



Scottish Forest Industries Cluster



Scotland's Forest Industries



Scotland's Forest Industries

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1. Foreword



Anyone travelling around the country will probably see something of Scotland's forests. They are much less likely to see the mills where the wood from these forests is processed.

Every week, some 4,000 lorry loads of harvested wood is transported to these mills for conversion into timber for house building, fencing materials, high-quality papers and many other essential products. After felling, more trees are planted – taking the opportunity to increase diversity, for example, by planting broadleaved species alongside rivers and burns or by leaving open spaces to improve the view.

This makes forestry truly sustainable – meeting our needs, but also leaving a better resource for future generations.

Within the Scottish Executive, we are determined to promote economic activity in rural Scotland in ways that protect and conserve our natural environment. Scotland's forest industries can do just that. Some 40,000 jobs in Scotland would disappear if there were no forests or forest industries. Through Forestry Commission Scotland, we manage Scotland's national forests for multiple benefits, including wood production, recreation and wildlife conservation. And, through the Scottish Forestry Grants Scheme, we are encouraging other landowners to create and manage woods and forests to provide economic, environmental and social benefits in the long term.

Our forestry policy is set out in *Forests for Scotland – The Scottish Forestry Strategy*. One of its key objectives is to maximise the value of the wood resource, and we have taken this forward by supporting the Scottish Forest Industries Cluster, which is a partnership between the industries and Scottish Enterprise.

This booklet tells the story of Scotland's forest industries; of how they have invested a billion pounds over the past 20 years in the state-of-the-art equipment needed to compete in global markets; and of the challenges that lie ahead as the wood harvest from Scotland's forests continues to grow.

A handwritten signature in black ink, consisting of the first letters of the first and last names, 'All' and 'Wilson', written in a cursive style.

Allan Wilson MSP
Deputy Minister for Environment & Rural Development

2. Introduction



Image: Mike Henderson

Sometimes described as 'Scotland's secret industries', Scotland's forest industries provide many thousands of jobs throughout the country. However, because there are few major concentrations of employment, their significance is easily overlooked.

Although the industries use sophisticated technologies and are committed to sustainability, old myths abound. Foresters are frequently asked whether they still sell wood for pit props, a market that virtually disappeared with the end of deep coal mining in the 1980s. People who have read or seen television programmes about destruction of the world's natural forests are often surprised to learn that tree felling in Scotland is part of a sustainable cycle of harvesting and replanting.

The purpose of this booklet is to dispel some of these myths, to tell people about this fascinating and multi-faceted sector of the economy, and to encourage them to find out more.

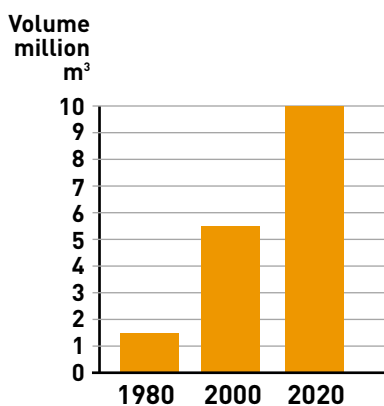
What are Scotland's forest industries? They are networks of interdependent businesses. They include the forest owners and managers who produce wood, while creating wildlife habitats and providing recreation facilities in their forests. They also include the forest nurseries, where young trees are grown from seed, the contractors who harvest the wood, and the hauliers who transport it. In addition, there are the businesses that process the wood that is grown in Scotland, producing timber and wood panels for sale to builders, joiners and DIY enthusiasts. And there are the companies that import wood, or wood products such as pulp, to make items such as paper or furniture.

The development of Scotland's wood-processing industries really took off in the 1980s. This was when the Scottish forests created during the middle part of the 20th century began producing significant volumes of softwood.

In 1980, just over 1.5 million m³ of wood was harvested from Scotland's forests; by 2000 this had reached 5.5 million m³ per year. This production increase stimulated massive investment, averaging £60 million per year, to create today's modern industries. As newer forests mature, the wood harvest will continue to grow, approaching 10 million m³ per year by 2020. (One cubic metre of wood fresh from the forest weighs about one tonne: a typical load on an articulated lorry weighs about 25 tonnes.)

The future growth of the industries represents a tremendous opportunity and a tremendous challenge, recognised by the Scottish Executive in its Forestry Strategy. The Scottish Forest Industries Cluster was formed in 2000 as a partnership between the industries and Scottish Enterprise. Its job is to ensure that this opportunity is not missed.

Wood production from Scotland's forests



This booklet:

- sets the scene by explaining where Scotland's forest industries sit in an international context. Although the scale is small compared with some other countries, Scotland benefits from being part of one of the world's biggest import markets, namely, the United Kingdom (UK). But the global nature of the forest products industries means that Scottish manufacturers face international competition on a daily basis;
- explains why Scotland's forest industries can justifiably claim to be sustainable;
- gives an overview of Scotland's forest industries, outlining their contribution to the economy and explaining why they are so inter-dependent. This section also describes the transport infrastructure, the opportunities for training, and the role of research;
- provides more detail about the sawmilling, papermaking and wood panel manufacturing industries;
- discusses opportunities for developing new markets, explaining that some of them (such as wood for fuel) actually represent ancient uses of wood;
- describes the forests themselves;
- considers the importance of innovation in creating future opportunities;
- explains how to find out more and gives a glossary of terms.



Image: Mike Henderson



Image: Mike Henderson

3. Our Place in the World



International context

Scotland has long relied on other countries for wood. By the 16th century, there was an established import trade from the eastern Baltic and Scandinavia. This was because it had already become difficult to source all the timber needed for building purposes from accessible forests within Scotland. As trade followed exploration and colonisation, so wood also came into Scotland from North America and from tropical forests.

At the beginning of the 20th century, Scotland (like the rest of the UK) depended almost entirely on imported wood, mainly from Sweden, Russia, Canada and the United States of America (USA). This led to serious problems of supply during the naval blockades of the First World War; the shortage of wood for pit props gravely threatened the nation's main source of energy – coal.

Acknowledging this, the Government founded the Forestry Commission in 1919 with the task of establishing a strategic reserve of timber. This was achieved by acquiring land for planting and by encouraging tree planting on privately owned land. Since then, nearly one million ha (or 10,000 km²) of new forest have been created in Scotland – and almost half of this area was planted in the 25 years 1965-90. Most of this planting took place on poorer land that was not required for agriculture: it is only fairly recently that planting has moved 'down the hill' on to better land.

The Commission was able to draw upon the experience of enlightened landowners who had pioneered techniques for establishing forests in Scotland. They planted Scots pine and also proved that species introduced from abroad could grow well. These include Sitka spruce and Douglas fir, both introduced to Europe by the great Scottish plant collector and explorer, David Douglas (1799-1834). Both these species flourish in Scottish conditions, benefiting from good rainfall and enough warmth during the growing season to give growth rates that are fairly high by international standards.

International comparison of forest areas

Year 2001	World	EU	UK	Scotland
Forest area (million ha)	3869	116	2.8	1.3
Forest area (% land area)	30%	37%	12%	17%
Forest area (ha per person)	0.65	0.31	0.05	0.26

(Source: FAO State of the World's Forests 2003 and FC statistics)



Image: Forest Life Picture Library



Image: Forest Life Picture Library

David Douglas

Value of imports of wood products to main importing countries

	Value of imports (US\$ billion 2001)
USA*	25.1
China	10.5
Germany*	10.1
Japan	9.4
UK	9.0
France*	8.4

* USA, Germany and France are also major exporters, with exports worth US\$15.5 billion, US\$10.1 billion and US\$5.5 billion respectively in 2001. By comparison, exports from the UK had a value of US\$2.1 billion.

[Source: UNECE Timber Bulletin: Forest Products Trade Flow Data 2000-2001]

Wood supply and demand

World consumption of wood is about 3 billion m³ per year, of which half is used as fuel. Because of global imbalances between supply and demand, there is a great deal of international trade in wood and wood products. This international trade was worth US\$133 billion per year in 2001.

The UK is one of the world's largest net importers of wood and wood products, along with the USA, China and Japan. The total value of the UK's net imports was US\$6.9 billion in 2001. Pulp and paper products accounted for 71 per cent of the value of UK imports (and 80 per cent of the value of exports).

The main countries from which the UK imports wood and wood products are Finland and Sweden. Together they account for 36 per cent (by value) of all imports, including (by quantity) 49 per cent of sawn softwood, 23 per cent of wood pulp and 46 per cent of paper and paperboard.

In order to estimate the overall volume of wood that is consumed in the UK, conversion factors are used to express consumption in terms of 'wood raw material equivalent'. This means, for example, that one tonne of newsprint is equivalent to a standing volume of 4.3 m³ of wood in the forest, and 1 m³ of sawn softwood is equivalent to 2.13 m³ of wood in the forest. Using these conversion factors, total annual consumption of wood (including recycled) in the UK is 87 million m³ wood raw material equivalent – this is about 1.5 m³ wood raw material equivalent per person per year.

Presuming that average consumption per person in Scotland is the same as in the rest of the UK, this means that total consumption in Scotland is about 7.5 million m³ wood raw material equivalent. This compares with Scotland's annual wood harvest of 5.5 million m³, implying 73 per cent self-sufficiency. In practice, Scotland imports more than the balance of 2 million m³, but also exports considerable volumes – particularly to markets in England.

How wood grown and processed in Scotland helps to meet UK needs

	Apparent UK consumption, million m ³ wood raw material equivalent	Scottish production, million m ³ wood raw material equivalent
Paper products	48.3	0.58
Sawnwood	21.9	2.41
Wood panels	15.7	1.32
Miscellaneous	1.1	0.18
Total	87.0	4.49

[Note: Wood raw material equivalent volumes are standing volumes, including the equivalent for recycled material.]

[Source: Scottish Forestry Strategy indicators of progress, using statistics for 2000.]

Our Place in the World

When products, such as sawnwood, are imported to the UK, their selling price is determined partly by the exchange rate. This can be illustrated by examining the effect on sawn softwood prices of changes in the exchange rate between sterling and the Swedish kroner.

In 1995, the average value of sawn softwood imported from Sweden was £144/m³. At that time the exchange rate was 11.26 Swedish kroner/£. This means that Swedish exporters were receiving 1621 Swedish kroner per m³.

In the last quarter of 2001, the average value of sawn softwood imported from Sweden was £101/m³. At that time the exchange rate was 15.26 Swedish kroner/£. This means that Swedish exporters were receiving 1541 Swedish kroner per m³.

Thus, the price (in Swedish kroner) received by Swedish exporters fell by 5 per cent over this period. But, because of the change in the exchange rate, the selling price (in pounds sterling) had fallen from £144 per m³ to £101 per m³ – a drop of 30 per cent.

Since Scottish sawmillers sell to customers who are free to buy Swedish timber, they had to respond by cutting their prices by 30 per cent in order to be able to compete.

Scotland's contribution to the UK's wood needs has doubled over the past 20 years. This significant increase in market share has been achieved as a result of the industries' positive approach to investment in modern technology, training and marketing. The global nature of the forest products industry means that Scottish processors have to face international competition when they sell into UK (or other) markets. In recent years, this competition has been particularly fierce as wood supplies from the Baltic states (especially Sweden, Finland and Latvia) have increased at a time when growth in the European market has been slow. In this competitive marketplace, relative costs and exchange rates are critical drivers.

“In the global context the [Scottish] contribution [to global wood supply] might seem small. However, given the softwood focus in Scotland, the location relative to markets, the stable business environment and the relative importance of Scottish forestry, the resource takes on a disproportionate strategic value.”

Robert Wilson, Executive Vice President,
Jaakko Poyry Consulting (UK), 1999

Major costs for the industries include the cost of energy, including road fuel, together with the costs of employing staff and providing a safe workplace. Where countries that export to the UK have lower costs, because of different economic conditions or different fiscal regimes, they have a clear cost advantage. In these circumstances, Scottish processors have had to improve efficiency and add value to remain profitable.

It is estimated that global demand for wood may grow by about 385 million m³ over the next 15 years – and 75 per cent of this increased demand will be for softwood. Much of the increased supply will come from fast-growing plantations that have been established around the world (and especially in the south-eastern USA and in the Southern Hemisphere), and possibly from Russia, which has nearly one-quarter of the world's forests.

4. Sustainability

Professional forest managers know that they can only go on producing wood from their forests if the trees are growing fast enough to replace what they harvest. There is nothing new in this. For example, estate records from the 18th and 19th centuries show that there were strict rules about cutting and regenerating the oak woods around Loch Lomond and in the Trossachs. But without good forest management, the temptation is always to take a short-term view – to harvest the wood and take the profit without worrying about the future.



Image: Forest Life Picture Library

Global concern about the state of the world's forests, and the need for sustainable management, was highlighted at the Rio 'Earth Summit' in 1992 where a Statement of Forest Principles was agreed. The UK was one of the countries to follow this up by developing clear guidelines for sustainable forest management. Building on the existing framework of felling regulation, environmental controls and forest design guidance, the *UK Forestry Standard* was published in 1998. In the foreword, the Prime Minister, Tony Blair, said:

“... we in the UK have a special responsibility to make sure that our forests are a renewable resource and make a positive contribution to the environment.”

Meanwhile, there was increasing interest in developing forest 'certification'. Certification gives buyers an assurance that wood products come from forests that are sustainably managed. Key requirements are a certification standard, laying down precise requirements for sustainable management, a system for inspecting forests, and a mechanism for demonstrating a 'chain of custody' to show that wood products on sale are indeed derived from certified forests. (A chain of custody needs to record accurately a piece of wood's movements through a chain of 'custodians' that may include a forest owner, a harvesting contractor, a sawmill, an exporter, a shipping company, a timber merchant and a retailer or tradesman, not to mention several hauliers, before the final buyer.)

Sustainability

FSC Trademark 1996 Forest Stewardship Council, A.C.



The FSC logo is now a common feature on packs of wood and wood products sold by major DIY chains.

In the UK, a wide range of organisations came together to develop a certification scheme with its own standard – *the UK Woodland Assurance Standard (UKWAS)* – see www.forestry.gov.uk/ukwas. This reflects the requirements of both the *UK Forestry Standard* and the national Standard developed by the independent, international Forest Stewardship Council (FSC). Accredited certification bodies carry out inspections (known as audits) and issue forest management and chain-of-custody certificates. Certificate holders who have been inspected to the UKWAS standard by auditing organisations accredited by the FSC (www.fscoax.org and www.fsc-uk.info) may use the FSC trademark. Another accreditation scheme is run by the PEFC (the Pan-European Forest Certification scheme – www.pefc.org and www.pefc.co.uk). By 2002, 45% of Scotland's forests, including all those managed by the Forestry Commission, had been certified.

According to the FAO *Global Forest Resource Assessment 2000*, the world's natural forests are still being lost, at an estimated rate of 14.6 million ha per year during the 1990s. Ten years after the Rio Summit, the 2002 World Summit on Sustainable Development in Johannesburg gave a fresh impetus to the international process of sustainable development. The United Nations has established a UN Forum on Forests to address issues of global concern (www.un.org/esa/forests/).

The UK is working hard to ensure that international discussions are followed up with effective action. To achieve this, the UK is supporting international efforts to combat illegal logging, for example, by ensuring that wood used in public-sector projects comes from sustainable and legal sources, and by promoting greater uptake of certification. The UK is also helping to develop an international partnership on forest restoration, which aims to integrate conservation of biological diversity and sustainable use of forests.

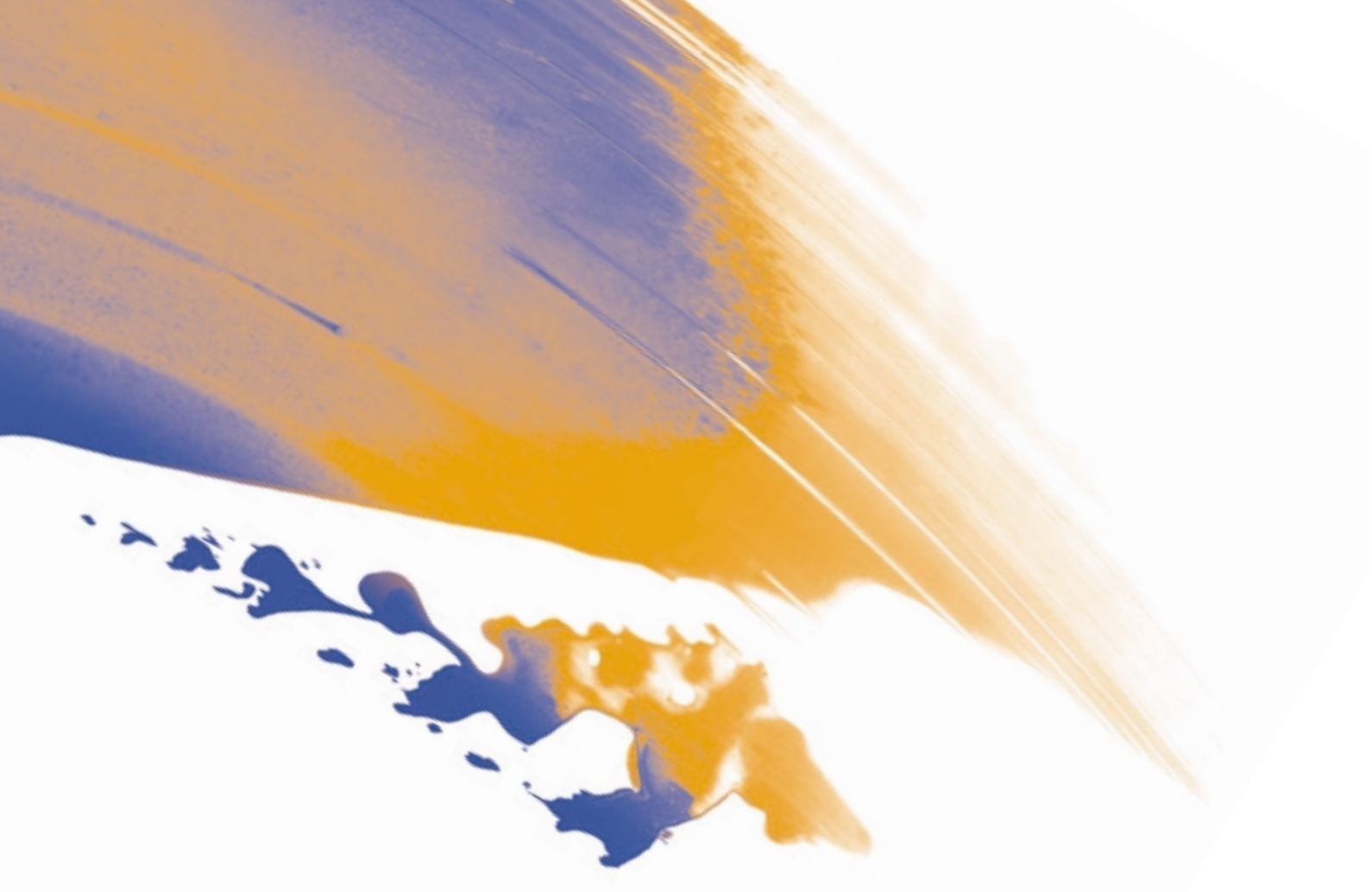
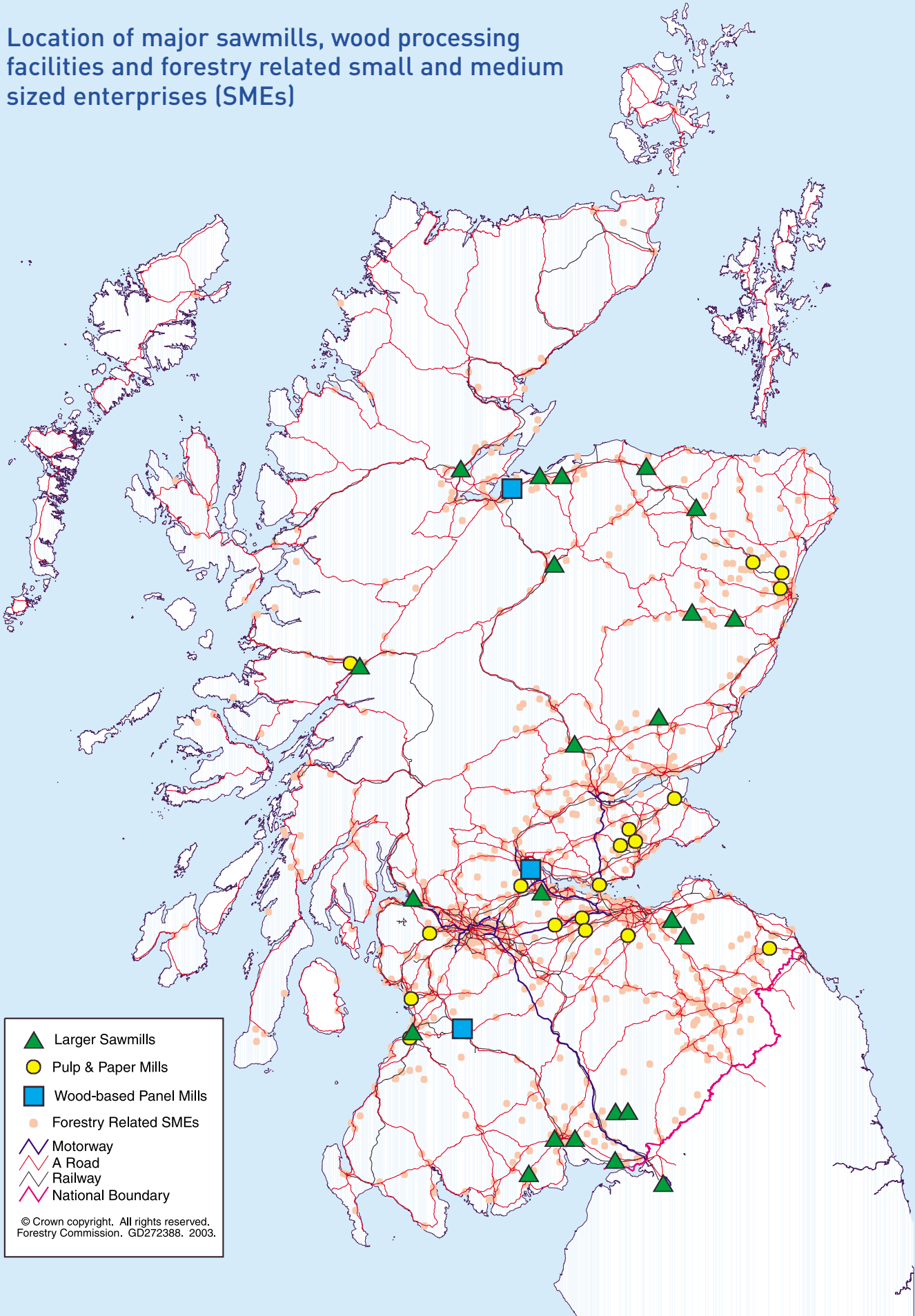


Image: Michael Wolchover

Another major area of activity is the development of a sustainability strategy for forest industries. Coordinated by the Forest Industries Development Council (FIDC – www.fidc.org.uk), this strategy covers the whole wood chain, from growing through to processing and distribution of wood products. It sets out the industries' commitment to sustainable development, reinforcing the social, environmental and economic attributes of wood as a renewable and highly versatile resource with proven sustainability credentials. The strategy recognises that each link in the wood-chain is important for the sustainability profile of different products. It also explains that sustainability, which is based on providing long-term economic, environmental and social benefits, can only be maintained and enhanced if the industries' businesses are financially sustainable.

The world's forests also play an important role in storing and recycling carbon, thus helping to combat the threat of climate change. Within Scotland, forests and woodland are not being created with the sole aim of storing carbon. Nevertheless, tree planting can make a useful contribution towards meeting targets for reducing net carbon emissions. Similarly, using wood for fuel (discussed in section 9, Rediscovering 'New' Markets) can help prevent global warming by substituting wood for fossil fuels.

Location of major sawmills, wood processing facilities and forestry related small and medium sized enterprises (SMEs)



▲ Larger Sawmills
● Pulp & Paper Mills
■ Wood-based Panel Mills
● Forestry Related SMEs
— Motorway
— A Road
— Railway
— National Boundary
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Forestry Commission. GD272388. 2003.

5. Integrated Industries

Defining Scotland's forest industries in the broadest terms, they include:

- the forestry related small and medium sized enterprises (SMEs) that service Scotland's woods and forests. These include forest nurseries, forest managers, consultants and timber harvesting and haulage businesses;
- sawmills and wood-based panel mills that rely on wood grown in Scotland;
- pulp and paper mills that make use of imported pulp and recycled paper as well as wood grown in Scotland;
- the SMEs that import wood and wood products for distribution and further processing (for example, furniture manufacture).

The contribution of these businesses to the Scottish economy can be expressed in terms of their gross added value. The following statistics (derived from the Scottish input-output tables) are incomplete – for example, forest-related haulage is not classified separately. However, they do give an indication of the scale of the industries in relation to other sectors of the economy.

Direct contribution of forest industries to Scottish economy

	Gross value added (£ million - 1999)
Forestry planting	58.0
Forestry harvesting	74.7
Wood and wood products	225.5
Pulp, paper & paperboard	198.9
Total	557.1

Note: this compares with the gross value added of agriculture (£883 million), sea fishing (£182 million) and fish farming (£133 million).

(Source: Scottish Executive *Input-Output Tables 1999*)

Total gross value added for all industries in Scotland is £64,050 million, so, on this basis, Scotland's forest industries represent just under 1 per cent of the economy. If all forestry-related businesses are taken into account, the total value represents about 2 per cent of the Scottish economy.

Total employment in Scotland's forest industries has grown by between 1.5 and 1.8 per cent per year over the past 20 years to reach more than 35,000, or 2 per cent of all jobs in Scotland. This takes no account of those who are self-employed, those working in support services or those working further downstream in timber-using industries such as construction. Overall, it is estimated that more than 40,000 jobs in Scotland depend on the forest industries in this broader sense.



Image: Mike Henderson



Image: Mike Henderson



Image: Mike Henderson

Integrated Industries

Employment in forestry and primary wood processing by activity 1998/9

Nurseries	201
Planting & establishment	1,189
Forest maintenance	1,304
Harvesting	1,947
Road construction	179
Other forest	372
Haulage	593
Processing	3,083
Other non-forest	1,826
Total	10,694

(Source: FC statistics)

There are also jobs in other industries, such as tourism, that may depend on forestry. The temporary closure of forests in 2001 due to Foot and Mouth Disease created immediate problems for small businesses, such as hotels, bed and breakfasts and adventure centres, whose clients make use of local woods and forests. Overall, there are some 22 million day visits per year to Scottish forests.

Every five years, there is a survey to estimate the number of people employed in Scotland's forests and woodlands and in businesses that are directly related, namely forest nurseries, harvesting, haulage and primary processing. This survey does not include the sectors that rely on imported wood or pulp. On this narrow definition, total employment is about 10,000. Some two-thirds of these people work within 20 miles of home – others travel further afield, for example, to take specialist harvesting machinery to forests where it is needed. Another feature of the industries, particularly the contracting sector, is that significant numbers of people work in small businesses with fewer than 10 employees. Forestry-related jobs are particularly significant in remote and fragile rural areas where there may be few other employment opportunities and the jobs are essential to the prosperity, or even survival, of the communities they help support.

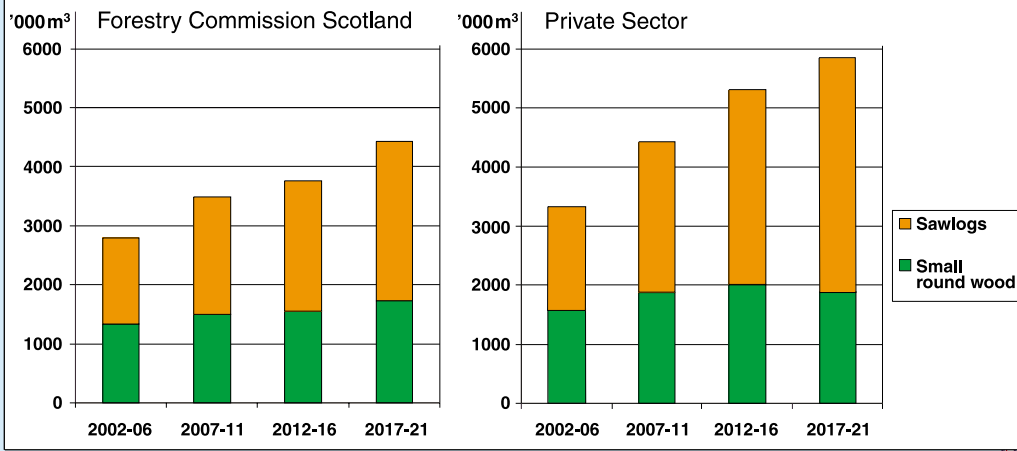
Forestry-related jobs require a wide variety of skills. These include: practical skills in growing trees; engineering skills – for building roads and for operating and maintaining sophisticated machinery; conservation and landscaping skills to ensure that the forests are attractive for wildlife and for people; recreational and interpretative skills so that people enjoy visiting the forests; and management skills to integrate these activities in a business-like way.



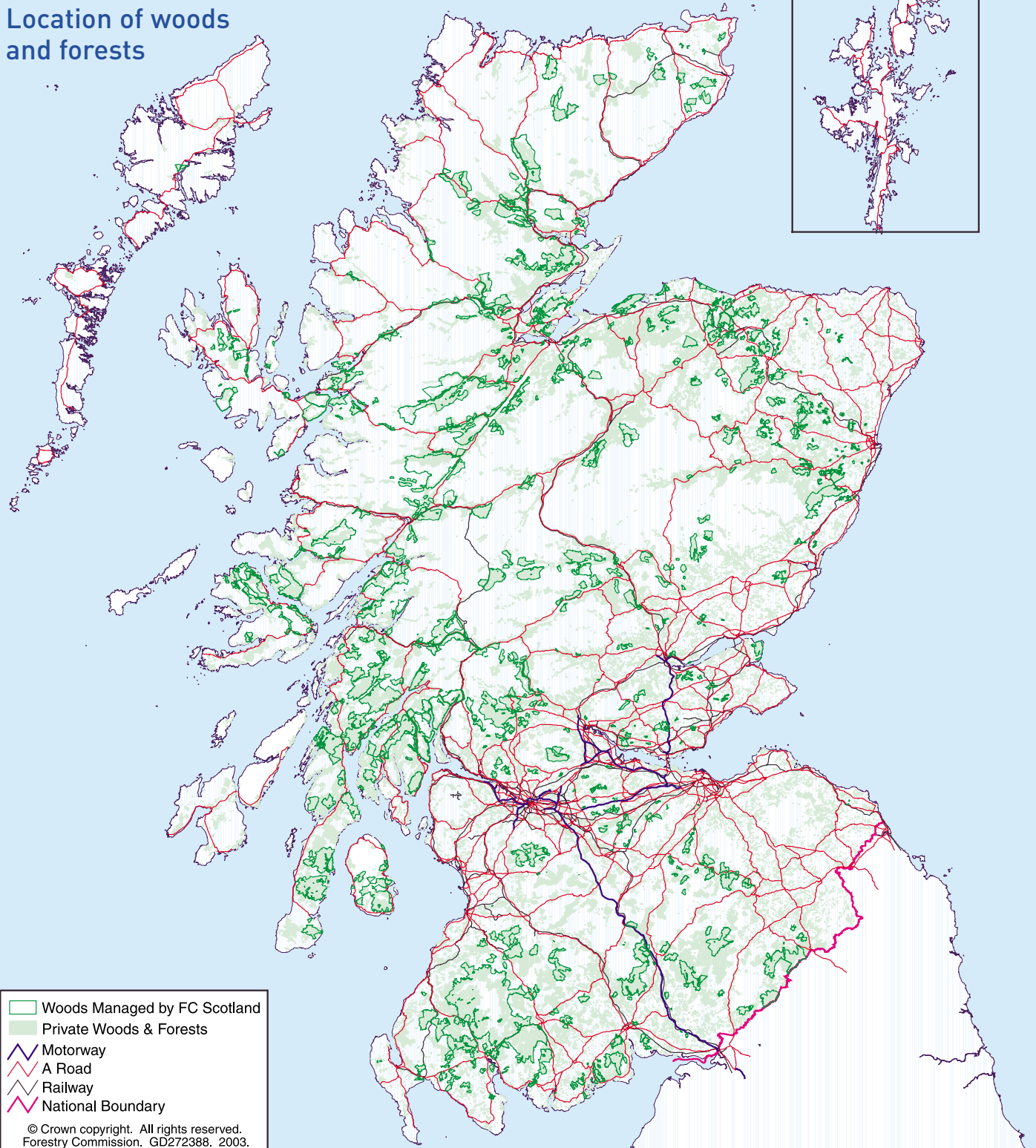
Image: Forestry Commission

Andy Martin, harvesting forester with Forestry Commission Scotland's Buchan Forest District, grew up as a 'city boy' in Edinburgh but always enjoyed holidaying in the great outdoors. Thus, when it came to choosing a career, the prospect of an office-based job was distinctly unappealing. He joined the Forestry Commission in 1979 and, 10 years later, took up his present appointment which involves detailed planning, preparation of sale information and the overseeing of harvesting operations. Key developments over the years, according to Andy, have included mechanisation and computerisation of the harvesting process, such that annual out-turn per member of staff has risen from around 1000 m³ to nearer 10,000 m³. Close teamwork between machine operators and foresters has also increased – "particularly on the environmental and safety side," he adds.

Projected timber production in Scotland for public and private sector forests 2002 - 2021



Location of woods and forests



Integrated Industries

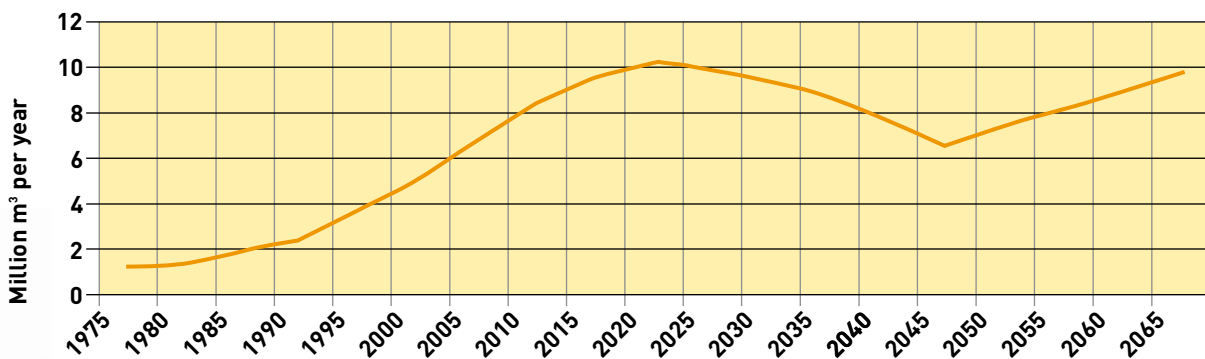


Image: Mike Henderson

Wood production

The growth in softwood production from Scotland's forests has led directly to the development of the industries that process this wood – the sawmills, the wood-based panel mills and the pulp and paper mill described in later sections of this booklet. This production will continue to grow over the next 15 years or so, but will then begin to fall. The reason for this future fall is the decline, from the end of the 1980s, in the level of planting of the coniferous forests that produce softwood. (Broadly speaking, Scottish coniferous trees reach economic maturity about 40-60 years after planting, although some timber is produced from thinnings from about age 20, so wood production reflects planting activity half a century earlier.)

Trends in wood production and availability



(Source: FC statistics and Forest Research Woodland Surveys)

The chart shows forecast availability of wood in Scotland, presuming that current planting trends continue. There is a need to manage the forecast dip in wood production. Its impact can be minimised through a combination of approaches, such as planting new forests, delaying the felling of some forests, exporting raw material during the peak, and importing raw material during the trough. (There is a similar peak in forecast production from Irish forests, but this occurs after 2020, reflecting the high levels of planting that took place there in the 1990s.)

Levels of hardwood production, from broadleaved trees, account for only about 1 per cent of the total volume. The role of hardwood processing is discussed in section 9, Rediscovering 'New' Markets.



Investment

A major initiative to attract new investment in wood processing in Scotland was launched in 1980. This was successful, creating today's modern industries that are capable of processing, and selling into competitive markets, a greatly increased volume of wood. While some wood is processed south of the Scottish border (mainly in the north of England), over 80 per cent of the wood grown in Scotland is processed in Scotland. This has been achieved through investment by the industries of more than £1 billion since 1980.

The industries that have been created are highly interdependent. When a mature tree is felled, the bottom parts of the tree trunk (with a diameter of at least 12–14 cm) are sold as sawlogs to sawmills. The top part of the tree is sold as small roundwood for pulping or panel board manufacture. The sawlogs are more valuable and so, in effect, the prices obtained for sawlogs help to pay for the cost of harvesting small roundwood. Chips and sawdust produced during the sawmilling process are also sold as 'co-products' for pulping and for panel board manufacture. Bark is in demand as a mulch in parks and gardens, and also provides a soft-landing for children's play areas. Anything that cannot otherwise be sold is burned, generating energy for space heating and for drying wood in kilns. Thus, all the wood that enters the sawmill is used.



Image: Mike Henderson

A W Jenkinson (www.awjenkinson.co.uk) has built its business on sawmill co-products. It began in the 1960s with regular collections of sawdust from the neighbouring sawmill to supply local farms. The company, which has a major facility alongside the James Jones & Sons Ltd and Forest Garden plc sawmills at Lockerbie, Dumfries-shire, now handles an annual 700,000 tonnes of chips, sawdust, bark and other co-products from sawmills and other wood processing industries. This material is sold to the wood-based panel industry and to agricultural, horticultural and equestrian markets.



Image: Mike Henderson

Transport infrastructure

Good infrastructure is essential for an efficient cluster of industries. Transport accounts for about 20–50 per cent of the cost of wood delivered to Scottish mills and is a major factor affecting the profitability of the Scottish forest industries.



Image: Forest Life Picture Library

Integrated Industries

Having previously worked in the farming industry, **Jim Craik** joined haulier John Miller Ltd some 11 years ago and became a timber lorry driver three years later, in which role he now covers an average of 450 to 500 km every working day. "I always liked driving," he explains. "I like the time on my own and the freedom of being left to get on with the job." According to Jim, the last few years have brought a substantial increase in the number of timber lorries on the road as well as technical improvements to the vehicles themselves. "For example," he says, "they all have weighing devices now which means that you are never overweight."



Image: Brian Sherman Studios

About 95 per cent of all roundwood entering Scottish mills is moved by road and there is a good network of motorways and major roads connecting Scotland to markets in England and to ports.



Image: Mike Henderson

There are, however, difficulties in transporting timber from forests in a number of remoter rural areas, where much tree planting has taken place. There is a particular problem where roads and bridges are too weak to withstand timber traffic. Solutions include strengthening (which requires capital investment), finding alternative routes, or restricting the intensity of timber haulage. The forest industries, growers, trade organisations and local authorities are working together to tackle this issue through local timber transport groups. The activities of these local groups, in Argyll, the Highlands, Borders, Ayrshire, Grampian and Dumfries & Galloway, are coordinated at the national level through a Timber Transport Forum (www.fidc.org.uk/timber_transport). Meanwhile, engineers are examining options for more cost-effective road-building techniques aimed at improving road strength and reducing maintenance requirements.



Image: Mike Henderson

There are obvious environmental benefits in transferring the movement of logs from roads to rail and sea, where this is possible and practicable. Nevertheless, the use of railways and coastal shipping normally involves some road haulage to and from the railhead or port, and there is also the cost of double handling. In order to encourage greater use of rail or sea transport, the Scottish Executive is contributing to the cost of upgraded timber handling facilities at selected points on the rail network and at various quays and ports (particularly on the west coast).

Training and research

Efficient industries also require a well-trained, motivated work force. Overall responsibility for forestry training lies with the Trees and Timber Group of Lantra (www.lantra.co.uk), which is the Sector Skills Council with responsibility for land-based training in the UK. Lantra is developing a coherent qualifications framework for the industries, based on nationally agreed standards of performance. Meanwhile, Scottish Enterprise provides support for company-level training and skills development. The Scottish School of Forestry (www.school-of-forestry.org) is part of Inverness College and the University of the Highlands and Islands Millennium Institute. A number of other colleges throughout Scotland offer relevant SVQ courses and a Scottish Forest Industries Technology Centre has recently been opened at Barony College (www.barony.ac.uk), in Dumfries-shire.



Image: Barony College

At 20 years of age, **Euan Maccormick** has ambitions to reach management level within the forestry industry and perhaps to start his own business. He has recently embarked on an HNC/HND at the Inverness School of Forestry following a three-year spell at Barony College near Dumfries, where he completed courses on chainsaws, timber trailers/skidlers and tree surgery. Euan is following his father – a farmer – in pursuing a rural profession and has built up a healthy affinity with the great outdoors through his hobbies, which include canoeing and shooting. He has opted for a wide-ranging study workload so as to “keep my options open” and has enjoyed a real sense of progression in completing the various course modules.

Integrated Industries



Cell structure of Sitka spruce

Image: Forest Research

A recent report from Forest Research examined the quality – in terms of straightness – of spruce wood that will be coming on to the market. Such information is vital for potential investors, particularly because the research results have predicted a lower proportion of spruce sawlog material than had previously been expected. This was attributed to such factors as planting on exposed, windy sites, the genetics of seed sources, poor planting techniques, over-enthusiastic use of fertilisers, and initial spacings that were too wide.

Both Aberdeen (www.abdn.ac.uk/agfor/) and Edinburgh (www.geos.ed.ac.uk) Universities have long-established forestry schools, now integrated with other rural disciplines, that provide opportunities for tertiary education and research. The University of Abertay Dundee (<http://scieng.abertay.ac.uk/siwt>) offers undergraduate training in timber and wood science that makes use of its expertise in wood preservation.

A centre for research is the Forestry Commission's Forest Research station at Bush, just south of Edinburgh (www.forestry.gov.uk/research). This employs about 100 people throughout Scotland and provides expert advice on such matters as identifying and preventing tree disease; minimising woodland damage, for example, by deer or the wind; silviculture; tree breeding; and improving the conservation and social value of woodlands. It is also responsible for carrying out periodic surveys of Scotland's forests and maintaining up-to-date information on wood production forecasts.

BRE (www.bre.co.uk) is the primary UK research and consultancy provider for the construction sector. Previously known as the Building Research Establishment, it employs approximately 600 staff in the UK covering all aspects of construction and the built environment.

BRE's Centre for Timber Technology and Construction (CTTC) has extensive research and development capabilities and employs 30 expert staff. CTTC works closely with Forest Research to understand and improve the quality of wood grown in Scotland and the rest of the UK. Other research-based consultancy covers timber engineering, strength grading, structural insulated panels, wood-based panels, composites, wood processing (including drying, scanning, and wood quality modelling), wood modification, durability, protection against insect damage, and coatings.

A Centre for Timber Engineering (CTE – www.cte.napier.ac.uk) has been established at Napier University in Edinburgh to encourage greater use of timber as a construction material. It provides undergraduate and post-graduate courses in timber engineering and supports professional engineers and architects through research, information provision and continuing professional development (CPD) events. One of the Centre's priorities will be to bring together detailed technical information on the properties of Sitka spruce grown in Scotland.

6. Sawmilling

Production in Scotland

There are about 80 sawmills in Scotland, producing around 1 million m³ per year of sawnwood, or about 10 per cent of the UK's needs.

The biggest 10 sawmills are responsible for about 70 per cent of the total production. After sawlogs are delivered to these mills, they are debarked and electronically scanned so that they can be sorted into different sizes by computer-controlled equipment. The debarked logs are fed, in batches of the same or similar length and diameter, into processing machines that convert the round log into square or rectangular timbers. The most common of these machines are called chipper canters: they chip the wood removed from the circumference of the log as it is squared. These chips are then sold separately as sawmill co-products for panel board manufacture or pulping. As well as moving south of the border to England, chips are also being exported to Scandinavia. The income from co-products such as chips, sawdust and bark is important to the profitability of sawmills.



Image: Mike Henderson



Image: Mike Henderson

Sawmilling



Image: Mike Henderson

Treatment operator **Randall Whalen** first joined what is now Howie Forest Products in the mid 1970s and is enjoying his second spell with the Dalbeattie-based sawmiller. After a six-year break in which he worked for joinery, radiator and grain companies, he returned to the sawmill when friends told him that the company was looking for people to operate a large, new treatment plant. Fourteen years later and Randall has been enthused by the addition of a new automated and computerised treatment plant, which he describes as simply 'amazing'. As for the attraction of the forest industry in general, he comments: "It's very interesting to see a tree coming in and to see it going out as a finished product." The rapid growth of the Howie sawmill is identified by Randall as one of the major changes he has seen during his time in the industry. "It has become one of the biggest employers around here," he observes.



Image: Mike Henderson

To maximise output of sawnwood of required dimensions, computers – programmed with details of customers' orders – control the saws in the mill. Increasingly, customers require deliveries on a 'just in time' basis to builders' merchants, DIY sheds and other markets. By using leading-edge production technology and highly developed, computer-controlled equipment, sawmills can develop direct computer links with customers so that their orders are cut immediately. The ability to respond rapidly to changing orders gives mills located in the UK a competitive advantage over importers.

It is important that construction timber meets the requirements of building regulations. To ensure this, mills test the strength of their sawnwood using machines that are calibrated according to British and European Standards. The sawn wood is also dried in kilns to reduce its moisture content, which is necessary to minimise distortion or shrink when in service. Wrappings are used to protect it against rain, snow and dirt whilst in transit or storage.

Large, modern sawmills are engineered to process specific types of log. Thus, a typical mill might be designed for softwood logs with a diameter of between 12 cm (minimum top diameter) and 45 cm (maximum butt diameter). Larger logs are sent to specialist mills capable of handling them.

The capacity of a mill is described either in terms of the input of roundwood (in m³ round) or in terms of its output of sawnwood (in m³ sawn). A mill might produce 55,000 m³ sawnwood for every 100,000 m³ roundwood – a conversion ratio of 55 per cent. Most of the remaining 45,000 m³ is sold as chips or sawdust.

As in other areas of manufacturing, sawmilling benefits from economies of scale. This has been reflected in structural changes in Scotland. Between 1995 and 2001, the total number of sawmills fell from 114 to 80, but the number of large mills producing more than 50,000 m³ (sawn) per year has increased from two to eight.

Softwoods dominate in Scotland's sawmilling industry, accounting for over 99 per cent of production. (Hardwood sawmilling also takes place, but on a very much smaller scale supplying niche markets – see section 9, Rediscovering 'New' Markets.)

A challenge facing the industry is to respond to the changing nature of the sawlogs that are coming on to the market, in terms of straightness, average diameter, density and other properties. These characteristics are affected by species (and, within species, genetic origins), the location of the forest (for example, its altitude and exposure), and silviculture (for example, the history of thinning and the age at felling). In turn, such characteristics have a major impact on the engineering requirements of sawmills and on market opportunities, so it is important that the sawmilling industry has access to high quality information about potential sawlog quality.

The Scottish sawmilling sector is largely made up of family-owned companies that have been subject to restructuring and merger in the face of changing commercial pressures.

Structure of softwood sawmilling industry in Scotland (2002)

Size category (m ³ sawn production)	<5,000	5,000 - 25,000	25,000 - 50,000	50,000 +
Number of mills (Number in 1995)	50 (78)	19 (27)	3 (7)	8 (2)
Softwood consumption (m ³ underbark round)	115,000	398,000	201,000	1,176,000
Sawn softwood production (m ³ sawn)	69,000	223,000	112,000	633,000

(Source: FC statistics)



Image: Mike Henderson

Sawmilling



Image: Mike Henderson

Major players include:

- Adam Wilson & Sons Ltd, based in Troon, Ayrshire. (www.adam-wilson.co.uk);
- BSW Timber plc, which is the biggest sawmilling business in the UK. It has six sawmills in Britain and one in Latvia. Its GB headquarters is in the Scottish Borders. The company's two largest sawmills in Scotland are Kilmallie Sawmill, near Fort William, and the Boat of Garten Mill, near Aviemore in the Highlands. There is a third, much smaller, mill at Petersmuir, East Lothian. BSW Timber plc also operate a major sawmill in Carlisle, which buys much of its wood from Scotland. (www.bsw.co.uk);
- Forest Garden plc, which manufactures a range of garden products at its sawmill near Lockerbie, Dumfries-shire. (www.forestgarden.co.uk);
- Howie Forest Products, based in Dalbeattie, where it operates a large sawmill and runs a bark distribution and sales business. (www.howie-forest.co.uk);
- JDG Munro & Partners, based in Dingwall, Easter Ross;
- James Callendar & Sons Ltd, based in Falkirk;
- James Jones & Sons Ltd, which operates seven sites in Scotland – further information is given on p23. (www.jamesjones.co.uk);
- James Cordiner & Sons Ltd, based in Banchory, Kincardineshire. (www.cordiners.com);
- John Gordon & Sons Ltd, based in Nairn, Morayshire. It operates two sawmills in Nairn, and a third at Carrbridge, Inverness-shire. (www.gordontimber.co.uk);
- Riding Sawmills, based in Cardoss, Dunbartonshire;
- Tulloch Timber (Nairn) Ltd, based in Nairn, Morayshire.



James Jones & Sons Ltd (JJSL) is a privately owned, family company dating from the mid-nineteenth century. Over the past 10 years the company has invested about £30 million in its Scottish operations, which employ about 300 people. Its Scottish sites are:

- Mosstodloch, Fochabers, Morayshire. This sawmill employs 70 people and consumes 125,000 m³ (round) of logs per year. The mill was upgraded in 1997 to incorporate latest technology for timber handling and crosscutting. Further investment is designed to add value, shifting the production emphasis from pallet wood and fencing material towards planed, dried and treated construction timber;
- Forres, Morayshire. This is a specialist production facility producing engineered timber beams ('JJJ Joists') for the construction industry. These are manufactured using finger-jointed timber as the top and bottom flanges and oriented strand board (OSB) as the intermediate web: see p44;
- Kinnoir, Huntly, Aberdeenshire. This traditional sawmill is used for conversion of poorer-quality logs into pallet wood and fencing. It employs 43 people and consumes 38,000 m³ (round) of logs per year;
- Aboyne, Aberdeenshire. This sawmill employs 50 people and consumes 100,000 m³ (round) of logs per year. It concentrates on the production of construction grade timber. It was opened in 1989 and continual investment since start-up has brought capital spending close to £7 million. This allows the mill to plane timber and produce regularised joists, which have rounded edges for easier handling and are individually marked with the British Standard Kite Mark to demonstrate their consistent quality, strength characteristics and dimensions;
- Kirriemuir, Angus. This traditional sawmill is used to convert large logs and to cut special orders for customers. It employs 41 people and consumes 30,000 m³ (round) of logs;
- Dumfries. There are two sawmills, employing a total of 61 people. The larger produces 60,000 m³ of sawn timber for the construction industry. The smaller produces pallet wood and fencing. Both mills will eventually be replaced by the new production facilities on the Lockerbie site;
- Lockerbie, Dumfries-shire. Phase 1 of the development on this site was a sawmill producing palletwood. Phase 2 will develop the site for timber distribution, providing 'just in time' delivery for customers south of the border from all Scottish sites. Other investment plans include planing, resawing and regularising of construction timber; timber preservation; relocation of the Dumfries mills; finger-jointing and I-beam production. Total capital expenditure is likely to be about £16 million and, when complete, the JJSL site at Lockerbie will provide 123 jobs.

In addition to operating these production facilities, the company also has long-term business relationships (some of which have continued for generations) with the forestry contracting businesses that harvest the trees in the forest and transport it to the mills.

JJSL also owns a pallet manufacturing business in the north of England and a substantial share in a Canadian wood products company.

Sawmilling

Markets

Total UK consumption of sawn softwood is about 10 million m³ per year.

About 10 per cent of this is produced in Scotland, 15 per cent in the rest of the UK, and 75 per cent is imported, mostly from Sweden, Finland and Latvia. Imports from Latvia increased substantially following its independence from the former Soviet Union in 1991. This had a significant impact on the UK market. There are, however, now signs that this might decline as more Latvian timber is sold into Japanese and US markets, and the Latvians are converting more of their better-quality wood into higher-value joinery products.

The value of sawn softwood imports to the UK exceeds £750 million per year. There is a network of well-established businesses in Scotland involved in supplying and distributing imported timber.

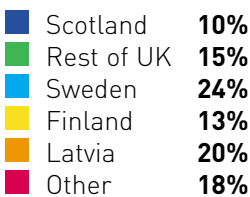
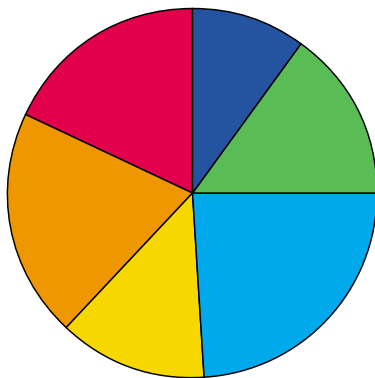
As Scottish production continues to grow, sawmills must continue to compete directly with imported timber, particularly in the construction sector. This is the biggest and most valuable sector of the sawn softwood market, accounting for about 50 per cent of its total value. Sawn softwood is a major component in timber-framed buildings and is used throughout the building industry, for example, in floor joists and tiling battens.

Other major applications for Scottish sawnwood are in pallets and packaging and as fencing material. Although Scottish sawmills have a good share of these markets, they are mature and any growth is likely to be only modest, as well as facing continued competition from imports.

The market for sawnwood is continually evolving, as demonstrated by the disappearance over the past 20 years of the market for mining timber, which used to be a mainstay for the Scottish sawmilling industry. An example of a new market is the market for timber decking, promoted by gardening and home improvement features on television and in magazines.

Because of its size and potential for growth, the construction market represents the most significant future opportunity for Scottish sawmills. In 1980, Scottish sawmills had just 1 per cent of this market; by 2000, this market share had risen to nearly 10 per cent in the face of intense competition from imported wood and competing materials. This achievement was the result of major investment in state-of-the-art sawmilling equipment, including strength-grading machinery, kiln drying facilities, good presentation of the timber and focussed research and development, as well as growth in sawlog production from the forests. For sales from Scottish sawmills to continue to grow, they will need to maintain their competitive position in terms of price, quality and service. This will require continuing capital investment and innovation, which will, in turn, depend on profit expectations.

Sources of sawn softwood consumed in UK in 2001



(Source: UNECE Timber Bulletin: Forest Products Trade Flow Data 2000-2001)

Production from large Scottish mills 2002

	Sawn m ³
Construction	447,000
Fencing	202,000
Packaging & pallets	301,000
Other	18,000
Total	969,000



Image: Mike Henderson

In addition to competing for market share, suppliers of sawn timber agree that they can all benefit from market growth. Thus, importers and domestic producers have come together to support the '*wood.forgood.*' campaign (www.woodforgood.com). This has included a major advertising campaign aimed at encouraging more use of wood, for example, in house building and in garden structures. It has also sought to educate, inspire and motivate architects and structural engineers in the use of wood.

Another element of the '*wood.forgood.*' campaign has been to promote the benefits of timber frame building. Demand for wood within the construction industry will increase when more use is made of timber framing. Timber frame construction is used to build low to medium-rise housing as well as some offices, hotels, restaurants and small industrial buildings.

At present, more than half the new houses built in Scotland are timber framed, but in England only about 10 per cent are built in this way. Given the size of the English market, where about 135,000 new houses are built every year, an increase in timber framed construction is expected to have a major impact on the market for construction timber. This market growth forecast is based on increasing recognition within the construction industry of the benefits of timber framing. These benefits include speed of erection, design flexibility, quality control (because units are pre-fabricated), less need for on-site skilled labour, and superior sound and thermal performance. The advantages of timber frame construction were proved to the construction sector through the 'TF2000' project when a six-storey timber frame building was constructed and tested inside the airship hangar at BRE's Cardington laboratory. A design guidance document is now available through the BRE on-line bookshop (www.BREbookshop.com).

Sustainability is an important issue in the construction industry, with environmental performance becoming of increasing interest to architects, engineers and the owners and occupiers of buildings. An internationally agreed life-cycle assessment approach has been used by BRE to compare wood with other construction materials, such as concrete, plastics and steel. This takes account of all factors, including production, processing, fabrication, installation, maintenance, eventual replacement and disposal. The results show that timber products generally have a lower environmental impact than other building materials. Thus, they can make an important contribution to achieving more sustainable construction.

Traditionally, sawn timber required for joinery purposes has nearly all been imported, mainly from countries where timber grows more slowly and is freer from knots. Techniques are now available to overcome the limitations of timber grown in Scotland, for example, by cutting out defects such as knots, and finger jointing. Finger jointing is used to join pieces of wood together, end grain to end grain, to produce longer lengths. BSW Timber plc is now working with Jeld-wen and BRE to make and test wooden window frames using this system.



Image: Forest Life Picture Library



Image: Mike Henderson

7. Papermaking



Image: Mike Henderson

UPM-Kymmene is one of the leading paper companies in the world. The company's businesses focus on magazine papers, newsprint, fine and speciality papers and other wood products. It has production facilities in 17 countries.

UPM-Kymmene employs close to 36,000 people worldwide and its turnover in 2002 was more than over 10 billion euros.

As well as Caledonian Paper, the Company owns the Shotton Paper mill in North Wales and Tilhill (a UK forest management company). It also holds a minority shareholding in the sawmilling company BSW Timber plc.

Production in Scotland

There are a dozen paper and paperboard mills in Scotland. Most of them exclusively use imported wood pulp and recycled fibre from recovered paper in their manufacturing process. However, Caledonian Paper (www.caledonian-paper.co.uk), based at Irvine, Ayrshire, uses about 250,000 tonnes per year of Scottish wood, namely Sitka spruce small roundwood – most of it grown in the forests of southern and central Scotland.

Caledonian Paper's mill opened in 1989 and produces about 250,000 tonnes per year of lightweight-coated paper for magazines, brochures and catalogues.

Wood from the forest is debarked at the mill and then ground up by four rotating pulpstones in a pressurised chamber. Mechanical action breaks the wood and the chips into individual fibres, which are then screened, cleaned and bleached to form mechanical pulp.

The pulp is blended with imported pulp to create the appropriate 'recipe' for the grade of paper that is being made. It is then fed into the paper machine and mixed with water to create a liquid solution, which is poured onto a wide, continuously rotating belt. The water is then eliminated through gravity, suction, pressure and drying. Then the paper is coated with china clay and pressed.

The paper is sold to printing companies throughout the UK and Europe. Output from Caledonian Paper is equivalent to 20 per cent of the total UK requirement for lightweight-coated paper.

Caledonian Paper employs 350 people in Ayrshire and is owned by a Finnish company, UPM-Kymmene. It has developed plans to invest in a second paper machine at Irvine. The final decision on this investment will be taken by UPM-Kymmene in the light of prevailing global market conditions.

The other major purchaser of Scottish wood for use in pulping is Iggesund Paperboard Ltd (www.iggesundpaperboard.com), which transports significant volumes of roundwood by sea from forests on the west coast of Scotland to its mill at Workington on the Cumbrian coast. This mill produces paperboard, which is used in food cartons, packets, packaging and for graphics. Iggesund Paperboard AB is one of the largest manufacturers of virgin-fibre paperboard in Europe and is a business unit of Holmen AB (www.holmen.com/index_uk.htm), a major European forest products group.

Recycling

There has been a major increase in recycling over the past 10–20 years. Consequently, recycled paper and recovered wood, for example, from old pallets, have both become important sources of raw material for making paper and board. Environmental pressure and subsequent Government action (including landfill tax and incentives to encourage recycling) have stimulated this.

There seems little doubt that the potential for increased use of recycled paper will continue to be an important factor affecting investment decisions within the paper industry. At present, more than 40 per cent of the paper and board consumed each year in the UK is derived from recovered paper and this is expected to rise to at least 50 per cent.

WRAP, the Waste and Resources Action Programme (www.wrap.org.uk) is a not for profit company supported by Government. It is working to promote sustainable waste management by creating stable and efficient markets for recycled materials and products, including paper and wood.

Markets

Total consumption of paper and board in the UK is about 12 million tonnes per year, with imports (in 2002) of 7.1 million tonnes per year of paper and board and of 1.6 million tonnes of woodpulp; in addition, about 1.3 million tonnes per year of paper and board was exported in 2002. The value of net imports was £2.8 billion in 2002 (and £3.2 billion in 2001). Since paper and board feature in so many aspects of social, economic and industrial activity, global markets for paper and board are strongly influenced by the overall economic climate. The industry is also highly capital intensive, with a new paper or board mill costing between £200 and £400 million. To obtain an adequate return on investment the equipment has to be fully utilised and is therefore staffed on a 24-hour, continuous-working basis. When these investments take place, they represent substantial incremental increases in supply. With supply being determined in this way, prices of paper products are very sensitive to fluctuations in demand. A recent report by UPM-Kymmene noted that there was little growth in paper demand in Europe and that, worldwide, over-capacity persists in most of the main paper grades. However, the company also noted that, although prices are slack, demand for coated magazine paper (the product from Caledonian Paper) was growing.



Image: Mike Henderson

Although recycling is increasingly important within the paper industry, paper cannot be recycled endlessly. The use of virgin wood is essential to replace the fibres worn out by recycling. Because of its strong and long fibres, Sitka spruce is excellent for this purpose.

8. Wood-based Panels



Image: Mike Henderson



Image: Mike Henderson

Nexfor Inc, the owner of the mills at Dalcross and Cowie, is an international forest products company based in Toronto, Ontario. It employs 7,100 people at 27 locations in Canada, the USA, and the UK. The company operates three business segments: North American Building Materials, Paper and Pulp, and European Panels.

Nexfor employs a total of 700 people in Scotland. Production is increasing steadily through operational improvements at its two sites. Nexfor has also invested £4 million in waste recycling plant.

Production in Scotland

About 1.43 million m³ of wood-based panel products are manufactured in Scotland, from small roundwood, chips and sawdust (bought from sawmills) and recycled wood. The main types of wood-based panel produced in Scotland are:

- **Particleboard.** This is made by gluing together clean sawdust and chips. It is used mainly for flooring and furniture making, DIY, kitchen units, worktops, roofing and general construction. Like other wood panels, it can be faced for decorative and functional purposes with materials such as melamine and wood veneer. Particleboard is made by Nexfor (www.nexfor.com) at its mill in Cowie and by Egger (UK) Ltd (www.egger.com) at its mill in Auchinleck, in Ayrshire;
- **Oriented Strand Board (OSB).** This is produced by Nexfor's factory at Dalcross, near Inverness. OSB is made from strands of wood that are glued together under heat and pressure. It is increasingly used as a substitute for plywood in flooring, internal walls, roof decking, hoarding, shop fitting, agricultural buildings and furniture manufacture. One example of OSB is Sterling Roofdek, an 18 mm thick board, which is sanded and has two long edges tongued and grooved for use as decking on flat roofs or as sarking for pitched roofs;
- **Medium Density Fibreboard (MDF).** This is produced by Nexfor's factory in Cowie, near Stirling. It is made by chemically bonding sawdust (which has wood fibres and fibre bundles of uniform size) under heat and pressure. MDF is increasingly used to make furniture and kitchen units. It is also used in many non-structural applications, such as shop-fitting, and can be moulded to form skirting boards and other interior design features.

Recycling

Recovered wood now forms an integral part of the raw material supply for the industry. To avoid incurring landfill charges, material such as old pallets is broken down, denailed and chipped. It can then be used in the manufacture of wood-based panels. This has benefited the panel board industry by providing a new source of fibre, although it has substituted for small roundwood and sawmill co-products. WRAP, the Waste and Resources Action Programme (www.wrap.org.uk) is also promoting the recycling of wood. One of its aims is to achieve a 40 per cent recovery and reuse of construction and demolition waste wood.



Images: Mike Henderson



Markets

UK net imports of wood panels had a value of £702 million in 2002 (and £671 million in 2001); this includes plywood and veneer sheets as well as particleboard (including OSB) and fibreboard. Total consumption was 5.7 million m³, including 3 million m³ of particleboard (including OSB) and 1.6 million m³ of fibreboard.

Scotland's production of 1.43 million m³ of particleboard, OSB and MDF equates to about 30 per cent of UK consumption of these products. In practice, however, much of the board that is made in Scotland is exported to other parts of Europe. Indeed, OSB is one of the main commodities handled by the port at Inverness.

Prices have fallen throughout Europe in recent years. Nevertheless, Nexfor's Annual Report for 2002 reported encouraging signs for continued improvement in 2003 as prices firmed and the pound weakened in relation to the Euro. European demand for OSB continues to grow strongly as it displaces plywood and chipboard. The product is in increasing demand from builders and other end-use sectors due to its ready availability, consistent properties and price. MDF markets also improved in 2002, with better supply and demand balance associated with a slowing down of new plant openings.

9. Rediscovering 'New' Markets



Image: Forest Life Picture Library

“For the beauty of its figure, for the multitude of uses it can be put to... oak is too well known to remark here, except [to say] that Scots oak is... more interesting than English, owing to the fact that the growth has been slower and the fight with the elements more severe”

Sir Robert Lorimer, architect, Country Life, April 1916

One of the beauties of wood is its versatility. Ever since man first discovered fire, or made simple tools and shelter, wood has been an essential raw material. For many centuries, herbalists have understood how to use bark or leaves for medical purposes. With the aid of modern technology, some of these ancient uses are now finding a place in today's marketplace. As a renewable resource, wood is once more being used as fuel. Skilled craftsmen are bringing out the natural beauty of wood in the design and manufacture of high quality furniture. The role of timber cladding for buildings is being investigated, and Scottish hardwood is being used for flooring. Looking to the future, wood technologists are also learning more about the chemical structure of wood – and about its potential to provide a chemical feedstock for industry, in the same way as oil.

Scottish hardwoods



Image: Mike Henderson

Hardwood production in Scotland is on a much smaller scale than softwood production, accounting for less than 1 per cent of the total. Nevertheless it is important for two main reasons. First, the availability of markets for hardwood timber provides an incentive for owners of broadleaved woodlands to look after them – and many of these broadleaved woodlands have conservation and landscape value. Secondly, small businesses based on hardwood processing can contribute to local rural economies.

Traditionally, high-value hardwood logs have been exported to England, or the Continent, where they are used to make top-quality planks or are peeled or sliced to make strips of veneer wood. Much of the rest of the timber is only available in fairly short straight lengths, or is characterised by knots or other 'natural features'. The challenge is to find ways of processing and marketing this timber, much of which may be available only in small parcels on sites with difficult access.



Image: Highland Birchwoods

Hazel Allen trained as a lawyer and accountant before deciding “to follow my interests” with an environmental MSc. This combination of skills was then brought to the role of project accountant for the Millennium Forest for Scotland Trust, an umbrella body disbursing grants to native woodland restoration projects across Scotland. The Trust worked with a wide range of partners, from public sector owners through large NGOs to community groups. “The commitment and energy of the projects and the range of different initiatives from replanting to timber utilisation were inspiring,” she says. Following a three-year break from the industry, she has returned to it as chief executive of Munloch-based Highland Birchwoods. Noticeable recent trends, she says, include the ‘huge wave’ of community involvement in woodlands and the private sector’s increasing interest in managing native woodlands.

Small, mobile sawmills that can be taken onto the site provide part of the solution. Depending on timber quality, the tree may be cut into planks and posts useful for on-farm use. There are about 20 mobile sawmill operators working in Scotland. On a larger scale, a number of companies specialise in converting hardwoods into high-quality furniture and fittings. Products that include tables, chairs and bespoke kitchen units are sold to individual customers, cafes, bars, restaurants and offices. A booklet published by Highland Birchwoods (www.highlandbirchwoods.co.uk) discusses the potential for *The Production and Marketing of Scottish Hardwood Flooring*. Highland Birchwoods has also published a *Birch Woodland Management Handbook*, which describes how to increase the timber production potential of birchwoods.



Woodschool (www.woodschoolltd.uk) is the trading arm of the Borders Forest Trust (www.bordersforesttrust.org) and is based in Ancrum, near Jedburgh. Its aim is to combine the undervalued hardwood resource of the Scottish Borders with the talent of young furniture designers and makers. Woodschool was formed in 1997 to provide these designers and makers with workshop facilities, collective marketing and administration backup. It seeks product innovation, process innovation and style. As well as furniture, Woodschool is developing flooring, worktops, home office and restaurant fittings. The flexibility of its workshop and of its makers allows Woodschool to offer a prototyping service for other designers.



Images x 3: Woodschool Ltd

Rediscovering 'New' Markets

Hardwoods are also used by craft-workers, including green woodworkers. Although these operations may be small-scale, using low volumes of wood, they can create valuable local rural economic activity. This may extend beyond the actual value of the wood products themselves; for example, the water-powered sawmills in Finzean, in Aberdeenshire, are also being restored as heritage sites that can be visited (see www.birsecommunitytrust.org.uk).

Although small, the hardwood sector has grown in recent years, with investment averaging £100,000 per year. A majority of hardwood businesses surveyed in 2002 reported an improvement in market prospects since the mid-1990s, and 25 per cent had taken on new staff. During this period a major promotional effort was made through the Scottish Hardwood Timber Market Development Group. This included a regional programme of practical seminars demonstrating to woodland owners and managers the factors that determine the market value of hardwoods. The Association of Scottish Hardwood Sawmillers (ASHS – www.scottish-hardwoods.co.uk) has now been established to provide links within the sector and to help customers source particular products.



Image: Mike Henderson

Describing himself as having had an affinity with wood all his life, **Bernd Pinamonti** worked in Germany's manufacturing joinery sector prior to moving to Britain in 1987 and establishing his Out of Wood hardwood and durable softwood sawmilling/joinery business near Dunblane in 1989. He was attracted to home-grown timber partly on environmental grounds since local utilisation serves to reduce transport requirements. "When we arrived in Scotland, home-grown wood had a bad reputation and people did not see it as a resource," he recalls. "The biggest change is that attitudes are now very positive – people come to us because they are interested in home-grown timber." Also, a strong increase in the number of operators in the home-grown timber sector has "given the industry a lot more clout", he adds.



Image: John Glen



Image: Michael Wolchover



Image: Michael Wolchover

Timber cladding

Timber cladding is used extensively on buildings in Scandinavia and North America. In Scotland, however, there is very little timber cladding. Despite the common use of timber framing for houses, few (most of which are architect-designed or kit houses) are timber clad.

This has not always been the case. For example, the Old Town of Edinburgh was largely built in timber and, at the end of the 18th century, there were only four stone buildings in Dundee. Although stone took over as a preferred building material, a good number of timber-clad buildings in Scotland survive from the 19th and early 20th centuries. These include shooting lodges, railway signal boxes, stable blocks and porches. One example is the RSPB's Forest Lodge at Abernethy, Inverness-shire, which dates from 1882 and is made entirely from locally grown wood.

Understandably, those considering the use of timber cladding are concerned about the risk of decay. To prevent decay, it is important to pay careful attention to detail, in architectural design as well as in the choice of species and use of preservative coatings. In order to help architects with this, the Scottish Executive has published a booklet called *Timber Cladding in Scotland*. Benefits include cost savings (for example, building foundations need not be so deep) and opportunities for innovative design with bright and vibrant finishes. To find out more about the technical and design challenges, Highland Council is leading a timber cladding project (part-funded by the EU) to share experience with Norway, Iceland and the Faeroes, all which have maritime climates like Scotland's.

Rediscovering 'New' Markets



Image: Torren Energy Ltd

Torren Energy
(www.torren-energy.com)

is a wood-based heat supply company based in the Highlands. It installs wood using boilers for its customers and supplies them with regular deliveries of wood chips, charging customers for the heat they use.

In the Scottish Borders, 3Genergi
(www.3genergi.co.uk) also offers woodfuel solutions for domestic and commercial heating.



Image: Torren Energy Ltd

Wood for fuel

Traditionally, wood is burned as firewood on open fires or in log-burning stoves and, in many places throughout rural Scotland, there are small businesses supplying firewood for domestic purposes. However, in other European countries, such as Austria and Scandinavia, technology has been developed to make more-effective use of wood as a fuel. This fuel may be in the form of wood-processing co-products (such as chips, bark and sawdust); it may consist of treetops and branches left behind after timber harvesting; or, if the price is right, all the wood in the tree may be used.

Burning wood instead of fossil fuels (such as coal, oil or natural gas) helps in the fight against global warming. Like these fossil fuels, wood is carbon-based so when used as fuel it also generates carbon emissions. The fundamental difference, however, is that wood is carbon neutral. This is because the release of carbon dioxide from wood during combustion is offset by the absorption of carbon dioxide that takes place as more wood is grown. By contrast, carbon emissions from fossil fuels cannot be recycled in this way.

Wood can be used as fuel in different ways and at different scales. At the larger scale, opportunities include the installation of wood-using combined heat and power plants. These can generate electricity from wood and produce heat as a by-product for district heating schemes. Elsewhere in Europe there is proven technology to do this, although substantial capital investment is needed. Other options are electricity generation (not linked into heating schemes) or community heating (that does not generate electricity). Heat supply companies that use wood provide another market model.



Image: Royal Botanic Garden Edinburgh



A study examining the potential for making more use of non-timber forest products has highlighted opportunities for edible goods such as mushrooms, herbal medicines, decorative products such as foliage, pharmaceuticals, cosmetics and aromatics.

The report is available on the Scottish Forest Industries Cluster website (www.forestryscotland.com).

Image: Caledonian Wildfoods Ltd



Examples of current projects in Scotland include:

- a new community housing scheme in Lochgilphead, Argyll, that will have a wood-fired district heating scheme;
- Lanarkshire Biomass, a partnership project providing wood heat to 14 public and private buildings in Lanarkshire is due to start operation in 2004;
- Powergen is investigating the development of a 40-megawatt, wood-fuelled power station at Lockerbie, Dumfries-shire. This would generate enough electricity to supply 55,000 households and would use 500,000 tonnes of wood per year, much of it bought as co-products from wood processing mills on the site.

The Government recognises the importance of biomass (including wood) as a source of energy and is promoting the development and use of appropriate technologies – see www.dti.gov.uk/energy/renewables/technologies/bioenergy.shtml.

Following a conference on the subject, the Scottish Forest Industries Cluster published a report on *Woodfuel Opportunities: renewable energy for Scotland* in 2002. This is available on its website (www.forestryscotland.com).

A living oil well?

Wood is made up of carbon, hydrogen and oxygen, which are combined together to form molecules of cellulose, lignin and hemicellulose. During the Second World War, when there were oil shortages, factories were built that could convert these molecules into products such as engine fuel, other industrial chemicals, and animal fodder. Turpentine is derived from tree resins, and can itself be further refined to make other compounds. The synthetic fabric rayon is made from cellulose derived from wood pulp.

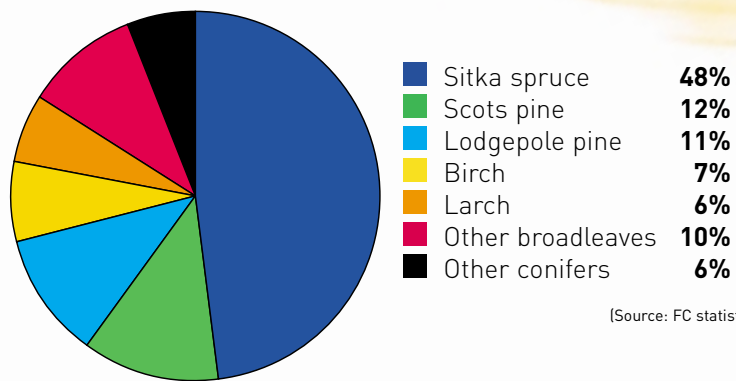
With the ready availability of oil as a chemical feedstock, many potential applications of wood are not viable commercially. Nevertheless, the rich variety of chemical molecules within the wood, bark and leaves of different species will remain, ready to be exploited when the need arises.

10. A Growing Resource

Total area and future production

The total area of woodland and forest in Scotland is 1.3 million ha (or 13,000 km²). Of this, about 70 per cent is coniferous woodland that will produce softwood timber, 14 per cent is broadleaved woodland that will produce hardwood timber, 4 per cent is mixed woodland and the remaining area is open space within woodland. The main conifer species are Sitka spruce, Scots pine and lodgepole pine, while the main broadleaved species are birch and oak.

Species distribution in Scottish forests



(Source: FC statistics)

Over 70 per cent of Scotland's forests were planted during the second half of the 20th century. Since about 1990 there has been a significant shift in the type and location of new planting. Before then most new forests were planted on poorer land considered unsuitable for anything but very extensive agriculture; now, planting on better land is encouraged. At the same time, there is now a much greater diversity of species being planted, including higher proportions of broadleaves. This has also included planting of native Scots pine and native broadleaves in order to help re-create some of the native woodlands that have been lost over the centuries. Another change is that very little new planting is now undertaken on land managed by the Forestry Commission Scotland (FCS); most new planting now takes place on land that is privately owned, or is owned by voluntary organisations or community groups.



Image: Forest Life Picture Library

Sitka spruce



Image: Forest Life Picture Library

Scot's pine



Image: Forest Life Picture Library

Silver birch



Image: Forest Life Picture Library

Restructuring is a design process aimed at improving the structure and composition of the uniform plantation forests established in upland Scotland during the second half of the 20th century. It is a key element in achieving greater biodiversity (or ecological richness) and more attractive landscaping. It involves careful analysis of the landform and potential conservation value of the site. This then forms the basis for long-term felling plans and for decisions about suitable species for replanting, with a view to creating a more varied age structure and increasing species diversity. Up to 20 per cent of the forest area is normally left unplanted, and these unplanted areas are chosen to maximise their amenity and conservation value, for example, alongside burns or lochs.

On suitable sites, managers may decide not to clear-fell the trees but to practise an alternative form of silviculture called 'continuous-cover forestry'. Trees are still harvested, but operations take place on a smaller scale so that the visual and ecological impact is reduced and natural regeneration can be encouraged. This also leads to the development of a more-varied forest structure.

New planting (1971 - 2001)

	Average per year (ha)	% conifer species	% on land managed by FC
1971 - 81	24100	99%	59%
1981 - 91	20500	95%	27%
1991 - 01	11500	57%	7%

[Source: FC statistics: figures refer to April 1971 to March 1981 etc.]

The Scottish Forestry Strategy suggested that the total area of forest in Scotland may increase from the year 2000 level of about 16 per cent of the land area to nearer 25 per cent by the middle of the century. This expansion of Scotland's forest area will include further creation of new native woodland, particularly through natural regeneration, as well as planting of productive forests.

In addition to new planting, 'restocking' takes place on forest areas that have been harvested. This means that land that has been clear-felled is, usually, replanted with trees within a couple of years. Careful thought is given to forest design so that this opportunity can be taken to increase the attractiveness of the forest, for people and wildlife. This design process is known as restructuring.



Image: Forest Life Picture Library

As the level of harvesting from Scottish forests has increased, so has the level of restocking. During the 1970s, restocking averaged 2,750 ha per year; by 2000, it had reached 8,000 ha per year. With greater attention being given to forest design, the proportion of felled land replanted with broadleaves has increased from only 2 per cent in the 1970s to reach 20 per cent in 2000.

A Growing Resource



Image: Forest Life Picture Library

Successful planting of new forests and replanting felled areas depends on attention to detail. This includes matching the species to the site; suitable ground preparation; careful plant handling; effective weeding; and protection against potential pests, which include certain insects as well as mammals such as rabbits, voles and deer. The nursery trade supplies most of the plants that are used for forest planting in Scotland. Major nurseries include Alba Trees plc (www.albatrees.co.uk) in East Lothian, Ben Reid & Co Ltd near Aberdeen, and Christie-Elite (www.christie-elite.co.uk) in Morayshire. As a result of a long-term programme of selective breeding, nurseries are now able to supply young Sitka spruce trees that have superior genetic characteristics that will increase future productivity of forests.



Image: Forest Life Picture Library

To help plan investments, it is important that the wood-processing industries have accurate information about future supplies of wood that will become available as a result of past planting programmes. Information about supplies of wood from land managed by Forestry Commission Scotland is based on detailed surveys and harvesting plans. The forecast of wood availability from private-sector forests is based on Forest Research's National Inventory of Woodland and Trees and presumptions about harvesting that are derived from a survey of private-sector forest managers and owners. At present over half Scotland's wood harvest comes from forests managed by Forestry Commission Scotland, but in future wood from privately owned forests will become increasingly dominant. A number of private owners work together through a Timber Marketing Group (www.t-m-g.com) to sell their wood in a planned and coordinated way.



Image: Christie Elite Nurseries Ltd

Brian McCamon was a 'hobbyist propagator' working in the civil engineering sector when the opportunity arose to turn his pastime into a career. In 1985, he responded to a newspaper advertisement for a nursery foreman at Forres-based Elite Trees and, several years later, became nursery manager at what is now Christie Elite Nurseries. "I enjoy the cycle of working with plants and seeing the fruits of your labour," he explains. As for major changes over the years, he claims that the removal of tax incentives in the 1988 Budget "led to a decline in planting" from which the sector has "never fully recovered". Other major developments highlighted by Brian include the increase in competition from Eastern European timber.

Forecasts of availability also include details of size assortment. This information is important in helping to calculate the potential supply of sawlogs (suitable for sawmills), as opposed to small roundwood (for pulp or wood-based panel manufacture). For more refined predictions of potential sawlog volume, however, further information on quality is also required; this is why Forest Research has been assessing log straightness. Material of sawlog size that is unsuitable for sawing can be sold into the same markets as small roundwood.

2000 Forecast of softwood availability in Scotland

	Million m ³ /yr	% of sawlog size	% spruce	% from privately owned forests
2002 - 06	6.2	53	70	55
2007 - 11	7.9	58	72	56
2012 - 16	9.1	61	73	59
2017 - 21	10.1	64	73	56

[Source: Forest Research Woodland Surveys]

Scotland has more than 500,000 ha of Sitka spruce. This species is likely to retain a dominant position in Scottish forestry, providing at least 70 per cent of softwood production for at least the next 30 years. This is significant because Sitka spruce has long, strong fibres that make it particularly valuable for making paper.

Forest management

Many of Scotland's forests are managed for a range of benefits. This multiple-benefit management can be achieved because the production of timber, the provision of recreation, the conservation of wildlife habitats and the enhancement of landscapes are generally compatible. Of course, this is not always the case: for example, conservation is clearly a priority in Sites of Special Scientific Interest. Nevertheless, multiple benefits can be realised in many different types of forest and woodland. Even native woodland, managed primarily for conservation, can produce timber, as well as being very attractive for recreation. The balance between different objectives depends on the characteristics of the woodland, its location and the owner's objectives.



Image: Forest Life Picture Library

A Growing Resource

Forestry Commission Scotland manages Scotland's national forests, which are owned by Scottish Ministers and represent about 36 per cent of Scotland's forest area. Sophisticated strategic and forest design planning processes are used to secure multiple-benefit management that makes the most of the opportunities provided by each forest. Local communities are encouraged to take part in discussions about these plans and, if they wish, to become more actively involved in hands-on forest management. So far as timber production is concerned, a key priority is to harvest timber in accordance with published production forecasts so that the processing industries can predict future supplies with confidence. Long-term contracts have been sold on a competitive basis to encourage individual companies to invest in processing capacity, secure in the knowledge that a proportion of their timber supply is guaranteed.

The ownership of the other 64 per cent of Scotland's forest area is extremely varied. It is estimated that there are about 1,000 owners with more than 100 ha of forest: these include traditional estates and investors in forestry. There are probably about 5,000 with more than 10 ha, and this group includes a large number of farmers. At the smaller end of the scale, it is estimated that there are between 10,000 and 20,000 owners with at least one hectare of woodland. Many of these forest and woodland owners are private individuals or privately owned companies. Some of the owners of bigger forests are financial institutions, such as pension funds or insurance companies. Some local authorities own woods, usually in and around towns and cities. Voluntary organisations such as the John Muir Trust (www.jmt.org), the National Trust for Scotland (www.nts.org.uk), the RSPB (www.rspb.org.uk) and the Woodland Trust (www.woodlandtrust.org.uk) also own significant areas of woodland. A survey carried out in 2002 showed that there are also 51 community woodland groups that own or manage a total area of 22,000 ha.

Forest management companies or firms of chartered surveyors with specialist forestry departments manage large areas of privately owned woodland on behalf of their owners. Two of the largest forest management companies are Scottish Woodlands Ltd (www.scottishwoodlands.co.uk) and Tilhill Forestry Ltd (www.tilhill.co.uk). There are also smaller management companies that offer professional advice and contracting services within their own region of Scotland. The Institute of Chartered Foresters (www.charteredforesters.org) maintains a register of forestry consultants.



Image: Forest Life Picture Library

The national forests of the Queen Elizabeth Forest Park exemplify multiple-benefit management. These forests supply significant volumes of wood to processing industries throughout central and southern Scotland. Lying within the Loch Lomond and Trossachs National Park, they also welcome hundreds of thousands of visitors each year. Along with a major visitor centre and numerous trails, picnic sites and car-parks, there are newly refurbished log cabins made largely of Scottish wood, and camping and caravan sites run by Forest Holidays (www.forestholidays.co.uk). There are also significant areas of native oak wood; although managed primarily for conservation, these woods produced oak timbers for the reconstruction of the medieval Great Hall in Stirling Castle.



Steve Conolly, managing director of Cawdor Forestry Ltd near Nairn, studied forestry at the University of Aberdeen. He chose forestry as a career “because I had an interest in the management of the environment and natural resources” and because he liked the idea of spending at least some of his working time out of doors. After graduating he worked during the 1980s and 1990s for, among others, management company EFG, Shotton Forest Management and Cawdor Estates. During that time Steve has witnessed a major change in Scottish forestry with an increasing focus on environmental issues and timber quality. The shift from large-scale afforestation and the current state of the timber market has left all sectors of the industry facing ever tighter margins. “To stay in the game we all have to be as efficient as possible and not be afraid of being innovative”, he says.

Services provided by forestry management companies vary, but may include:

- survey and mapping, using Geographical Information Systems (GIS)
- advice on forest design
- preparation of grant applications
- employment of contractors for planting, maintenance and timber harvesting
- timber production forecasting
- timber sales
- securing forest certification
- ecological and wildlife consultancy
- investment appraisal
- forestry valuations
- property acquisition and sales
- woodland insurance

Naturally, the objectives of management on privately owned forests are likely to vary with ownership. For example, conservation may be the primary objective of many of the voluntary organisations. Financial results will be important for most owners, although many also place a value on non-monetary benefits such as amenity and conservation. To help those who own forests as investments, and prospective investors, the Investment Property Databank (www.ipdindex.co.uk) publishes an annual index comparing financial returns from forestry with other investments. In recent years, performance has been badly affected by low timber prices.

Long-term investment performance to December 2002

% return per annum	Over 1 Year	Over 3 Years	Over 5 Years	Over 10 Years
Forestry investments	- 4.6	- 3.2	- 4.4	0.5
Timber price change	- 21.9	- 12.1	- 16.3	- 8.5
Equities (total return)	- 22.3	- 14.1	- 2.2	6.6
Gilts (total return)	9.8	6.7	7.9	9.9

(Source: Investment Property Databank UK Forestry Index 2003)

A Growing Resource

Grants and regulation

The Scottish Forestry Grants Scheme (SFGS) provides financial incentives to encourage people to manage their woods and forests and to create new ones.

Planting grants contribute towards the costs of establishing (and, where appropriate, restocking) well-designed forest for timber production; new native woodland; riparian woodland; woods in and around towns and post-industrial landscapes; and woods on farms and crofts.

There are also 'stewardship' grants for improving the economic, ecological and social value of existing woods and forests.

The SFGS helps to improve the economic value of woods and forests by supporting work that will lead to the production of high-quality wood. This means choosing suitable species (and, within species, plants of the right genetic origin) for particular sites; planting at the correct densities; and carrying out necessary operations such as pruning and thinning. Further information is provided in technical guidance published by the Forestry Commission and other organisations. The SFGS also contributes towards the cost of managing deer numbers, improving biodiversity, forest landscaping, developing alternatives to clear felling, recreation and community involvement.



Image: Mike Henderson

To be eligible for grants, operational plans must meet the standards for sustainable forest management that are set out in the UK Forestry Standard. In addition, all felling requires Forestry Commission approval and this depends on the proposals' meeting the UK Forestry Standard.

Certain forest operations – and in particular new planting and forest road construction – are subject to environmental impact assessment under European Union (EU) legislation.

Further details on the SFGS, and environmental requirements, is available from the Forestry Commission (www.forestry.gov.uk/forestry/hcou-4u4j37).

Contractors



Image: Mike Henderson

Forestry contractors carry out much of the work of planting, protecting and maintaining forests, harvesting wood, and haulage. Many contractors engaged in harvesting and haulage have invested heavily in sophisticated, state-of-the-art equipment. This includes harvesting machines that can cost £200,000 to £250,000 when new, and can readily fell, debranch and cut into length some 30,000 m³ of wood a year. Unless the terrain is very steep, the wood is then taken to the forest road on 'forwarders', which can cost about £150,000 new. On steeper ground, specialised 'skylines' are used to bring the wood to the forest road. Timber lorries need to be able to travel equally well along forest roads and public highways. They, too, are specialist vehicles, capable of conveying their load of wood safely to its destination, and often fitted with loading equipment.

The Forestry Contracting Association (www.fcauk.com) is a national trade association that represents the interests of the many small and medium enterprises (SMEs) in this sector, and works to improve profitability and promote safety.



Image: Forest Machine Journal

Having got to know about the industry from a forestry contractor friend, **Clive Pattinson** spent only a year as a chainsaw operator before deciding to start his own harvesting contractor business in partnership with Alan Moffat. Gretna-based Pattinson & Moffat was formed in 1978 and currently operates 26 harvesters and forwarders in an area covering Glasgow, south-west Scotland and the north of England. Identifying mechanisation as the major change he has witnessed over the last quarter of a century, he adds: "In the past, it was chainsaws and skidders, now it's harvesters and forwarders." Whereas 2000-tonne contracts were considered sizeable in the past, 5000 to 15,000 tonnes has now become the norm. "It has to be this way because of the money tied up in the equipment," he observes.

11. Innovation

“Despite its old-fashioned image, wood is a sophisticated engineering material which – within a living tree – shows outstanding strength and resilience”

Professor Robin Mackenzie,
Head, School of Built Environment,
Napier University



Image: Mike Henderson

Innovation is vital to Scotland’s modern forest industries. In a world of global free trade and international competition, innovation is essential for their commercial survival.

Wood only has an economic value if it can satisfy markets. As social changes take place, and patterns of demand evolve, so these markets change. The man or woman who plants a tree can never be certain about the world it will enter when it is felled, decades later. Fortunately, wood is an immensely versatile material. The challenge for Scotland’s forest industries is to continue to find innovative ways to make use of this versatile raw material in ways that meet market needs and sustain their businesses.

The Centre for Timber Engineering is well placed to carry out research and development, linking engineering requirements with detailed analysis of wood’s fundamental wood properties. Techniques include numerical modelling and non-destructive testing involving advanced acoustical and ultra-sonic methods. In 2003, the Centre (in partnership with Glasgow University and the Forest Research) was awarded £1.2 million by the Scottish Higher Education Funding Council to help create a ‘virtual centre’ for the wood industry and to promote Scotland as the world centre of expertise for Sitka spruce. The Centre is also exploring the possibility of using wood grown in Scotland in new product applications, such as stress-laminated timber bridges.

The development of engineered wood products is another important opportunity. These are based on wood, but are fabricated to ensure that they have consistent and predictable structural properties. The key to the development of markets for engineered wood products is the availability of information about them, an understanding of them by architects, structural engineers and quantity surveyors, and a highly efficient, quality-assured production and delivery service.

An example of an engineered wood product that is already being manufactured in Scotland is the I-beam. This is made by James Jones & Sons Ltd in Forres (under licence from a Canadian company) and is marketed as the JJI-Joist. JJI-Joists provide an alternative to conventional construction timber and have important design and performance advantages. Their good strength-to-weight ratio makes for easier handling and they can be manufactured to whatever length is required: the only constraint is transport. They minimise creaky floors because they do not shrink or warp. They are also easier to drill for fitting cables and pipes.



Image: Mike Henderson

Another recent innovation is the 'Postsaver', developed by BPI Recycled Products in Dumfries. This is a bitumen-impregnated boot that is applied to the bottom of timber posts which are then covered with recycled plastic in a shrink-wrapping process. The result is a long-lasting, fully protected post.

BRE has carried out extensive research and development on uses of wood. Recent examples of innovative developments include new kiln drying methods; re-engineering to produce glulam; gluing of wet wood before drying; methods of strength grading; and wood modification. BRE's timber newsletter, *Best Utilisation*, outlines some of this work (see www.bre.co.uk/services/Timber.html). One recent study by BRE showed how more use could be made of Scottish spruce for joinery. Using proven technology to identify defects such as the larger knots, cut them out and finger-joint the wood back together, the study demonstrated good potential for this material to be engineered for use in joinery.



Image: Mike Henderson

Innovation

Another potential market that is being explored is the one for wood pellets, which are used as fuel. The process for making wood pellets from sawdust is similar to that used by animal feed manufacturers. The advantage of pellets is that they offer a regularised, quality-controlled fuel source (see, for example www.woodpellets.org). The international market for pellets is growing rapidly and is being driven by the push for greater use of renewable energy.



Image: Renewable Heat & Power Ltd

Looking further ahead, new techniques and applications need to be explored. Possibilities include:

- the use of micro-biological processes to alter the properties of wood, for example, to improve durability;
- thermoplasticisation and wood hardening, leading to better, more consistent performance;
- development of new methods for bonding and treating wood to reduce the environmental impact of chemicals.

In order to take full advantage of developments in information technology, the Scottish Forest Industries Cluster has established an e-Business Forum

(www.forestryscotland.com/ebusiness_forum). This has led to the adoption of agreed data transfer standards for invoicing and despatches, and a significant increase in the volume of e-commerce within the industries. A data transfer standard for Geographical Information Systems (GIS) is also being developed. These developments are helping to reduce transaction costs and increase efficiency (for example, GIS is used to improve timber transport operations through better lorry allocation and route optimisation).

Within the growing sector, much is being done to develop new forms of forest management that can justifiably be called sustainable. This requires research. New techniques for protecting trees are being developed to reduce the need for chemicals. Ecological research helps foresters know how best to develop rich habitats for wildlife. Social science research helps in understanding people's preferences for landscaping and woodland recreation.



Image: Michael Wolchover

Another area of innovation is in architectural design and the use of wood in structural engineering. The new National Trust for Scotland visitor centre at Glencoe features an all-timber construction using only untreated Scottish wood – and relying on careful detailing in the use of wood to provide durability. The David Douglas Pavilion in the grounds of the Pitlochry Festival Theatre commemorates one of Scotland’s greatest plant collectors and demonstrates the huge potential that lies in the inspired use of Scottish timber (www.scottishplantcollectorsgarden.com).



Image: Pitlochry Festival Theatre



FOREST EDUCATION INITIATIVE

The Forest Education Initiative, or FEI (www.foresteducation.org.uk), brings together people who know about growing and using wood with those in education. It aims to increase young people’s understanding of the local and global importance of trees and woodland, the forest industries, the timber trade, and the connections between them. It encourages them to find out about forests and to visit local woods and wood processing sites. It has also produced educational resource material to fit in with relevant Scottish primary and secondary school curricula.

The Scottish Forestry Strategy recognises that forestry is a long-term business, offering a wide range of benefits for current and future generations. Much of this booklet focuses on what Scotland’s forest industries are doing to realise one aim of the Strategy – to maximise the value to the Scottish economy of the wood resource becoming available over the next 20 years. The Strategy also recognises the need to create a diverse forest resource of high quality that will contribute to the economic needs of Scotland throughout the 21st century (and beyond); that will make a positive contribution to the environment; that people can enjoy; and that will benefit communities.

Scotland’s forests and woodlands can make a major contribution to sustainable development, but this will depend on forest industries that can continue to innovate, taking advantage of new technologies and responding to new markets.

12. Further Information

Websites

In addition to specific websites referred to in this publication, general sources of information include:

- the Confederation of Paper Industries (www.paper.org.uk) represents UK paper and paperboard manufacturers;
- the FAO (Food and Agriculture Organization of the United Nations) (www.fao.org/forestry/) gives international statistics;
- the Forest Industries Development Council (www.fidc.org.uk). FIDC is an umbrella body for the industries. As well as providing website links, it gives details of the industries' sustainability strategy;
- the Forestry Commission (www.forestry.gov.uk). This website contains a good deal of general and statistical information and a wide range of links to other sites. It also gives contact details and explains where to go to visit forests;
- the Forestry Contracting Association (www.fcauk.com) represents the interests of forestry contractors;
- the Forestry and Timber Association (www.forestryandtimber.org) represents the interests of forest owners and managers;
- Highlands and Islands Enterprise (www.hie.co.uk) is the development agency for the north of Scotland and is closely involved in Cluster activities within its region;
- the Institute of Chartered Foresters (www.charteredforesters.org) is the professional body for foresters and arborists in the UK;
- the Royal Scottish Forestry Society (www.rsfs.org) is Scotland's oldest forestry organisation, with membership open to all;
- the Scottish Forest Industries Cluster's website (www.forestryscotland.com) gives more information about the work of the Cluster and includes its newsletters and reports. Its links include Scottish Enterprise (www.scottish-enterprise.com) and the Small Business Gateway (www.sbgateway.com);
- the Timber Trade Federation (www.ttf.co.uk) represents timber importers, sawmillers, timber merchants, timber agents, builders' merchants and others who supply timber and wood products within Scotland. The Scottish Timber Trade Association (www.stta.org.uk) is its Scottish arm;
- the UK Timber Frame Association (www.timber-frame.org) promotes the benefits of timber frame, provides consumer and technical information, supports training initiatives and champions Quality Standards within the industry;
- the United Kingdom Forest Products Association (www.ukfpa.co.uk) represents the technical and commercial interests of the UK forest products industry;
- the UN/ECE Timber Committee (www.unece.org/trade/timber) is another source of international statistics, particularly in relation to trade and activities in Europe, North America and Russia;
- the Wood Panel Industries Federation (www.wpif.org.uk) represents the interests of manufacturers of wood-based panels.



Image: Michael Wölkover



Image: Mike Henderson



Image: Mike Henderson

Publications

Key publications include:

Forests for Scotland
the Scottish Forestry Strategy, Scottish Executive, 2000

Delivering the Scottish Forestry Strategy
Scottish Executive, 2002

Roots for Growth
a strategic framework for action for the Scottish
forest industries, Scottish Enterprise, 2000

Roots for Growth, the first year
Scottish Enterprise, 2001

Sustainability and Innovation in Scotland's Forest Industries
Annual Review 2002/03, Scottish Enterprise, 2003

National Inventory of Woodland and Trees, Scotland
Forestry Commission, 2002

Forestry Statistics 2002
Forestry Commission, 2002

British Timber Statistics 2002
Forestry Commission, 2003

A good general history of Scottish forestry is given in
People and Woods in Scotland – a history,
edited by Professor T C Smout, Edinburgh University Press, 2003.

Further Information

Glossary

Broadleaves (or broadleaved trees)

Trees that have leaves rather than needles or cones. Most broadleaved species are deciduous – that is, they lose their leaves in the winter. Their wood is called hardwood because it is denser and harder than the wood from coniferous trees, although there are exceptions. Common examples in Scotland are ash, beech, birch, cherry, elm, oak, sycamore and willow.

Canopy (forest canopy)

The 'roof' or 'ceiling' that is formed over a wooded area when the foliage of the trees blocks out the view of the sky from the forest floor.

Clear-fell; clear-felling

A system of harvesting trees that removes all the trees from the harvesting site, in contrast with continuous cover forestry.

Cluster

A term used in relation to economic and industrial development, relating to a grouping of industries linked through customer, supplier and other relationships that enhance competitive advantage.

Conifers (or coniferous trees)

Trees that have needles and cones rather than leaves. The wood they produce is called softwood because in most cases it is less dense and softer than the wood from broadleaved trees. Common examples in Scotland are various species of fir, pine, spruce and larch (which, unusually among conifers, sheds its needles in winter).

Continuous cover forestry

A system of managing forests with the aim of retaining an element of mature tree cover on the site at all times, and so avoiding extensive clear-felling.

Co-products (sawmill)

Materials including the wood chips, sawdust and bark that arise during the conversion of sawlogs to sawn timber. They are used as inputs for other industrial processes.

Environmental Impact Assessment

A process for assessing the likely environmental impact of a forestry proposal. Under EU legislation, this may be required by the Forestry Commission for proposals (new planting, forest roads or quarries, or deforestation) that are likely to have a significant effect on the environment. A key part of the process is the production of a report, called an Environmental Statement, which is made publicly available as part of the consultation process.

Establishment

The process of creating woodland, from planting until the young trees are big enough to survive at the required stocking (provided they are adequately protected). This usually takes 5–10 years.

FAO

United Nations Food and Agriculture Organization. Information about forestry is available on www.fao.org/forestry/forestry.

FC

Forestry Commission (www.forestry.gov.uk): the government department responsible for forestry.

Forestry Commission Scotland (FCS) reports to Ministers in the Scottish Executive.

Forest Research is the Commission's research agency.

FC statistics are available on www.forestry.gov.uk/statistics.

Finger jointing

A method of joining two lengths of wood end-to-end by cutting the ends into 'fingers' and slotting and gluing them together.

Forwarder

A specialist forestry tractor and trailer capable of negotiating rough terrain. It is used to haul logs from a harvesting site and stack them alongside a forest road, ready for loading onto a road-going lorry and transport to a wood-processing mill.

GIS

Geographic Information System.

Green tonne

A measure of the weight of freshly felled timber before any natural or artificial drying has occurred. As a rough rule of thumb one cubic metre of green wood weighs one tonne, although this varies according to wood density and actual moisture content.

Ha

Hectare. A unit of land equal to 10,000 square metres. There are 100 hectares in a square kilometre. (1 ha = 2.471 acres).

Hardwood

The wood of broadleaved trees. In addition, broadleaved trees are themselves sometimes called 'hardwoods'. See also 'broadleaves' above. Scottish hardwood timber is mostly used for furniture, flooring and joinery items.

Native woodland

Woodland composed wholly or mainly of species that naturally colonised Scotland after the last Ice Age. The term 'natural woodland' is sometimes used to describe woodland that has developed without human influence or before human influence on natural processes became significant. In Scotland, humans have modified the environment over such a long time-span and to such an extent that there are probably no truly natural woodlands left. Semi-natural woodland remnants that still contain many of the same native species and habitats found in natural woodland are an important natural resource. Woodland that has been managed for many years, such as Scots pine plantations or oak woodland, is also part of the native woodland resource, as are the many 'new' native woodlands that have been planted since the late 1980s.

Natural regeneration

Re-establishment of woodland by natural means, that is, without sowing or planting.

New planting

Establishing woodland by planting trees on ground that has not been wooded for many years.

NIWT

National Inventory of Woodland and Trees, undertaken and published by the Forestry Commission.

Overbark

The volume of wood including the bark. May refer either to standing volume or to felled volume.

Panelboard

See Wood-based panels below.

Restocking

The replanting of an area after trees have been felled.

Riparian

Waterside. Riparian land or woodland is land or woodland alongside a river, burn or loch.

Roundwood

Unprocessed wood. Generally categorised as sawlogs (diameter greater than 12–14 cm) or small roundwood (diameter less than 12–14 cm).

Sawlog

See Roundwood above. Sawlogs are sometimes categorised according to characteristics such as diameter, straightness, length, and size and frequency of knots. The better logs are commonly known as 'green' logs and the poorer quality logs as 'red' logs.

Sawnwood

Sawn timber – timber that has been sawn into square or rectangular pieces from (round) sawlogs.

Schedule D

A reference to special taxation arrangements for forestry that were in place until 1988.

SEERAD

Scottish Executive Environment and Rural Affairs Development.

SFGS

Scottish Forestry Grants Scheme.

Silviculture

The care and cultivation of forest trees.

Skyline

A system using winches and overhead cables to move logs to the roadside from hillsides that are too steep for wheeled or tracked vehicles to negotiate.

Small roundwood

See Roundwood above.

Softwood

The wood of coniferous trees. In addition, coniferous trees are themselves sometimes called 'softwoods'. See also 'conifers' above.

SSSI

Site of Special Scientific Interest – a statutory nature conservation designation.

Standing volume

The amount of timber in a tree or woodland before the tree or trees are felled. Usually expressed as cubic metres overbark standing.

Stewardship

The care of a forest or woodland.

Thinning

The removal of a proportion of trees in a forest in order to give the remaining trees space and light to grow into a more valuable crop. This is usually carried out some time after the forest canopy has closed, and may be repeated at intervals.

UK

United Kingdom: Great Britain (England, Scotland and Wales) and Northern Ireland.

UK Forestry Standard

A government document published in 1998 that sets out the minimum environmental and silvicultural standards that British forestry must achieve.

UN ECE

United Nations Economic Commission for Europe, responsible for the Temperate and Boreal Forest Resource Assessment and for compiling international statistics on the production and trade of wood products (see www.unece.org/trade/timber/).

Underbark

The volume of wood excluding the bark.

Wood-based panels

Plywood, Oriented Strand Board, Particleboard or Fibreboard. Detailed definitions of these products are available on the Wood Panel Industry Federation website (www.wpif.org.uk).

WRME

Wood Raw Material Equivalent – the volume of trees required to produce a wood product. Can be measured as underbark or overbark. The figures quoted in this booklet are overbark.



