Chapter 11
Engineered Wood Products – Production, Trade, Consumption and Outlook [1]

Highlights

- *Engineered Wood Products (EWPs) manufacture and use is expanding globally. Glued laminated timbers are being employed worldwide, while structural wood I-beams and LVL are primarily a North American phenomenon. However, LVL use is rapidly gaining popularity in Asian markets.*
- *Two key forces driving North American demand are prevalence of wood-frame construction and the changing nature of softwood fibre supply.*
- *North American I-beam production grew 27% in 1999 while North American LVL production grew 21%. EWPs now constitute more than 5% of North American softwood dimension lumber*[2] *(sawnwood) supply.*
- *EWPs in North America, Japan, and the Nordic countries are consumed primarily in structural applications in residential markets. In continental Europe, both structural and nonstructural applications drive demand in both residential and commercial markets.*
- *EWPs demand in Europe and Japan is also growing with greatest potential in Japan as the Japanese industry increasingly adopts these products in the traditional post and beam housing sector.*
- *Trade in EWPs is small compared with that of other wood products, but as a percentage of their production, the volume of trade is significant. North America, Japan, and Europe consume most of their own production in residential construction end uses. The largest trade flow is of glulam – primarily from North America and Europe to Japan.*
- *The outlook for EWPs is excellent with much of the impetus coming from the global need for efficient construction techniques, growing environmental concerns, and the universal requirement for affordable shelter.*

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[2] *Softwood dimension lumber is sawnwood produced to standard sizes for construction purposes.*

Secretariat note

This special chapter highlights an exciting growth market for forest products. EWPs are reconstituted flakes, fibres and veneers which produce products with uniform strength properties to fulfil new demands for wood products and replace some traditional uses.

The secretariat expresses its gratitude to the principal authors, Dr. Al Schuler and Mr. Craig Adair.

Dr. Schuler spent ten years as Manager of Economics and Market Research for Norbord Industries, a major North American producer of OSB and other solid wood products. He is now a Research Economist with the North East Forest Experiment Station of the USDA Forest Service. Mr. Adair has twenty-nine years of experience in the forest products industry with the past eleven years as Director of Market Research for The Engineered Wood Association (APA). Information for this chapter came from a variety of sources with APA providing the bulk of production and trade statistics. Mr. Ed Elias, Director, International Marketing Division, APA, supplied much of the international statistics. The APA information was supplemented by Jaakko Poyry Consulting or data provided by Mr. David Giroux, Vice President, Business Strategies, and data extracted from Dr. O'Carroll's report (Pullman Particleboard Symposium, April 2000) entitled "LVL and Engineered Wood Products Business in Europe". Although reasonably good statistics on production by country are available, there are less data on international trade flows. The main problem seems to be lack of tariff classifications for I-Joists and LVL trade. The authors relied on extensive experience in EWPs to analyse current and future trends in EWPs.

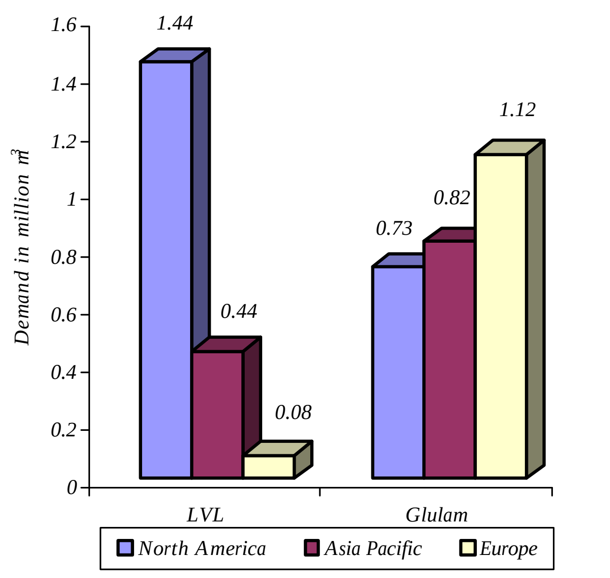
11.1 Introduction

For the purposes of this report, we will define engineered wood products (EWPs) as primarily those products used as substitutes for conventional softwood dimension lumber in markets where structural applications predominate. In current literature, these engineered wood product materials are often designated as "engineered lumber products", and include laminated veneer lumber (LVL), structural wood I-Beams, glued laminated timber (glulam), machine stress rated (MSR) lumber, finger jointed (FJ) lumber, and proprietary products such as parallel strand lumber (PSL) (Parallam™) and oriented strand lumber (OSL) (Timberstrand™). "Lumber" is sawnwood boards. (See box of definitions and abbreviations.) The majority of the statistics found in this report will focus on the three EWP that dominate worldwide production capacity - LVL, I–beams, and glulams. We should also mention that many researchers include oriented strand board (OSB), medium density fibreboard (MDF), and particle board in the EWPs category, however, these and other panels products are covered in another chapter of the Market Review.

On a total volume basis, EWPs are primarily a North American phenomenon. Graphs 11.1.1 and 11.1.2 present the regional market comparisons for glulam, LVL,

GRAPH 11.1.1

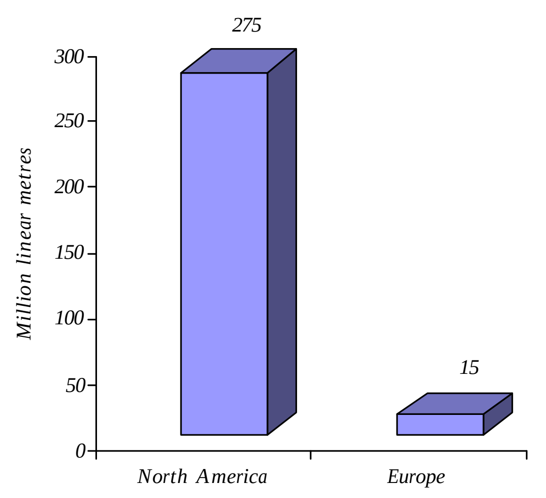
Regional markets for glulam and LVL, 1999



Sources: APA, 2000; Japan Customs Bureau, 2000 and Jaakko Pöyry, 2000.

GRAPH 11.1.2

I-beam production in North America and Europe, 1999

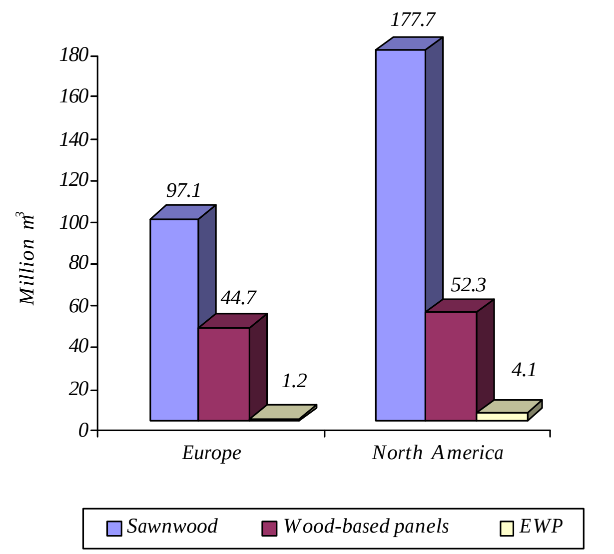


Sources: APA, 2000; and Jaakko Pöyry, 2000.

and structural wood I- beams. The glulam statistics for the Asia Pacific region are really only for Japan. EWPs are growing quickly in consumption in the ECE region, especially in North America and Europe, although they are currently a small market compared to sawnwood and wood-based panels (graph 11.1.3).

GRAPH 11.1.3

Consumption of sawnwood, wood-based panels and EWPs in Europe and North America, 1998



Note: EWP includes: Glulam, LVL and I-Beams.

Sources: APA, 2000; Jaakko Pöyry, 1999; and TIMBER database, 2000.

11.2 Current market situation

11.2.1 North America.

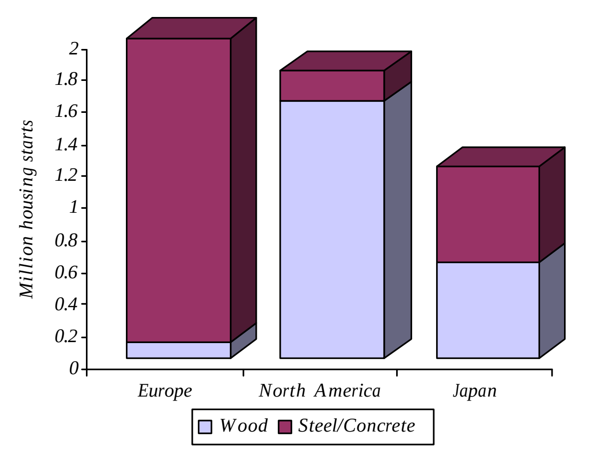
There are two key forces driving demand for EWPs in North America: the prevalence of wood frame construction (graph 11.2.1); and the changing nature of the softwood fibre supply (graph 11.2.2).

North American production has grown rapidly during the 1990s and currently constitutes 5% of North American softwood dimension/structural lumber (sawnwood) consumption. The level of housing starts and the fact that 90% of the homes built in North America are wood frame, dominate engineered wood product use in North America. European housing, by contrast, is only 10% wood based and 90% steel/concrete. In Japan, housing is about 50% wood-based and 50% steel or steel and concrete.

Conversely, the performance properties and good value of EWPs make wood-frame housing attractive. Furthermore, the North American population is aging, and this appears to be encouraging builders to switch to labour saving materials and construction techniques, many of which involve EWPs. The wood products industry wants to hold onto its most important market – residential construction – and it believes that modern EWPs will help fend off non wood building materials such as steel and concrete. Additionally, EWPs should provide wood building materials a better chance at penetrating non-residential construction markets which are currently using primarily steel and concrete.

GRAPH 11.2.1

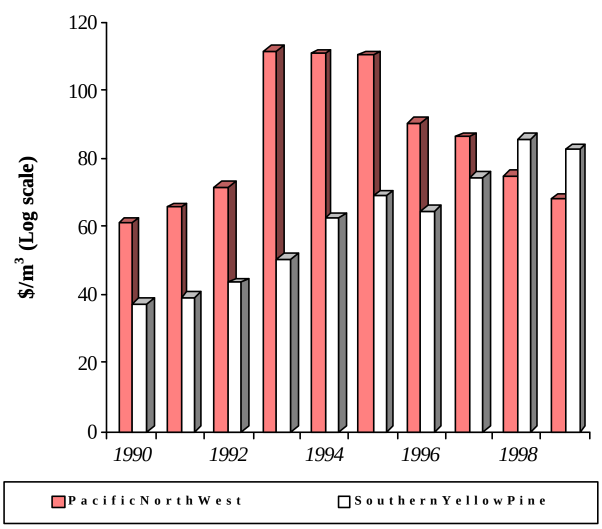
Wood frame construction



Sources: APA 2000; Japan Customs Bureau, 2000 and Jaakko Pöyry, 2000.

GRAPH 11.2.2

Regional fibre cost (sawlog stumpage), 1990-1999

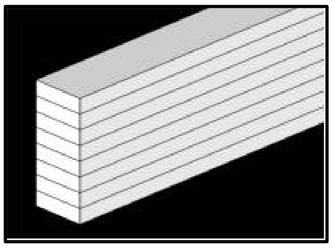


Source: Resource Information Systems (Wood Products Review, 2000).

Glossary of Engineered Wood Products

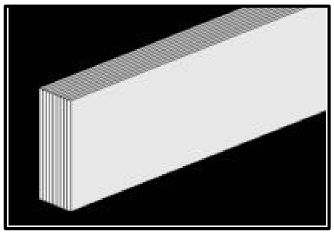
APA classifies glued engineered wood products into three general groups: 1) glued laminated timber (glulam), 2) structural composite lumber (SCL) consisting primarily of laminated veneer lumber (LVL), but also parallel strand lumber and oriented strand lumber, and 3) wood I-beams.

Glued Laminated Timber (Glulam)



Glulam is an engineered stress-rated product created by adhesively bonding together individual pieces of lumber having a thickness of 50 mm (2 inches) or less. It's one of the most versatile of the engineered wood products. It can be easily shaped into forms ranging from straight beams to complex curved members and is used for a wide variety of structural applications in both residential and non-residential construction. Glulam is used typically for headers, girders, purlins, beams, arches, and in exposed applications such as bridges, marinas and transmission structures.

Structural-composite lumber

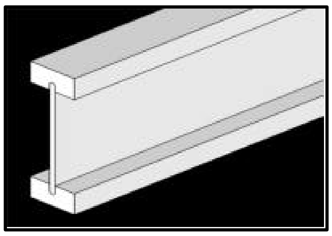


Laminated Veneer Lumber (LVL): LVL is the most widely used of the structural composite lumber products. It is produced by adhesively bonding thin wood veneers together in a large billet so that the grain of all veneers is parallel to the long direction. The LVL billet is then sawn to desired dimensions depending on the construction application. Some of the many uses are in header and beam applications, hip and valley rafters, as scaffold planking and as flange material for wood I-beams.

Parallel Strand Lumber (PSL): PSL consists of long veneer strands laid in parallel formation and bonded together with an adhesive to form beams. Like LVL and glulam, this product is used for beam and header applications where high bending strength is needed.

Oriented Strand Lumber (OSL): Similar to PSL, oriented strand lumber is made from flaked wood strands that have a high length-to-thickness ratio. Combined with an adhesive, the strands are oriented and formed into a large mat or billet and pressed. OSL is used in a variety of applications from studs to millwork components.

Wood I-Beams



Wood I-beams are structural, load-carrying products designed mostly for floor joist applications and are sometimes called I-joists. The beams offer long length and low material weight. Their "I" configuration provides high strength and stiffness. The flange material for I-beams is typically dimension lumber or LVL; the web material is typically oriented strand board (OSB) or plywood. Wood I-beams, used extensively in residential construction, continue to be the fastest growing of the glued engineered wood products.

Machine stress-rated lumber (MSR)

MSR is visually graded lumber that has been stress rated by machine for its modulus of elasticity and fibre bending strength. In addition, more stringent visual grading standards are applied, e.g. less wane than visually graded lumber.

Finger-jointed lumber (FJ)

FJ lumber is short pieces of lumber, finger jointed end-to-end to produce long boards.

Lumber prices and price volatility increased substantially in the 1990s as the wood products industry struggled with a dramatic reduction in availability of old growth softwood fibre from public timber supplies in western United States and Canada as well as exceptionally strong demand over a long period. For example, between 1989 and 1998, softwood timber supplies from Washington and Oregon fell 50% as court orders severely restricted harvest on Federal lands. These two states, accounted for more than half the softwood fibre in the Pacific Northwest, and an even larger percentage of "old growth". Sawn softwood production in the Western Region (Pacific Northwest, Inland Empire[3], and Northern California) fell 35% from the historical peak of 56 million m^3 in 1987 to 36.8 million m^3 in 1995. The changes in the availability of public timber were mandated in part by a shift in public attitudes toward "old growth management", and this in turn changed the nature of future softwood harvest in two important ways: harvests from private lands now constitute almost 75% of the softwood harvest in the Pacific Northwest, and the majority of the private inventory is 2nd and 3rd growth as compared to "old growth" on public lands. The sawnwood produced from the smaller diameter trees from the 2nd and 3rd growth forest has more juvenile wood and more knots. Sawnwood produced from the "younger forest" generally has diminished strength properties and reduced in-service performance.

During this same period, performance-based building codes[4] were adopted, and rapid advances were being made in resin technology. These events helped the EWPs industry to tap into vast volumes of underutilized, fast growing, relatively inexpensive fibre. Although the bulk of the available volume is in the form of low density hardwoods, softwood thinnings make additional low cost fibre available. Furthermore, new conversion technology (e.g. flaking machines, press technology and drying systems) allowed the industry to transform what were formerly "weed species" such as aspen, birch, red maple and sweetgum, into EWPs with superior performance properties.

As production capacity moved from the Pacific Northwest to the South, pressure was put on the softwood fibre resulting in higher sawlog costs and loss of competitive advantage. Southern yellow pine fibre, as noted in graph 11.2.2, is now more expensive than softwood in the Pacific Northwest according to recent reports from Resource Information Systems (Wood Products Review, 2000).

EWPs have two major efficiency-related advantages that should enhance their continued growth in residential and non-residential applications. (1) mechanical (uniform strength) properties that enhance design values and enable more efficient installation; and (2) more efficient conversion technology which results in higher final product yield from the resource. Final product yield from sawmilling averages 40% from the log with bark, while yields of LVL are 52%; Parallam™ about 65% (Truss Joist Macmillan, 1999); and Timberstrand™ about 75% (Truss Joist Macmillan Annual Report, 1999). Furthermore, EWP prices have remained relatively stable – a factor favoured by large builders who pre-sell many of their homes.

Cost savings for EWPs are often measured in terms of labour savings. For example, installing one LVL beam for a garage door header takes less time than the conventional method of nailing two 2x10s together to form the equivalent (table 11.2.1). Another example is where a traditional wood floor system takes 133 pieces of lumber while an I-beam floor has only 80, hence less labour.

In most cases EWPs cost more per linear foot than conventional materials, but they save labour and are stronger. In the example above, the "installed" cost of a I-joist floor system is comparable to a traditional 2x10 system. Hence, EWPs are often a better value.

There is currently a skilled-labour shortage in the North American building construction industry resulting from a combination of tight labour markets (the unemployment rate has fallen to 4%, a 30-year low) and demographics. Recent demographic studies suggest the problem will get worse in the new millennium as the North American population ages. Not only are fewer young people (roughly 20 to 35 years old) working in construction, but less young people are seeking jobs in construction (Engineered Wood Journal, 2000). These trends are forcing builders to adapt labour-saving building techniques including various forms of manufactured housing such as modular (manufactured in 2 to 6 modules in a factory), mobile homes, and panelized housing, (panels manufactured in a factory), (Automated Builder, 2000) (graph 11.2.3). Stick-built (sometimes referred to as "site-built") housing now constitutes less than 1/3 of United States housing starts (Automated Builder, 2000). In addition, shipments by the lumber components industry (roof and floor trusses, and wall panels) have

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[3] The Inland Empire of the western United States includes eastern Washington, eastern Oregon, Idaho, Montana, Colorado, Arizona, Utah and New Mexico.

[4] I.e. building codes which instead of specifying materials or production methods define performance standards to be achieved. This avoids distortion and does not discriminate against new processes. An example is when old codes specified plywood where a new performance-based code specified load bearing and other engineering performance requirements.

increased from 1.5 billion dollars in 1992 to an expected $3 billion by 2002.

For the above reasons, EWP demand grew rapidly in North America during the 1990s as described below in graph 11.2.4. LVL is used mostly in North America as flange material for I-beams (60%) with the remainder being used primarily in structural beam applications including garage door headers, purlins, supporting beams, and the like. I-beams are used primarily in floor joist and roof rafter applications in North American platform frame construction.

11.2.2 Europe

In Europe, glulam is the dominant EWP. Glulam is used primarily as load bearing structural members in commercial and industrial applications. These applications take the form of beams, arches, and columns, typically with a rectangular cross section.

According to Jaakko Poyry research, glulam makes up almost 95% of Europe's consumption of EWPs. Europe not only consumes large quantities, but is also a major exporter, with the bulk of the exports going to Japan.

TABLE 11.2.1

Examples of efficient applications using EWPs

Applications	Conventional solution	EWP Solution
Garage door headers [1]	Two 2x10s [2] nailed together	One LVL beam
Floor system	Conventional floor with 133 pieces	I-Joist system with 80 pieces (40% less)
Carrying beams [3]	Three or four 2x12s nailed together One steel I-Beam	One 3½" LVL beam, One Parallam beam
Roof truss	Metal plate wood truss with conventional lumber chords [4]	Metal plate wood truss with MSR chords (25% less lumber)

1 Headers span door and window openings to distribute the load from above.

2 "2x10s" are softwood lumber measuring nominally 2 inches by 10 inches in cross section.

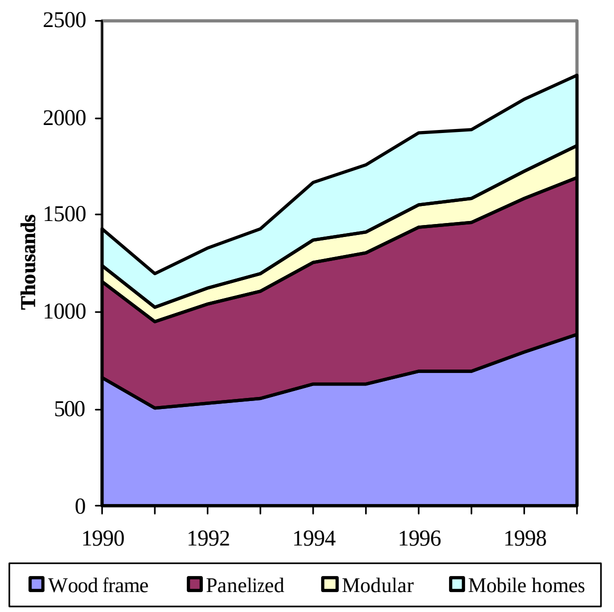
3 Carrying beams support loads from above and span openings below.

4 Chords are the top and bottom members of a truss, a pre-manufactured component used to support a roof, and more recently floors.

Source: Truss Joist Macmillan, 2000.

GRAPH 11.2.3

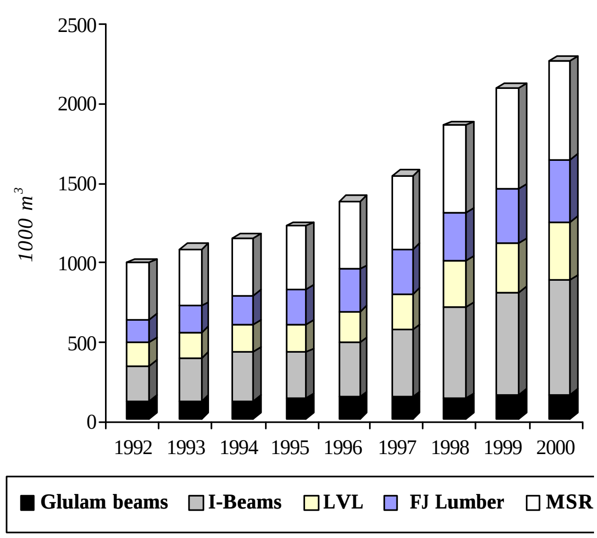
North American manufactured housing vs. Wood-frame construction



Source: Automated Builder, 2000.

GRAPH 11.2.4

Engineered wood product applications in North America



Note: For 2000, estimated data.

Source: Russ Taylor and Associates, 2000.

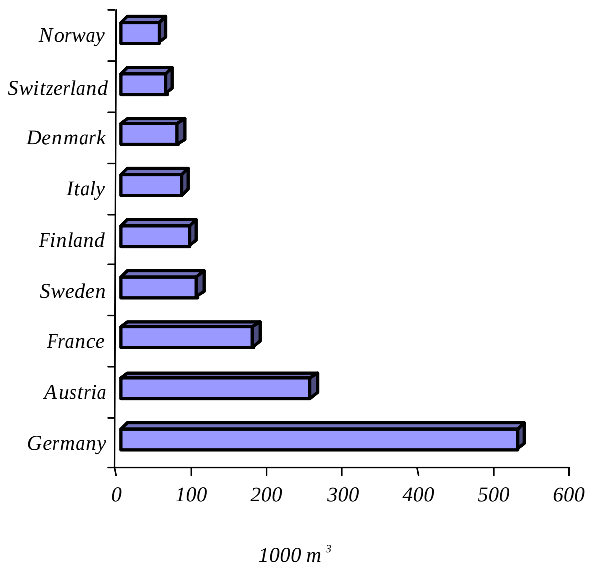
Glulam is the most heavily traded EWP within Europe, with the largest percentage of the domestic trade between Austria and the Nordic countries and the rest of Europe. The bulk of the intercontinental trade is from Austria and the Nordic countries to Japan. Germany is the leading European producer (graph 11.2.5) and the largest consumer of glulam on a per capita basis in the world.

In 1997, Europe was estimated to have consumed 80,000 m^3 of LVL. LVL beams, trusses, and studs are common with only two Nordic producers supplying most of Europe's requirements and a small amount coming from North America. European applications favour engineered constructions, 80% as estimated by Jaakko Poyry and about 20% in I-beam or beam/header type applications. Application usage is split equally between residential and commercial structures. Germany accounts for 35% of the consumption, followed by the Nordic countries (30%), France (10%), and the remaining 25% scattered throughout Europe. In Germany some very large and complicated engineering structures and renovation projects utilize LVL. In central Europe, and especially Switzerland, LVL is used as a slab structure for roofs, while in France LVL portal frame structures are common. A small amount of non-structural LVL is also used in the manufacture of stairs, windows and door frames.

In Europe, I-beam usage is present but it is of low volume (5% of North America consumption) with the

GRAPH 11.2.5

Glulam production in Europe, 1999 [1]



1 Estimate.

Source: Jaakko Pöyry, 1999.

main application being supporting members for concrete forming systems. Four Austrian manufacturers produce about 85% of the European structural wood I-beams (Jaakko Poyry).

11.2.3 Asia Pacific

Japan is both the largest consumer and producer of EWPs in the Asia Pacific region. The main products are LVL and glulam, with imports making up one-third of demand. The major supplying countries include Indonesia, New Zealand and Australia, with the latter two countries now starting to consume more EWPs domestically in residential construction. Malaysia and China are two more countries exporting to Japan.

Japan's imports of glulam increased by about 80% in 1999 over 1998, which was a weak year due to the Asian financial crisis. In the last two years Russia began exporting glulam to Japan (table 11.2.2 based on data from Zentral Markt-und Preisberichstelle für Erzeugnisse der Land-, Forst- und Ernährungswirtschaft (ZMP) as reported by Holz Journal, 2000).

Wood product consumption in Japan continues to be impacted by Japan's overall weak economic situation and the weakness of the Japanese housing market, which accounts for a major share of the overall demand for wood products including engineered wood (see chapter 2).

The Japanese market is comprized of two major segments; wood-frame construction accounts for almost half of starts. The wood-frame sector has three sub sectors: traditional post and beam construction; Japanese light-frame construction; and pre-fabricated structures. Post and beam housing dominates the wood-frame sector with over 80% share (table 11.2.3).

The significance of the post and beam sector is that it is the residential sector that employs the most EWPs. As much as 86% of the imported glulam into Japan has been estimated as having gone into this housing sub sector. A recent survey of fifty large post and beam builders (Nikkan Mokuzai Shimbun, 1998) indicated that a major use of glulam was as long-span beams, posts or as sills. The glulam growth is the result of a growing need for EWPs as a substitute for green solid lumber and other conventional lumber products as the Japanese housing sector attempts to upgrade the quality of house construction in Japan.

Although there is small I-beam usage in Japan in the growing market for platform-frame construction, consumption to date is estimated to be less than 2 million lineal meters. All I-beams are imported from North America as there is no domestic production.

Regarding LVL and glulam markets, Japan is quite different from North American and European usage in that a significant share is used in non-structural, mostly decorative applications in furniture, fixtures and *components. In fact, non-structural uses made up 80% of 1998 Japanese LVL demand. In addition, hardwood LVL makes up half of Japanese LVL consumption (APA and the Japanese LVL Association) (graph 11.2.6). For comparison, in North America most of the LVL produced is softwood-based while all LVL in Europe is softwood.*

The Asia Pacific market including Japan was estimated to have consumed 410,000 m^3 of LVL in 1999. Japan produced 280,000 m^3, followed by Australia and New Zealand with an additional 80,000 m^3 combined. LVL in Australia is used primarily in construction applications. There is one large mill producing LVL in Australia and the remainder of the production is obtained from plywood mills diversifying their product lines. Australia consumes an estimated 44,000 m^3 (graph 11.2.7).

TABLE 11.2.2

Sources of Japan's imports of glulam, 1997-1999
(m^3)

	1997	1998	1999	1999/1998 %
Austria	6,092	17,927	50,043	+ 179.1
United States	91,254	29,516	42,392	+ 43.6
Sweden	42,649	19,640	39,473	+ 101.0
Finland	16,041	12,737	33,151	+ 160.3
Germany	39,136	10,062	31,020	+ 208.3
Russia	0	23,630	26,280	+ 11.2
Canada	36,930	17,424	24,535	+ 40.8
New Zealand	7,325	7,789	11,417	+ 46.6
China	4,794	3,560	6,944	+ 95.1
Netherlands	8,916	3,273	1,133	- 65.4

Note: Data not entirely consistent with official data in table 11.3.4, but shown because of detail of source of imports.
Sources: ZMP and the Japan Laminated Wood Industrial Cooperative Association, 2000.

TABLE 11.2.3

Japanese housing starts by method of construction

	Post & Beam	Platform Frame	Pre-Fab.	Non-wood	Total
1994	619,103	64,037	38,291	848,822	1,570,252
1995	554,690	73,989	37,445	804,206	1,470,330
1996	619,028	93,693	41,575	888,970	1,643,266
1997	497,843	79,458	34,015	775,698	1,387,014
1998	447,287	67,923	29,923	653,162	1,198,295
1999	458,146	75,864	31,534	649,057	1,214,601

Source: Japanese Ministry of Construction, 2000.

TABLE 11.2.4

Estimated glulam consumption in Japan by type of housing

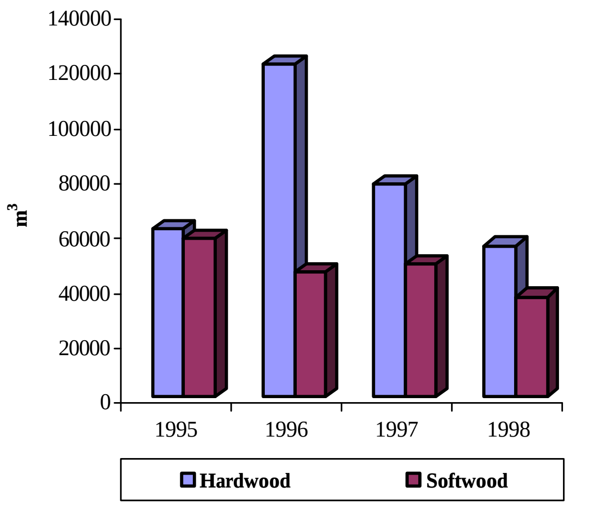
	1995	1996	1997	1998	1999	2000(forecast)
Post & beam housing starts	554,690	619,028	497,843	447,287	484,344	494,388
Glulam in beams (m^3)	25,000	139,000	112,000	201,000	218,000	334,000
Glulam in posts (m^3)	238,000	285,000	286,000	309,000	390,000	455,000

Source: Sumitomo Forestry, 2000.

In New Zealand, two LVL mills produce approximately 40,000 m^3 annually of structural and non-structural LVL destined for Japan. Consumption within New Zealand is nil. Meanwhile, in both Indonesia and Malaysia, the combined production of LVL is approximately 60,000 m^3 per year, again destined primarily for Japan.

GRAPH 11.2.6

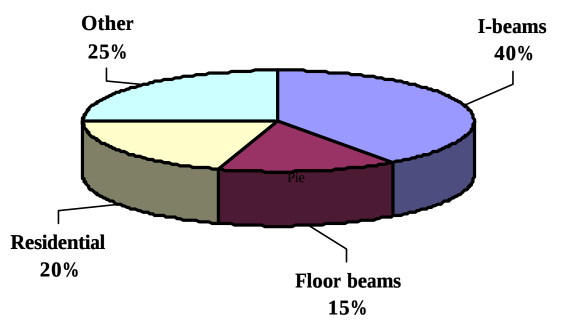
Japanese LVL production, 1995-1998



Source: Japanese LVL Association, 1999.

GRAPH 11.2.7

Estimated LVL consumption in Australia, 1999



Source: RWS Engineering Ltd., 2000.

11.3 Production, consumption and trade statistics

Statistics for EWPs are not as readily available as they are for other wood products due to the relative infancy of this industry. Therefore, the statistical tables in this section will not be as complete as in other Review chapters. The main problem is scarcity of trade statistics and this is due in large part to lack of tariff classifications for most of the EWPs. However, good production statistics are available. "Apparent consumption" will be reported only for those products and countries where import and export data are also available. Reliable consumption data exists for glulam in Europe, Japan, and North America, I-beams in North America and LVL in Japan and North America.

11.3.1 I-beams

Production and trade statistics

Consumption is essentially the same as production as international trade flows in I-joists are either non-existent or minimal. The only measurable trade flows are between the United States and Canada. I-joists are a North American product primarily due to prevalence in wood-frame construction in North America. In 1999, approximately 2 million m^3 of I-beams were produced worldwide with 95% produced and consumed in North America. I-joists now make up 40% of above ground, raised wood floors (excludes ground level concrete floor area) in the United States single family housing market and are expected to grow to as much as 80% market share in ten years.

The other major end use is for roof trusses, although market penetration to date has been lagging the success in the flooring market. New Zealand and Australia build wood-frame houses similar to North America. However, housing demand there is significantly less hence the lower production levels. Europe's primary use for I-joists is as support for concrete forming (flooring) applications. The European I-beams are characterized by an open-web lattice of solid timber in contrast to the North American product comprized of solid structural panel webs.

11.3.2 LVL

Production and trade statistics

LVL is similar to I-beams in that they are primarily produced and consumed in North America, although Japan is also a big consumer when structural and non-structural end uses are included (graph 11.1.1). North American end uses favour structural applications with the bulk consumed as flange material in I-joists (graph 11.3.1). In North America 95% of the LVL is from softwood species such as southern yellow pine and Douglas fir because of their good strength to weight ratios. There are also 3 hardwood-based plants using maple, oak and yellow poplar (tuliptree) in West Virginia and aspen and birch in Quebec.

TABLE 11.3.1

Production and trade of I-beams, 1995-1999
(1,000 m^3)

	1995	1996	1997	1998	1999	Change 1998 to 1999	
						Volume	%
PRODUCTION							
Europe					105.0 [1]		
North America	833.7	1,045.8	1,316.7	1,493.1	1,879.5	386.4	+26
Canada	81.9	113.4	168.0	193.2	340.2	147.0	+76
United States	751.8	932.4	1,148.7	1,299.9	1,539.3	239.4	+18
EXPORTS							
North America	6.3	7.8	11.4	18.9	89.6	70.7	+374
Canada	4.0	5.0	8.0	15.0	85.0	70.0	+467
United States	2.3	2.8	3.4	3.9	4.6	0.7	+18
IMPORTS							
North America	4.0	5.0	8.0	15.0	85.0	70.0	+467
Canada	0	0	0	0	0	0.0	0
United States	4.0	5.0	8.0	15.0	85.0	70.0	+467

1 Estimated data.

Source: APA, 2000.

TABLE 11.3.2

Production and trade of LVL, 1995-1999
(1,000 m^3)

	1995	1996	1997	1998	1999	Change 1998 to 1999	
						Volume	%
PRODUCTION							
WORLD	997.4	1,158.6	1,332.7	1,402.5	1,705.5	303.0	+22
Europe	85.0	85.0	88.0	93.0	93.0	-	0
Asia	119.5	167.4	126.6	91.9	100	8.1	+9
Japan [1]	119.5	167.4	126.6	91.9	100	8.1	+9
Malaysia & Indonesia			60		60		
Oceania			42.0		40		
North America	792.9	906.2	1076.1	1,217.6	1,472.5	254.9	+21
Canada [2]				56.6	113.3	56.7	+100
United States [2]				1,161.0	1,359.20	198.2	+17
EXPORTS[3]							
IMPORTS							
Asia							
Japan	41.7	76.4	60.3	67.4			
North America							
Canada	0	0	0	0	0	0	0
United States				22.3	24.5	2.2	+10

1 Japan LVL Association. Includes softwood and hardwood.

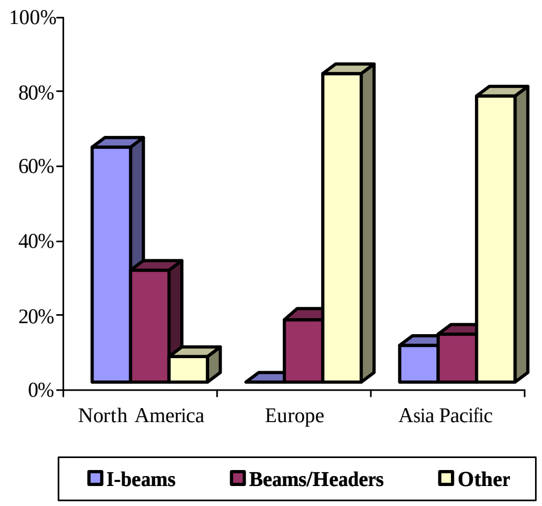
2 Combined to avoid disclosure 1995-1997.

3 Not available.

Source: APA, 2000.

GRAPH 11.3.1

LVL end uses by region



Sources: Japan LVL Association, 2000

End uses in Europe include commercial construction (engineered constructions) on the continent while residential construction dominates in the Nordic countries. Non-structural uses such as joinery and furniture applications are found in Europe and North America in small volumes.

In Japan non-structural uses are 77% of the market. Non-structural applications include fixtures and components, 51%, furniture, 7% and miscellaneous uses, 42% (Japan LVL Association). The Japanese LVL market is different in another important way in that it is manufactured from both hardwood and softwood fibre, much of which is imported. The hardwoods are tropical species from Indonesia primarily while softwoods come from North America, Russia, and the Nordic countries. Hardwood LVL normally is not as strong as softwood based LVL (strength/weight basis), hence hardwood LVL is used more in non-structural applications such as furniture. Softwood LVL in Japan is also used for crating and containers.

Trade in LVL is primarily to Japan mainly from New Zealand and the rest from North America. In 1999, Japan imported about 110,000 m^3 (Jaakko Poyry, 2000). The bulk of that came from New Zealand with North America supplying the rest. In 1999, Europe shipped 20,000 m3 to the United States while the United States sent about 10,000 m^3 to Europe.

Apparent Consumption.

Consumption patterns for LVL reflect differences in construction technology with structural applications dominating North America consumption while more decorative (structural and non-structural) uses are favoured elsewhere in the world.

TABLE 11.3.3

LVL Consumption, 1995-1999

(1,000 m^3)

	1995	1996	1997	1998	1999
North America	790*	900*	1,070*	1,191.2	1,438.1
Japan	161.0	244.0	187.0	159.0	..

*Assuming negligible net trade.

Source: APA, 2000, including estimates.

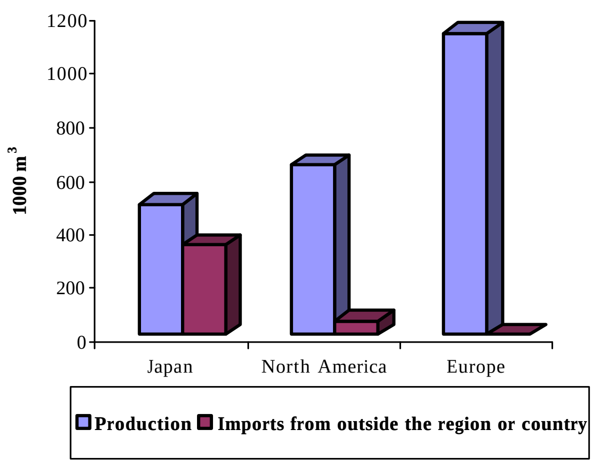
11.3.3. Glulams

Production and trade.

Glulam production is focused in three regions – Japan, North America, and Europe as seen in graph 11.3.2. Trade in glulam is primarily between Europe and Japan, and between North America and Japan. In 1999, Europe shipped 140,000 m^3 (12% of production) to Japan while North America shipped about 60,000 m^3 (8% of production). In addition, Russia shipped about 33,000 m^3 to Japan in 1999.

GRAPH 11.3.2

Regional glulam production and imports, 1999



Sources: APA, 2000; Japan Customs Bureau, 2000; and Jaakko Pöyry, 2000.

Consumption.

Glulam is the most universally traded and consumed of all the EWP. Glulam is the one EWP that Europe consumes more of than North America and this trend is expected to continue. Germany is by far the largest consumer of glulam (graph 11.3.3).

TABLE 11.3.4

Production and trade of glulam, 1995-1999

(1,000 m^3)

	1995	1996	1997	1998	1999	Change 1998-1999	
						Volume	%
PRODUCTION							
World	1,761.3	1,974.6	2,128.6	2,159.9	2,609.0	449.1	21
Europe [1]	855.0	870.0	992.5	1,035.7	1,300.0	264.3	26
Austria	108.0	119.0	133.5	160.0			
Denmark	55.0	53.0	54.0	48.0			
France	100.0	100.0	100.0	110.0			
Germany	350.0	360.0	460.0	510.0			
Italy	54.0	48.0	50.0	55.0			
Netherlands	15.0	15.0	15.0	7.0			
Norway	56.0	54.0	52.0	32.9			
Sweden	70.0	75.0	81.0	74.8			
Switzerland	47.0	46.0	47.0	38.0			
Russian Federation	0	0	0	38.0	41.0	3.0	8
Japan [2]	208.1	340.1	385.0	374.2	483.7	109.5	29
North America	698.2	764.5	751.1	712	784.3	72.3	10
Canada	30.7	30.7	35.4	30.7	35.4	4.7	15
United States/Mexico [4]	667.5	733.8	715.7	681.3	748.9	67.6	10
EXPORTS							
Europe [5]	35.9	68.1	137.9	72.0	175.9	103.9	144
Russian Federation	0	0	0	30.6	32.9	2.3	8
North America	149.5	233.5	213.9	121.3	143.4	22.1	18
Canada	29.5	56.7	102.4	72.5	88.3	15.8	22
United States/Mexico [3, 4, 7]	120.0	176.8	111.5	48.8	55.1	6.3	13
IMPORTS							
Japan [6]	164.1	350.6	342.7	188.9	335.0	146.1	77
Of which from: Canada	20.8	30.2	38.9	18.4	25.8	7.4	40
United States	81.2	123.1	121.4	32.5	44.8	12.3	38
New Zealand	12.9	12.0	14.4	13.7	18.3	4.6	34
Sweden	16.3	33.4	43.5	19.7	40.2	20.5	104
Finland	12.2	14.8	19.8	13.3	34.6	21.3	160
Germany	3.5	10.7	42.2	10.7	31.5	20.8	194
Austria	0.1	0.6	6.3	18.0	50.4	32.4	180
China	0.8	3.5	15.9	15.3	32.7	17.4	114
Russia	0	0	0	30.6	32.9	2.3	8
Other	16.3	122.3	40.3	16.7	23.8	7.1	43
United States	24.3	43.3	59.1	46.7	49.6	2.9	6

1 The European Glued Laminated Timber Industries Association.

2 Japan Laminators Association.

3 APA-The Engineered Wood Association. JLA import data used for United States exports and Japan imports since Japanese data are thought to be superior to the United States data collected from manufacturers.

4 Data from one glulam plant in Mexico added to United States to avoid disclosure.

5 Total European exports estimated by assuming that most of the volume went to Japan.

6 Japanese Customs Bureau, Ministry of Finance.

7 United States export data for 1997 smaller than Japan import data for the same year possibly due to shipment vs. arrival dates.

Source: APA, 2000.

TABLE 11.3.5

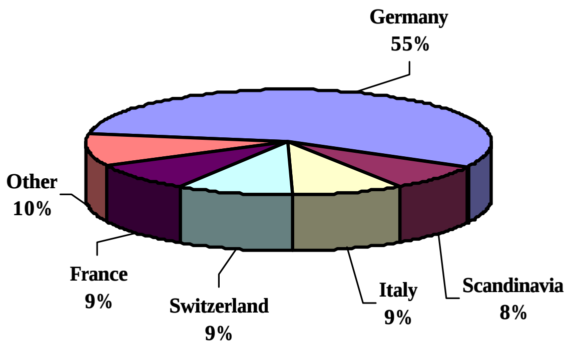
Apparent consumption of glulam, 1995-1999

	1995	1996	1997	1998	1999	Change 1998-1998	
						Volume	%
	(1,000 m^3)						
EUROPE							
Production	855.0	870.0	992.0	1,036.0	1,300.0	+264	+25
Imports	0	0	0	0	0	0	0
Exports	36	68	138	72	176	+104	+144
Net trade	36	68	138	72	176	+104	+144
Apparent consumption	819.0	802.0	854.0	964.0	1,124.0	+160	+17
RUSSIAN FEDERATION							
Production	0	0	0	38	41	+3	+8
Exports	0	0	0	30.6	32.9	+2.3	+8
Apparent consumption	0.0	0.0	0.0	7.4	8.1	+0.7	+9
JAPAN							
Production	208	340	385	374	484.0	+110	+29
Imports	164.0	351.0	343.0	189.0	335.0	+146	+77
Apparent consumption	372.0	691.0	728.0	563.0	819.0	+256	+45
NORTH AMERICA							
Production	698	765	751	712.0	784	+72	+10
Imports	0	0	0	0	0	0	0
Exports	120	178	112	49	55	+6	+12
Net trade	120	178	112	49	55	+6	+12
Apparent consumption	578.0	587.0	639.0	663.0	729.0	+66	+10

Source: APA, 2000.

GRAPH 11.3.3

European glulam demand, 1999



Source:

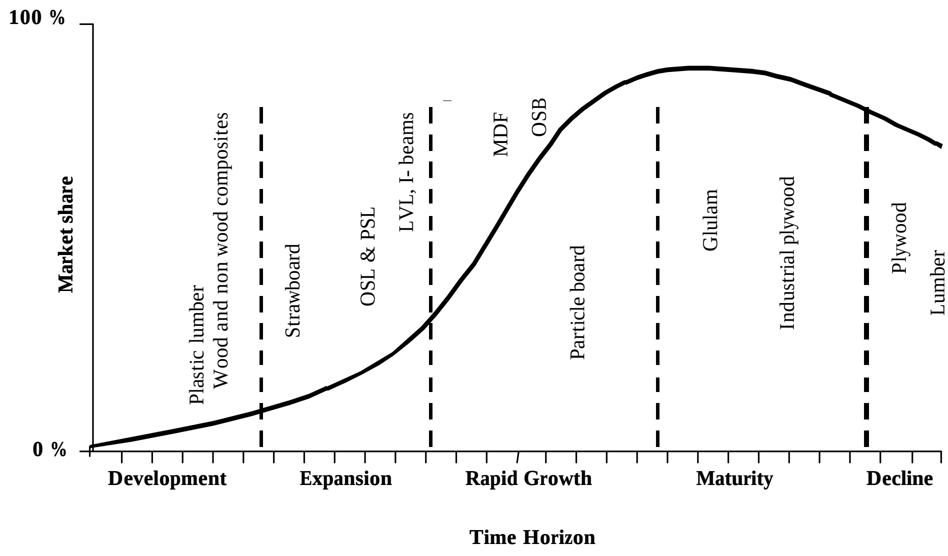
11.4 Outlook for EWPs

The outlook for EWPs is excellent with much of the impetus coming from the global need for efficient construction techniques, growing environmental concerns, and the universal requirement for affordable shelter. EWPs will continue to evolve and capture market share from maturing conventional building materials (graph 11.4.1). Product life cycles as depicted below are not uncommon – in fact they exist for all products. The only factor differentiating one product from another is the speed at which market share is gained or lost. Driving this evolution in EWPs are rapid technological developments in resin technology, press design, wafer geometry, drying systems, etc.

In addition, building codes all over the world have been switching to performance-based codes in lieu of the older "product-based" codes. Performance-based codes allow builders, architects, specifiers to take full advantage of the performance enhancing properties of EWPs. Due to the worldwide adoption of these codes, demand growth for EWPs escalates. These properties will help EWPs to compete "head on" with steel and concrete in the large non-residential building construction market.

GRAPH 11.4.1

EWP "Product Life Cycle"



And, because many EWPs are made from young, small diameter trees, the fibre input can be truly labeled as "renewable". In fact, some EWPs actually enhance forest management options by providing a market for lower quality fibre (both species and diameter). For example, Timberstrand ™ and some North American LVL is made from trees that previously had limited economic markets. By providing markets for a wider range of species and grades, harvesting costs are often reduced, and additional silvicultural operations become economic.

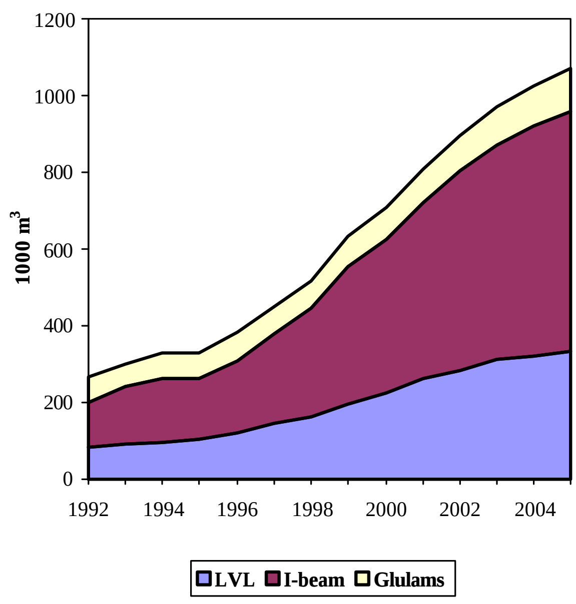
11.4.1 North America

The outlook for EWPs is encouraging as they continue to capture market share from conventional wood building materials. For example, I-joists now have over 40% of market share for raised wood floors, up from 20% in 1995 (APA, 2000). The number of EWPs plants in North America has doubled in the past decade according to APA statistics. EWPs production will have grown 150% between 1992 and 2000 (R. Taylor, 1999). Large increases in demand for LVL, I-joists, and glulam are projected over the next four to five years (APA, 2000) (graph 11.4.2).

Another aspect of EWPs is that the speed with which these products are being developed is increasing in response to changing needs in the market place.

GRAPH 11.4.2

Forecast EWPs growth in North America, 1992-2004



Source: APA, 2000.

Conventional wood products are losing appeal for a number of reasons:

- *decreasing quality and performance as more younger and smaller trees are utilized;*
- *increasing costs;*
- *more demanding consumer; and*
- *tougher environmental regulations.*

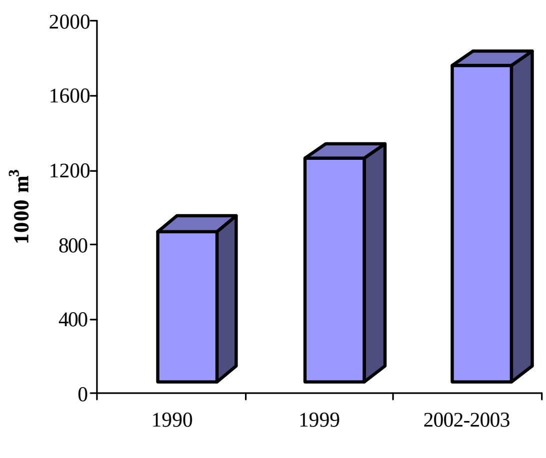
For all these reasons, EWPs are the product of the future as far as wood-based building materials are concerned. This is true whether referring to North America, Europe or Japan. Continuing evolution of all types of EWPs is expected.

11.4.2 Europe

Glulam production will continue to increase as timber frame construction gains in popularity (graph 11.4.3). This will help drive demand for glulam. Over 75% of production will continue to be exported to markets such as Japan. LVL and I–joists are expected to grow in response to growth in timber-frame construction.

GRAPH 11.4.3

Forecast growth of European glulam production, 1990-2003



Source: Jaakko Pöyry, 2000

11.4.3 Japan

Japan will remain the major importer of EWPs in the world. EWP usage in Japan will grow as the residential construction industry continues to adopt new products for traditional post and beam housing and introduces panelized and platform frame construction technologies.

In addition to the slight economic recovery expected in Japan, another boost for EWPs is a discernible marketplace shift from quantity and price to quality and performance. The Housing Quality Assurance Law, implemented in 2000, requires Japanese builders to provide a ten-year warranty on all structural parts of a newly built home. This will favour dry sawnwood, stronger species, and further penetration of pre-cut packages, which in turn favour demand for EWPs. Revisions to the Japanese Building Standards Law implemented in June 2000 will direct a shift to performance standards, again favouring EWPs.

Deregulation of the Japanese housing sector has stimulated efforts to develop housing systems based on new building technologies and materials. Many of these new housing systems include LVL and glulam (New Heavy Timber magazine, 2000). In 1989, there were 15 new systems recognized and only one incorporated LVL or glulam. In 1998, 114 new systems were recognized with 57 incorporating LVL and or glulams.

11.4.4 South America

LVL production is expected to expand into this region over the next half decade. By 2005, an estimated production base of 300,000 m^3 per annum is expected to evolve. The majority of this volume will be exported to the United States.

11.5 Conclusions

This chapter presents an overview of the current status and near-term outlook for an exciting group of emerging wood products that are quickly capturing market share from conventional products. Worldwide variances in consumption trends reflect differences in building construction techniques throughout the world with residential applications prevalent in North America and Scandinavia; commercial and non-residential markets in Europe; and a mixture of residential and commercial end uses in Japan. The outlook for EWPs is excellent as they represent the future of structural wood building materials, particularly residential construction in North America. Although reasonably good statistics on regional production by country are available, there is less data on international trade flows. The main problem seems to be lack of tariff classifications for I-joist and LVL trade into and out the United States. Japan has excellent statistics on LVL imports. Glulam trade statistics are the exception – they are excellent

Industry structure is concentrated, and becoming more so, which is consistent with conventional wood products, such as pulp and paper. One United States company, Trus Joist MacMillan, recently acquired by Weyerhaeuser, produces approximately half the LVL and I-beams produced in the United States. In Europe, most of the I-beams are produced by a few producers in Austria *while most of the LVL is produced by Finnforest. Glulam production is the one EWP without the heavy concentration exhibited by other EWPs.*

EWPs have two major efficiency or cost reduction advantages over conventional wood products that will enhance their continued growth:

- *End use applications – superior technical properties (uniform strength) enhance design values that use less wood thus facilitating installation efficiencies (both labour savings and material reductions); and*
- *Conversion efficiencies, i.e. final product yield from the tree are significantly higher than lumber recoveries. The end result is that EWPs are competitive on an "installed cost basis" and they help us extend the valuable forest resource.*

Engineered wood products are the future of wood building materials because they offer the best hope for incorporating technological change (resin technology, flaking machines, press technology, etc.) to ensure that forest products are cost competitive on an installed cost basis with all alternative building materials.