GLULAM and solid sawn beams[45]. LVL is applied as beams and posts, I-joists (see below) and trusses. In the USA, seven companies produce LVL; other companies are located in Japan, Finland, Australia and New Zealand. In the USA, LVL is now used only in buildings where higher strength is needed or larger spans are desired[46]. In 1993 the production of LVL was estimated at 440,000 m^3 in the USA, 51,000 m^3 in Europe and 40,000 m^3 in the rest of the world. Production shows a rising trend.[47] In 1996 LVL use in the USA mounted to almost 700,000 m3, with over 75% applied in I-joists.

As much as 12% of landfill space in the USA is consumed by waste wood

In Europe and Japan, I-joists are almost unknown[48]. In the USA, however, they may be the most commonly known engineered wood product. I-joists consist of OSB or plywood stuck between two strips of solid sawn, finger-jointed or engineered wood. Together they form an "I". According to the American Engineered Wood Association, I-joists are now used in 20% of all new homes built in the USA, replacing solid sawn timber[49]. I-joists are 50% lighter in weight than solid sawn wood[50].

Parallam Strand Timber (PSL), developed in the 1970s in Canada and now produced in the USA, is made of long strands of wood glued together, which end up looking like "compressed spaghetti". Intrallam is made from large parallel chips of up to 30cm in length which are glued with a polyurethane adhesive. Another veneer product is called Intrallam beam, made of wooden chips of young poplars, typically 30 years old when cut, which are glued with polyurethane and processed into a board out of which beams can be sawn[51]. The producer claims that young trees from production forests can be used, instead of ancient forest logs, and that the process is 30% more efficient on log consumption than traditional sawing.

OSB for structural purposes

Plywood and solid timber are increasingly being replaced by Oriented Strand Board (OSB). OSB consists of about 97% of oriented wood strands of up to 7cm in length and glued together in three layers[52] .

The annual use of OSB or waferboard for structural purposes for new single-family houses in the USA expanded from zero in 1969 to 242 million m in 1992[53]. While OSB can be used for structural purposes, it cannot replace every single specific use of plywood in construction. Almost all OSB is produced and consumed in the USA and Canada[54]. Canada produced 4.7 million m^3 of OSB in 1996; the United States produced 8.2 million m^3.

44 Vlosky, 1994.
45 Ranta-Maunus, 1995.
46 Ranta-Maunus, 1995.
47 Ranta-Maunus, 1995.
48 Gordijn, 1997.
49 FAO, 1997.
50 Gordijn, 1997.
51 De Groot, 1996; Schmon, 1997; Ranta-Maunus, 1995.
52 IVAM Environmental Research, 1998. MDI is also used (often introduced as "formaldehyde-free board"), but this adhesive has a relative high envi ronmental burden and application and production leads to health hazards. The energy requirements of OSB are lower in comparison with plywood and the amount of adhesive used are about the same.
53 McKeever & Phelps, 1994.
54 FAO 1997.

Box 2.5 Green Olympics 2000

Comprehensive Environmental Guidelines have been made for the Sydney Summer Games 2000. The Olympics' Athletes' Village is going to be the world's largest solar suburb, the use of PVC has been significantly reduced, and Sydney 2000 will be the first Olympics with large and efficient public transport facilities.

A Super Dome, an Olympic village, a showground, a stadium, a multi-use arena, a train station, hotels, a big exhibition hall, etc. - preparing Olympics takes a lot of building and a lot of timber. The Environmental Guidelines required that it should be sourced from sustainably managed forests. Companies tendering for construction contracts were required to submit details on the sources of their wood. Wood from FSC-certified forests and recycled timber were preferred, the use of any timber from native forests with high conservation values was strictly prohibited. Implementing these guidelines and starting the projects turned out to be a major learning experience for the Olympic committee.

The GLULAM beams used for the Super Dome's roof structure were made entirely from timber from Australian radiata and slash pine plantation timber. The Super Dome, which will be operating as Exhibition centre, is a radial construction with a diameter of 100m. It is the largest building of its type in the Southern hemisphere.

For the Olympic Village, radiata was used for framing and doors. Hoop pine, supplied by Midcoast Timber and Corinthian, was used for skirtings and architraves. Neither species were available on the market with an FSC certificate, so the second best option was to purchase timber from companies selling plantation grown pine only.

FSC-certified rock maple, from the USA and imported by The Woodage in North South Wales, has been used as kitchen cupboard veneer. FSC hardwood from a community-based logging project in Papua New Guinea is being used for the outdoor seating of the Olympic Village. The Clydesdale pavilion was made entirely of recycled timber[55].

Greenpeace design for Olympic village.

OSB production in the USA was boosted by the closure of one-third of the plywood plants in North America because logging of the ancient forests in the western US National Forests was coming to a halt. OSB can also replace many applications of tropical plywood, such as meranti/lauan plywood from Asia, plywood from the Amazon and okoumé plywood from Central Africa.

2.3 PANEL PRODUCTS

Throughout the world, veneer and plywood mills have often been built to process large diameter logs, which are usually derived from ancient forests, particularly in the tropics. Plywood is mostly used for short term, non-structural and interior purposes. As such it can be, and already is, replaced with Medium Density Fibre (MDF) board. MDF is already out-competing plywood in the furniture industry and this is expected to continue as MDF will soon be available in high-quality overlays or prints that look just like hardwood plywood[56].

MDF is an engineered wood product, made from wood dust and glue. The wood for producing MDF may be derived from well managed forests, plantations, milling waste or rainforest hardwoods. Given these unclear sources, only certification provides an adequate guarantee of responsible

55 pers.comm. Darren Gladman. Greenpeace Australia.
56 Sustainable Forestry Working Group 1998.

forest management. MDF can also be made from non-wood and post-consumer waste wood. Like MDF, OSB has also started to replace plywood as higher quality logs from ancient forests are becoming scarce. There are, however, various other alternatives.

Box 2.6 Bamboo veneer: Emvier

The quest for alternatives to tropical timber has already led to the development of many innovative products. Bamboo, widely used for house construction and furniture in the tropics, is one of those products. Several companies in Europe now supply bamboo parquet, replacing species such as merbau. Research by the University of Eindhoven has shown that bamboo could even be used for housing constructions in Europe or the USA. The company Emvier in the Netherlands produces bamboo veneer, which is used for decoration of interior doors, furniture panels and parquet, thereby replacing ancient forest veneers like mahogany. Bamboo production in Asia, like rattan which is widely used for furniture, does not degrade ancient forests. FSC certification of bamboo and other non-timber forest products will soon be possible, and is recommended in order to guarantee responsible resource management and workers' rights. Some bamboo species are grown in temperate climates.

Wheat straw and soybean stalks

The use of fibre other than wood for the production of particleboard is rapidly increasing. Plants using wheat straw for panel board production have been built in the USA and Canada within the past decade. Particleboard plants using cotton stalks have been built in India. MDF plants are operating in Malaysia using palm-oil and rubber trees as a raw material[57].

Tests in Germany and Sweden have demonstrated that non-structural particleboards of straw and soybean stalks have equal or better physical properties than those using wood. Strawboard is more homogenous than particleboard, and could be used in higher value furniture and cabinet production[58], replacing MDF and particle board. At least seven companies in Canada and the United States are currently producing - or have plans to produce - wheat straw/soybean/hemp particle and/or MDF board:

- PrimeBoard of Wahpeton, North Dakota
- Natural Fibre Board of Minneapolis, Minnesota
- CanWel of Hutchinson, Kansas
- Alta Goldboard of Thorhild, Alberta

Box. 2.7 Straw-panel furniture: Sauder Woodworking

Sauder Woodworking Inc. is the biggest maker of Ready To Assemble (RTA) furniture in the USA, with 1997 sales totalling US$ 500 million[59]. On the decision to buy tree-free board, Kenneth Sauder states: "One, early indications show it seems to have the uniformity characteristics of MDF yet with particle board price. Second, it ensures another source of supply that is not tied to the spotted owl. The long-term supply seemed to be strong, and we felt it was best to encourage that. Third, it has some moisture resistance attributes for any kitchen applications or vanities, or for international sales in hot and humid climates."

VT Industries, based in Iowa, USA, produces doors, countertops and components for kitchens and office furniture. John Fell, corporate purchasing manager for VT Industries says: "It's the attractiveness of the renewable resource of (straw) board. That's going to relieve some pressure on our forests. People are more and more concerned over the impact on the environment, and we feel this is much better, not having to rely on wood by-products."[60]

Eighty percent of the straw board used by Saunder and VT Industries is supplied by Isoboard in Manitoba, Canada. It sources the 200,000 tonnes of wheat straw required yearly from some 350 farmers in the province, who have formed the Straw Co-op of Manitoba. The adhesive used by Isoboard is MDI, a resin binder, which is more expensive than urea formaldehyde, but stronger and formaldehyde-free[61].

57 FAO 1999.
58 FAO 1997, forest products annual market review.
59 <www.hoovers.com> as viewed on 17 November 1998.
60 Wood and Wood Products 1998.
61 Isoboard in pers. comm. with Bill Barclay, Greenpeace International; Quotes Kenneth Sauder and John Fell, VT Industries: Tappi Journal. 1997.

- AgraFibre of Wanham, Alberta
- Phenix Biocomposites of Mankato, Minnesota
- Isobord from Isobord Enterprises Inc. in Minnesota, Canada
- Industrial AG Innovations
- Kafus Environmental Industries, Vancouver
- Agriboard Industries, Texas

As Dough Hathaway, Vice President of sales and marketing for Alta Goldboard puts it, "*You have to find your fibre from somewhere else. We're going to go to the grain forest and leave the rainforest alone"*

Some manufacturers of easy wall systems made of straw panels in Europe are:

- Stramit, the United Kingdom
- BioPack Karphos, Germany
- Panfene, Belgium

Agriboard Industries in Texas produces a structural insulated panel board from wheat or rice straw. The cover (linerboard) is made from wood-based Kraft paper, but the company is exploring the possibility of making that paper out of straw as well. Agriboard's product can reduce the use of framing timber in a structure by up to 90%.[62]

Box 2.8 Board out of waste wood: CanFibre Group[63]

In 1994, a small Canadian company set out to become a major global panelboard producer without relying on primary fibres or urea formaldehyde resins. CanFibre's goal of recycling 100% waste wood fibre to produce superior Medium Density Fibreboard (MDF) is now a fact.

Canfibre's ALLGreen® MDF represents a major breakthrough in the panelboard industry as it is made entirely from 100% recycled waste woodfibre materials normally landfilled. As much as 12% of landfill space in the USA is consumed by waste wood. CanFibre developed the technology to turn high volumes of wood waste into a resource stream and estimate that it is extraordinary inexpensive, costing around US$ 5 per tonne compared to US$ 100 per tonne for virgin wood. In Europe, new stringent recycling legislation will only encourage further the use of such wood waste.

According to CanFibre, the MDF is lighter, emits no formaldehyde and is available with fire resistant (FR) and moisture resistant (MR) grades. Its applications run from panelling and furniture for schools, libraries and commercial buildings, to fire-rated doors, elevator cabs, motor home interiors, garage door panels, bathroom and kitchen cabinets, and boat interiors.

The CanFibre Group is currently engaged in the worldwide development of production facilities at Riverside, California; Lackawanna, New York and Amsterdam, Holland.

North America

The first plant, a US$ 120 million facility, was built in Riverside, California and began production in early 1999 with a capacity to convert over 155,000 tonnes of old pallets and demolition waste into 24 million square metres of ALLGreen® MDF annually. The Riverside plant is near Los Angeles, where about one million tonnes of wood is landfilled every year within 100 miles of the plant. A second is being built in Lackawanna, New York State, and is expected to come on stream in 2000. A third plant is proposed for a 25 acre site in South Chicago. CanFibre has already signed wastewood supply agreements and sales contracts for the purchase of the entire annual output of all three facilities.

Europe

CanFibre is currently developing plans for three plants in Europe, together with three more plants in key Commonwealth markets. CanFibre is completing all the elements required to finance, construct and operate a $150 million MDF facility to be located in the Port of Amsterdam. This facility will be 60% larger than existing CanFibre facilities coming on line or under construction in the United States.

Further finance has been agreed for a facility to be located on Canvey Island, east of London. The facility is expected to have a total cost of approximately US$ 120 million. Wood supply agreements at guaranteed prices for the coming 20 years have been signed for all the waste wood required.

Sales Contracts Already Signed

To ensure a market for its products, CanFibre is signing up buyers before its plants go into final production. It has already signed a 20-year deal with an Oregon company, Timber Products Company, which has guaranteed purchase of 100 per cent of production from the Riverside and New York MDF plants. Its European affiliates will take 100% of the output of the Dutch CanFibre facility under a 20 year agreement

62 Agriboard in pers. comm. with Bill Barclay, Greenpeace International.
63 Business Wire 1997; CanFibre 1999a, 1999b; Fried 1998; McCabe 1998; Kafus 1998; Kafus 1999; http://www.kafus.com.

Alternative wood-based panels for exterior applications

Substantial amounts of plywood, mainly from Sarawak, are used for concrete moulding ('con pane') in Japan. Russian wood has started to replace tropical plywood in recent years - which does not relieve the overall pressure on ancient forests. However, con pane is also being more frequently recycled, which is a positive development. Given the large volumes of waste wood in the vicinity of large Japanese cities, there may also be the opportunity to develop waste wood-based panel processing plants.

2.4 WOOD PROCESSING TECHNOLOGIES

Star-sawing

A new way to saw up logs has been developed by the Swedish Royal College of Technology and KTH-Trä. Compared to conventional sawing of softwood logs, 'star-sawing' reduces wastage by a third and produces stronger timber, which contains no piths and little juvenile wood. The method gives sawn timber with two different shapes: conventional timber with a rectangular cross-section and timber with a triangular cross-section. The triangular portions derived from star-sawing can be glued and finger-jointed into boards, which are especially suitable for the manufacturing of windows, floors, furniture and musical instruments because they tend to distort and crack less than traditionally sawn wood.

Studio Board is made from 85% recycled material, and has no toxic adhesives

A star-sawmill started production in Sweden in early 1999, operated by Nova Wood which is partly owned by SCA. It will process an estimated 14,000 m^3 of pine a year. SCA's head of marketing, Anders Ek, says that these boards sell for between 50 and 75 percent more than ordinary timber of the same dimensions. He expects to generate two or three times the usual value from each log[65]. Manufacturers can get access to the technology by obtaining a licence from PrimWood AB, the patent holder. The technology is suitable only for logs smaller than 27cm in diameter. The Swedish Royal College of Technology is working to adjust the technology for larger logs and hardwoods[66].

Box 2.9 Tropical Plywood - Hollywood feature ancient forest free films

The film industry in California has been a major consumer of tropical hardwood plywood, which it used to construct film sets and then threw away. Before Rainforest Action Network began campaigning against the use of 'lauan' (which basically included meranti, virola, malapi and other ancient forest plywood), Hollywood used a quarter of a million plywood sheets a year.

In 1994, Paramount agreed to stop using tropical plywood. Disney Warner Bros. greatly reduced consumption, and its first lauan-free film was Batman III. Fox Studios and MCA/Universal Pictures joined ranks and decided to refrain from using tropical lauan plywood to build movie sets. MCA/Universal will use Unicore board, which is made from 100% post-consumer recycled waste instead.

In response to the campaign and Hollywood's commitments, Simplex Products designed 'Studio Board', a replacement of lauan plywood. Studio Board is made of 85% recycled material, and has no toxic adhesives[64].

From Softwood to Hardwoods

There are various revolutionary initiatives which give softwood the same properties ass hardwoods.

PLATO

PLATO (Providing Lasting Advanced Timber Option) is one promising new wood processing method from an environmental point of view, as no substance is added to the wood and the struc-

64 Various references by Rainforest Action Network and Rainforest Information Centre; Simplex Products Division, An Antony Industries Company. Studio Board, Sales Binder.
65 Tickell 1998.
66 Prof. M. Wiklund. Royal Institute of Technology, Stockholm. Pers. comm.; Sandberg 1998.

ture of wood stays intact. It is a pure physical thermal treatment through an autoclave wet-heating system.

Though thermal treatment of wood is not completely new - the first publications about trials date back to the 1930s - the PLATO process, developed in 1993 in the Netherlands, seems to be a more sophisticated and operational treatment to make wood more durable[67]. The process makes softwoods – such as Scots pine, Douglas fir and Norway spruce – into a product which has the durability of iroko or teak. Strength properties do not change substantially in comparison with the untreated wood. The dimensional stability of the wood is enhanced, and the technology also makes it possible to compress and bend wood in the shape which is desired.

Funded by banks and shareholders to the tune of US$ 15 milllion, the first commercial factory will open in Arnhem, Holland in the year 2000 and will initially produce 50,000 m^3 of PLATO timber. The final production capacity is set to rise to 150,000 m^3 within five years. Other PLATO processing plants are planned worldwide[68].

The raw material input for the PLATO process is, in this case, untreated sawnwood of a quality comparable to that needed for GLULAM production. The maximum thickness of planks to be hydrothermally treated is about 5cm, so for the option of a PLATO processed purlin (a structural joist[69]) it is also necessary to laminate planks to obtain the desired size. Less energy is required to process a purlin this way than laminated veneer timber[70]. Eucalyptus, and some soft broadleaf tree species, are also potential raw materials for the PLATO process.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Acetylation

Acetylation is a process similar to PLATO as it makes coniferous wood more durable and stable. The timber is treated with acetic anhydride, which alters the molecular structure of the cell walls of the wood making it heavier. The company which developed this acetylated wood, Acelyteer Kennis BV, claims that acetylated wood has a high dimensional stability and is very resistant to decay (durability class 1). Like PLATO wood, acetylated wood can become an alternative to tropical and temperate timbers (e.g. mahogany or western red cedar) normally used for window frames, doors and staircases. A pilot plant is due to be built in the Netherlands in the coming years[71].

67 The PLATO-process consists of three steps; thermolysis, drying and curing. During thermolysis hemicellulose is decomposed and lignin trans formed into smaller reactive structures, while the cellulose structure remains essentially unchanged. During the second stage of the process, dry heating results in a reaction of the earlier mentioned reactive intermediates forming a thermosetting resin, penetrating the cellulose fibrous material and producing a rigid structure which retains the appearance of natural wood.
68 TTJ 1999
69 A purlin is a horizontal beam that provides intermediate support for the common rafters of roof construction.
70 PLATO 1997; Fraanje 1998.
71 Acetyleer Kennis BV, 1998.

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2.5 FSC-CERTIFIED TIMBER

Sawn wood from FSC-certified forests is already available in Europe, and to a lesser extent, in the USA and Japan. As of mid 1999, more than 175 Forest Stewardship Council endorsed certificates for forest management covering over 16 million hectares worldwide has been awarded. The area under FSC endorsed certificates covers all major forest types and regions, and is expected to continue to grow very rapidly over the coming years.

Support for the FSC label is running high among many major purchasers and retailers of forest products. In the UK, a group of 85 companies with annual turnover of wood and wood products totalling more than US$ 4.3 billion dollars has agreed to preferentially purchase FSC certified products as they come available and eliminate purchases coming from forests which are not well managed. In November of 1997, the Certified Forest Products Council was launched in the USA. It currently has more than 140 corporate members, including the Turner Corporation, the nation's leading general builder, Home Depot, the world's largest "Do-It-Yourself" home supply chain, and Habitat for Humanity, one of the USA's largest homebuilders. Other groups of buyers supporting the FSC system have been established in the Netherlands, Belgium, Austria, Switzerland, Germany and Spain.

Over 3,000 different FSC labelled products are being sold in the UK

Over 3,000 different FSC labelled products are being sold in the UK and many more are in development. Supplies are expected to increase considerably in the next few years. The FSC-UK prepares an updated "Directory of Manufacturers of FSC Certified Products Worldwide" every six months, which offers the most comprehensive single source of information for large consumers of forest products[72].

72 FSC-UK, tel: 44-1-686-413-916; fax: 44-1-686-413-989;