

WOOD FIBRE AVAILABILITY & DEMAND IN BRITAIN 2013 – 2035

PREPARED FOR

**CONFEDERATION OF FOREST INDUSTRIES (CONFOR)
FORESTRY COMMISSION
UK FOREST PRODUCTS ASSOCIATION (UKFPA)
WOOD PANEL INDUSTRIES FEDERATION (WPIF)**

BY

JOHN CLEGG CONSULTING LTD

Funded by
**THE WOOD FIBRE PROCESSING & SUPPLY INDUSTRY
&
FORESTRY COMMISSION**

JUNE 2016

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UNITS

The moisture content of wood fibre in the form of logs, forest residues, SRC and recovered

wood can vary quite widely due to a range of factors that include where, and how long the material is stored, the time of year, and on whether the wood fibre is in the form of logs, recovered wood or wood pellets. All tonnes used in this report are on an "as received by customer" basis.

The alternative would have been to express all quantities on an oven dry basis or in Megawatts (MW), after assuming various conversion factors. While technically more correct, the report may have been less easy to understand for many people.

CONVERSION FACTORS

Coniferous Roundwood: 1 cu m over bark standing = 0.82 tonne on an "as received basis"

Broadleaved Roundwood: 1 cu m over bark standing = 0.9 tonne on an "as delivered basis"

Coniferous Log Volume: 1 cu m = 1 tonne "as received"

TERMINOLOGY & DEFINITIONS

Recovered Wood: This term covers wood recovered post consumer / industrial use.

Roundwood, Small Roundwood & Sawlogs: Roundwood is defined as round material cut from trees. Historically there was a reasonably widely accepted distinction between small roundwood (SRW) and sawlogs both in terms of log diameter and to a lesser extent length. SRW tended to be roundwood up to 16 cms top end diameter and sawlogs tended to be roundwood with top end diameters of 16 cms or more. This distinction is disappearing as most sawmills can now use roundwood with top end diameters down to 14 cms and panelboard mills, and most users of small roundwood, can use roundwood with top end diameters of 16 cms or more. The size definitions used in this report for SRW and sawlogs are therefore illustrative only and the sizes assumed are identified where they are used.

Sawmill Products: This term covers sawn timber, wood chips, sawdust, pin chips, shavings, slab wood and bark.

Wood Energy Plants: This term covers electricity only, heat only and combined heat and power plants.

Zonal Log Transfers: These are quantities of roundwood that companies expect to purchase in zones other than the one where their plant is located.

ABBREVIATIONS

Cu m: cubic metres

DECC: Department of Energy & Climate Change

Defra: Department for Environment, Food & Rural affairs

FC: Forestry Commission

FCE: Forestry Commission England

FCS: Forestry Commission Scotland

FI: Forest Industry

o.b.: Over bark

MSW: Municipal Solid Waste

MW: Megawatt

NFI: National Forest Inventory

NRW: Natural Resources Wales

Ofgem: Office of the Gas and Electricity Markets

RDF: Refuse Derived Fuel

ROC: Renewable Obligation Certificate

SEPA: Scottish Environmental Protection Agency

SRC: Short rotation coppice

SRF: Short Rotation Forestry

SRF: Solid Recovered Fuel

SRW: Small Roundwood. Logs with a top diameter up to 16cms

t.d.: Top diameter

t.e.d: Top end diameter

UKWAS: UK Woodland Assurance Standard

WID: Waste Incineration Directive

WRA: Wood Recyclers Association

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JUNE 2016

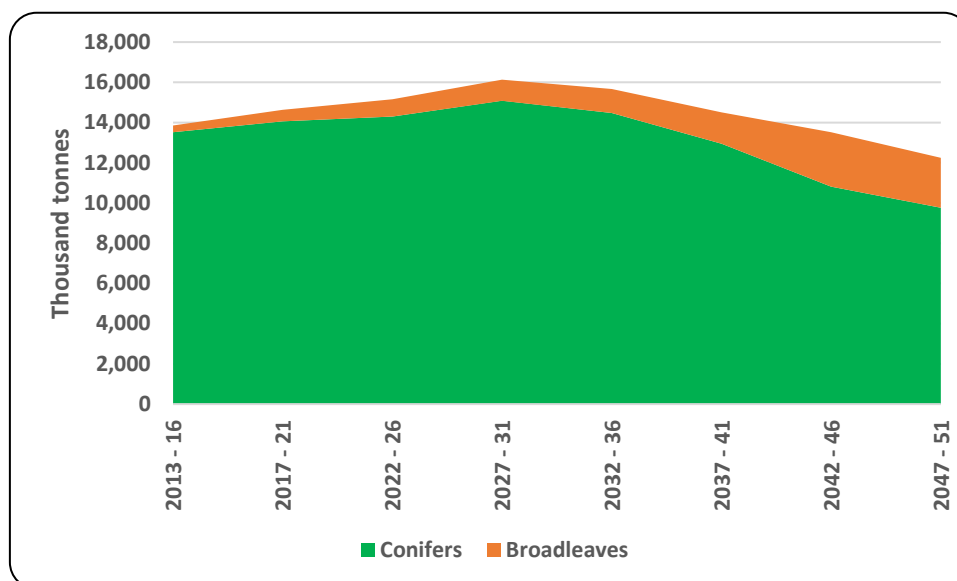
SUMMARY

1. The potential availability of wood fibre sourced in Britain is limited, but because it is a versatile and renewable natural product it is suitable for a number of end uses. The largest end users are companies in the forest sector, but there has been a substantial increase in its use as a fuel source for generating either heat, electricity or both. Wood fibre in the form of bark, wood chips and sawdust is also used for agricultural, horticultural and equestrian purposes.
2. This study into the potential availability and demand for wood fibre in Britain was commissioned by The Confederation of Forest Industries (Confor), the UK Forest Products Association (UKFPA), the Wood Panel Industries Federation (WPIF) and the Forestry Commission and it has been funded by 17 leading companies involved in wood utilisation and woodland management in Britain, and the Forestry Commission.
3. The need for this assessment has arisen primarily because in the last 3 years the Forestry Commission has published 25-year and 50-year forecasts of coniferous wood fibre availability in Britain, as well as one for broadleaved roundwood. These indicated that the potential availability of coniferous roundwood in Britain will continue to increase over the next 15 years. Potential availability then falls back to its present level around 2035 before falling significantly below current levels until 2050 when it bottoms out. To understand the potential economic and commercial implications of this, it is also necessary to have an as accurate assessment as possible of what the present and future demand for wood fibre will be. There have also been changes in the UK Government's energy policies in the last 3 years that have resulted in a number of the energy plants that were planning to use wood fibre being shelved, which has reduced the potential future demand for wood fibre in Britain, but the scale of the reduction is not very clearly known. It is therefore important to get an assessment of the overall scale and implications of all these changes on present and likely future wood fibre demand.
4. The information in this report covers the activities of 119 companies covering 141 existing or proposed plants who have declared an interest either officially, or unofficially, in using or supplying wood fibre in Britain. This covers all the larger companies and a very high percentage of the smaller ones. There are 33 companies that are operating, or have plans to operate 37 wood energy plants and of these 23 larger scale commercial wood energy plants are operating at the present time. The overall survey response rate was 75% (81% in the forest sector and 57% in the wood energy sector). Where companies have not supplied information directly, estimates of wood fibre requirements have been made by industry sources, or by using publicly announced information.
5. This report looks at the potential availability of wood fibre in Britain and the potential demand of users of this British sourced wood fibre. It should be recognised that the UK is the third largest importer of wood and wood products in the world which, in total, amounted to a value of £7.179 billion in 2014 and the quantities amounted to some 7.31 million tonnes of pulp and paper, 6.43 million cu m of sawn wood, 3.26 million cu m of wood-based panels and 8.39 million cu m of other wood products. The findings in this report therefore only cover a small proportion of the annual total demand for wood and wood products in Britain.

FORECAST POTENTIAL WOOD FIBRE AVAILABILITY

6. The only source of virgin wood fibre in Britain is from trees being grown in Britain. Chart A shows the forecast potential annual average availability of coniferous and broadleaved roundwood in Britain by 5 year intervals.

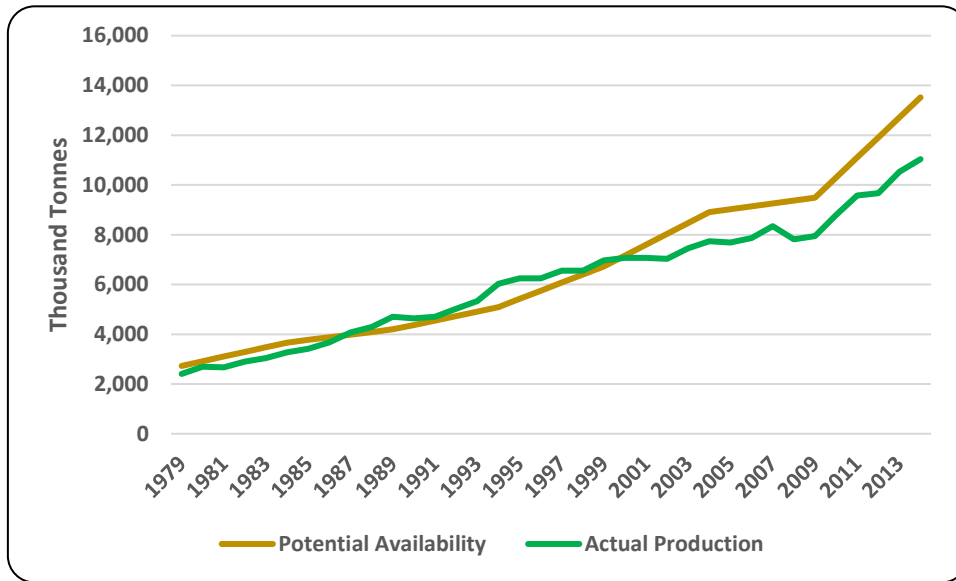
Chart A: Forecast Potential Total Annual Average Availability of Virgin Roundwood 2013 – 2051 Showing Proportions of Forecast Coniferous and Broadleaved Roundwood Availability



Source: Forestry Commission

7. The graph also shows that the majority of the forecast potentially available virgin fibre will be coniferous. The overall total of both fibre types is forecast to increase by about 2 million green tonnes per annum to just over 16 million tonnes per annum in the period 2027 – 31. After that the potentially available virgin fibre from both coniferous and broadleaved trees is forecast to fall. The fibre characteristics and end uses of coniferous and broadleaved roundwood mean that the two fibre sources are not interchangeable for many uses. Any wood fibre that might become available from planting new areas of short rotation coppice on a significant scale has not been included.
8. 'Potentially' available roundwood is taken to mean the maximum quantity of biologically available roundwood that could theoretically be harvested. In practice there will be a number of planning, environmental, landscape, social, harvesting cost and location factors that commercial users will need to take into account in developing roundwood harvesting plans and these are likely to mean that commercial availability will be less than 'potential availability' to a greater or lesser degree at local, regional and national levels. Actual production of coniferous roundwood can be significantly less than forecast roundwood potential availability as the following analysis by the Forestry Commission shows in chart B.

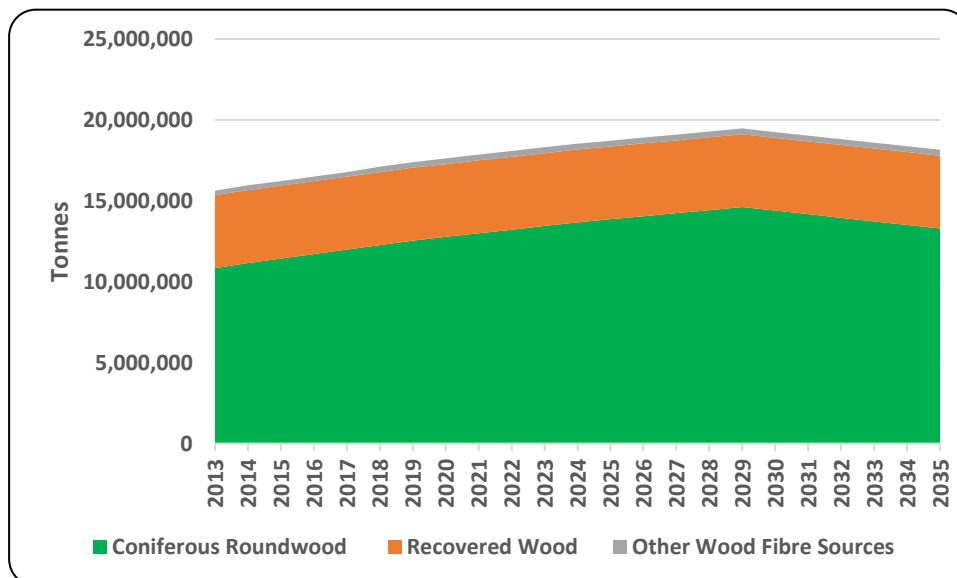
Chart B: Results of a Forestry Commission Analysis Comparing Forecast Coniferous Roundwood Availability with Actual Production 1979 - 2013



Source: Forestry Commission, 2016

9. The chart shows that since 2000 actual production has been steadily falling below the forecast potential availability of coniferous roundwood. In 2013 the gap between the two was 2.48 million tonnes with just over half this total accounted for by the woods in the private sector (F.C., 2016).
10. There are other sources of wood fibre that can be used to supplement the virgin wood fibre potentially available from trees in Britain. These include recovered wood obtained from domestically grown and imported wood products and other sources, such as arboricultural arisings and imports. Chart C shows the forecast potential availability of all these sources of coniferous fibre.

Chart C: Forecast Potential Availability of All Sources of Predominantly Coniferous Wood Fibre in Britain 2013 – 2035



Footnote: The chart excludes the wood fibre potentially available from sawmill products comprising wood chips, sawdust, pin chips, shavings, slab wood and bark because these quantities are derived from coniferous roundwood which are already shown in the chart.

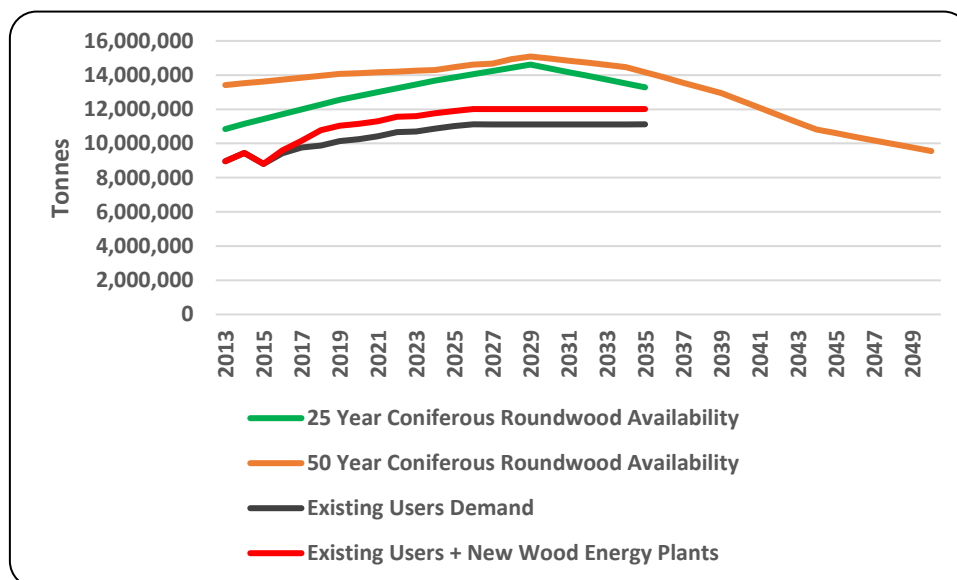
11. The chart shows that the overall potential availability of all sources of coniferous wood fibre in Britain is forecast to rise from its present level of about 15.6 million tonnes per annum to just over 18.2 million tonnes per annum on an 'as delivered weight' to customers. Thereafter the total starts to decline. These are all *potential availability* figures and in practice the amounts actually coming to market may be significantly less than these figures. Sawmill products comprising wood chips, sawdust, pin chips, shavings, slab wood and bark amounted to some 3.3 million tonnes in 2013 and the total is forecast to rise to about 3.9 million tonnes in 2035.
12. The following sections show the potential availability and demand balances for each of these fibre sources.

POTENTIAL GB ROUNDWOOD AVAILABILITY & FORECAST DEMAND OF USERS OF BRITISH GROWN ROUNDWOOD.

Coniferous Roundwood

13. The potential availability of coniferous roundwood in Britain is shown in chart D along with the demand of users of British grown roundwood.

Chart D: Coniferous Roundwood Potential Availability and the Forecast Demand of Users of British Grown Roundwood in Britain 2013 to 2050



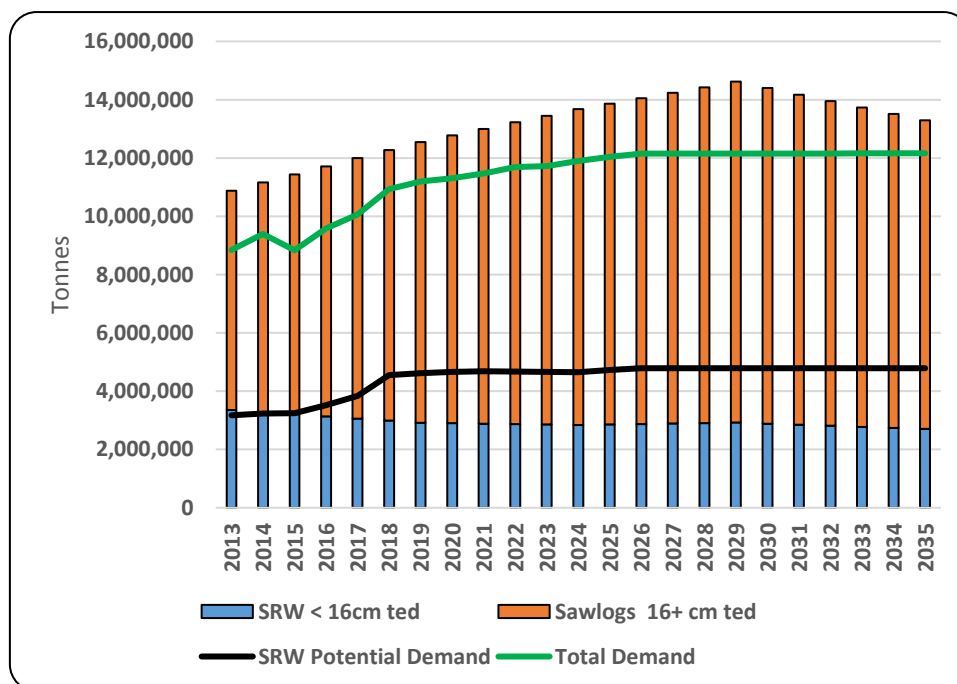
Footnote: In addition to the demand for wood fibre shown in this chart, Britain imports some £7 billion of wood and wood products annually.

14. The chart shows that over the next 15 years in Britain the gap between the potential availability and demand for coniferous roundwood is only expected to vary by between about 1 to 2 million tonnes per annum. As the gap between potential availability of coniferous roundwood and actual production was 2.48 million tonnes in 2013, the balance between supply and demand may be much tighter in practice than indicated by the chart. After 2030 the gap will narrow significantly as potential availability is forecast to start falling.
15. Although this is the overall situation in Britain, there are major differences in the situation in different parts of the country. In the Northern and Central zones of England, present and forecast use of coniferous roundwood exceeds forecast availability and in South Scotland, the potential availability and demand for coniferous roundwood is extremely tight. In other zones the forecast potential availability of coniferous roundwood exceeds

forecast demand to differing extents.

16. Much of the increased potential availability is forecast to come from woods in the private sector. Only about one third of these woods are registered as being managed in accordance with UKWAS. Most wood users require their roundwood supplies to come from sustainably managed woods which may significantly reduce the potential availability of coniferous roundwood supplies for many end users. However, there is some evidence that a number of woodland owners join UKWAS shortly before starting timber harvesting operations so the quantity of coniferous roundwood coming to market in the future from UKWAS registered woods may be higher than present statistics suggest.
17. The potential roundwood availability forecasts prepared by the Forestry Commission, and used in this report, assume that woods in Britain will not be further affected by pests and diseases on any scale.
18. The future growth in coniferous roundwood availability is forecast to be in larger (t.e.d of 16 cm or more) rather than smaller (t.e.d of less than 16 cm) logs as chart E shows. The chart also shows that at present the forecast demand for logs of 16 cm or less t.e.d is finely balanced with potential availability, but demand is expected to increase over the next few years. If all the planned developments proceed, demand for SRW will exceed potential availability.

Chart E: Forecast Availability & Demand for Coniferous Roundwood in Britain 2013-2035

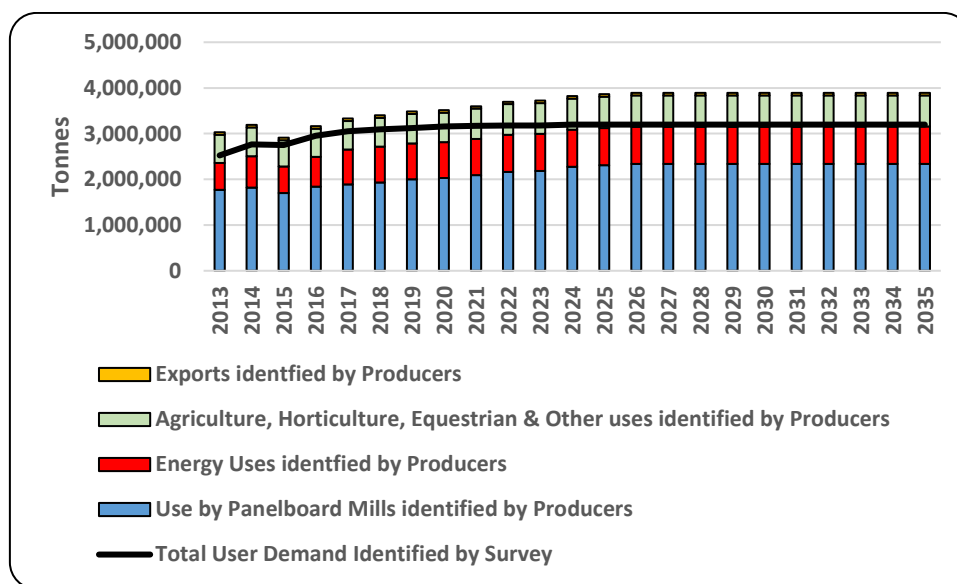


19. The excess annual demand for SRW over potential availability, if all the planned new wood energy developments proceed, could potentially be satisfied by users purchasing larger dimension roundwood that has previously been used by the sawmilling companies. Overall in GB there is potentially more than sufficient roundwood available, but there are, and there will continue to be shortages in some zones which is beginning to result in increased competition for the larger diameter roundwood that has traditionally been identified as being used by the sawmilling industry. High transport costs may encourage some sawmilling companies to start using more smaller diameter logs if they are available locally.

Sawmill Products.

20. Coniferous sawmill products comprise chips, slab wood, sawdust and bark. The estimates of annual potential availability and end uses of sawmill products are based on information obtained from sawmills, and the total demand is based on information obtained from known end users identified as part of this study. The information in Chart E indicates that the potential availability / production of sawmill products exceeds demand by between 400,000 to 700,000 tonnes per annum. The reason for this difference must be that we have not identified a number of smaller end users as the estimates of total production provided by the sawmills can be expected to be fairly accurate.

Chart F: Forecast Annual Total Potential Availability of Sawmill Products in Britain showing Producers' Estimates of their End Uses & Buyer Demand Identified by the Survey 2013 – 2035



21. The chart shows that the potential availability of sawmill products is set to increase as both potential availability and demand for coniferous roundwood increase in Britain over the next 15 years. With the forecast reduction in coniferous roundwood availability starting in about 2030, the potential availability of sawmill products can be expected to start falling as sawmilling activity reduces in line with conifer roundwood availability, but no sawmills appear to be factoring this into their projections at this stage.
22. No significant increase in demand for sawmill products for energy production has been identified by this study.

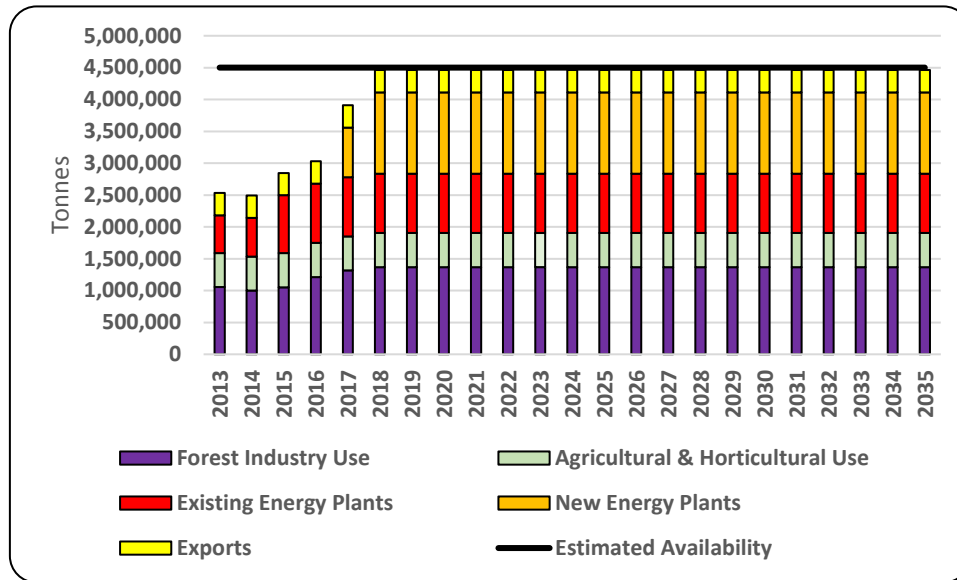
Coniferous Forest Residues

23. Approximately 190,000 tonnes per annum of coniferous forest residues are being collected at present for energy production. This figure is forecast to increase by about 60,000 tonnes per annum over the next five years as three new energy plants start operating bringing the total to about 250,000 tonnes per annum. If the delivered in price for forest residues becomes significantly cheaper than other sources of wood fibre for energy plants in the future, this might encourage wood energy plants to make greater use of forest residues.
24. The potential of sites to provide further wood fibre for wood energy from branches and the tops of stems will be limited in practice by operational costs and environmental constraints such as ground damage, soil carbon loss, loss of soil fertility and acidification.

Recovered Wood

25. The best and latest available estimate of the potential availability of recovered wood in Britain is 4.5 million tonnes per annum according to Defra. Chart G shows the potential availability and demand for recovered wood in Britain based on information collected during this study.

Chart G: Potential Availability & Demand Balance for Recovered Wood in Britain 2013 – 2035



26. The demand for recovered wood has been increasing and this trend will continue if all the new wood energy plants being planned become operational. By 2018 the balance between potential availability and demand for recovered wood will be finely balanced. Some slight gap may exist in the future if the present exports cease. A very important issue will be the quantities of recovered wood in the different quality grade categories as certain end users can only use certain grades.

Short Rotation Coppice & Miscanthus

27. The only large scale electricity generator presently using SRC and Miscanthus for energy generation is Drax. No other companies have indicated that they expect to use either material in the future. There has been no significant planting of either crop in recent years and no grants are available now to encourage their planting.

Arboricultural Arisings

28. Just over 100,000 tonnes per annum of arboricultural arisings are being used for energy production at present. Plans for one new energy plant are being based on using 5,000 tonnes per annum over the next 10 years once it becomes operational.

Broadleaved Woodlands

29. There are no wood energy plants of any scale that have announced plans to use broadleaved roundwood for energy generation, but it has the potential to contribute to a woodfuel mix for wood energy plants.

Imports

30. The lack of availability of wood fibre in Britain has meant that major electricity generators, who wish to use wood fibre to generate electricity, have had to source their supplies overseas. Drax is already importing wood pellets and Lynemouth Power Station has plans to switch its operations from using coal to biomass in the next year or so, if it receives the necessary financial support from the Government, and approval from the European Commission to do this. A new power station is planned for the Tees area and it is anticipating using wood pellets imported from overseas. In total wood pellet imports could increase to about 10 million tonnes per annum.

Conclusions

31. The potential availability of virgin fibre from trees grown in Britain is limited. Over the next 15 years the overall potential availability of wood fibre from coniferous trees grown in Britain is forecast to rise by about 36% to a peak in 2030, after which it is forecast to fall back to present levels in about 2035 before continuing its decline to about 2050 when it bottoms out.
32. Actual coniferous roundwood production has been less than forecast availability since 2000, and the gap has been widening. The reasons for the gap widening are not known with any certainty. Some of the roundwood may not be coming onto the market because of access, site or landscaping constraints and, if so, the availability and demand for virgin fibre grown in Britain may be tighter in practice than the charts have indicated. Some of the roundwood may be uncommercial to harvest at recent, or present price levels, but it could come to market if prices rise significantly. In the longer term as the availability of coniferous roundwood falls, so will the potential availability of products such as wood chips, bark and sawdust that are produced from coniferous roundwood. This will reduce the total wood fibre that is potentially available in Britain.
33. Some existing successful wood processing companies in the forest sector are planning to expand their operations and there are 25 energy plants at various stages of planning that are expecting to base their operations on using GB sourced wood fibre to generate energy. Three large scale electricity generators are importing, or are planning to import wood pellets from overseas because there is insufficient wood fibre in Britain to meet their needs.
34. The wood fibre situation in Britain is shaped by a number of different past and present Government policies, strategies, incentives and regulations involving several Government departments. Given the interconnectivity of wood fibre markets, there is a need for a clear overview and policy co-ordination to achieve the maximum public benefits for wood fibre use in Britain over the long term. Any policy changes connected with wood fibre use that take place without considering the potential consequential changes on the delivery of other policies may have a number of serious unintended results.

1. INTRODUCTION

1.1. Wood fibre in the form of trees and logs has been traditionally converted into products such as sawn timber, panelboard, paper, packaging, fencing and furniture products. Sawn timber and panel board products are materials that are widely used in the building industry. Innovations, such as engineered wood products and combining the use of wood with off-site construction methods in the forest sector and building industries, are widening both these products appeal and their uses. The positive environmental profile of wood products means they are becoming increasingly attractive products to use. This is enhanced by the fact that many products can also be re-used or re-cycled. Growing trees in Britain, and converting them into these products is contributing significantly to the rural economy and to the provision of jobs.

1.2. Increasing concerns over climate change in the 1990s, and a desire to move to a more low-carbon economy, brought a focus on developing renewable sources of energy. Of the various forms of biomass that could be used, wood fibre stood out as an obvious possibility to those concerned with climate change as trees appeared plentiful and wood, as a fuel, was renewable. Incentives were put in place to encourage the use of wood for generating electricity and heat through the installation of biomass boilers. This resulted in a large number of both small and large scale plants being planned in Britain around 2010. The potential aggregate demand for wood fibre in the form of logs, wood chips and bark increased very rapidly and became a major concern for the wood processors as they were very aware that the availability of wood fibre from trees grown in Britain was limited, and the potential demand was likely to exceed potential availability if all the proposed plants went ahead. Subsequent changes in energy policy since 2010 have resulted in the incentives being re-targeted, and reduced, which has meant that the number of wood fired biomass plants being planned has fallen significantly since then, but new technologies, such as gasification and pyrolysis, are still being developed to improve the efficiency of the conversion process which may again encourage increased use.

1.3. As a material, wood has traditionally been used in its solid form, for example, either by cutting it up and using it in various forms such as sawn timber, furniture or panelboard products, or by separating it into fibres and reforming it into various paper and packaging products. Increasing attention, mostly overseas, is now being directed at the chemical composition of wood (predominantly cellulose, hemi-cellulose and lignin) and to identifying what the opportunities are to make compounds and products from it such as ethanol, vanillin and nano-cellulose. Although this type of research is at an early stage, some of the findings suggest that in the long term wood could provide some new high value products.

1.4. Given the variety of products that the forest sector is making out of wood, and the continuing innovation in the way it can be used; the attraction of wood as a fuel for producing renewable energy and, in the much longer term, its potential as a source for making new chemical products, there are immediate and important commercial reasons, as well as long term policy and strategic interests, in understanding the potential availability and demand for wood fibre in Britain over the next 20 years.

This Study

1.5. This independent report into the wood fibre supply and demand in England, Scotland & Wales was commissioned to re-assess future wood fibre availability and demand in Britain over

the next 20 years. It follows a previous study undertaken in 2010¹. From the forest sector's perspective over the last 5 years since then:

- There have been changes in the UK Government's energy policies that have resulted in changes in demand for wood fibre for energy production. The overall scale and implications of those changes on present and likely future wood fibre demand is not clearly known at present.
- The results of a national inventory of Britain's woods and trees was published by the Forestry Commission in 2011 and a new 15-year coniferous roundwood availability forecast was published in 2012, followed by the publication of 50-year availability forecasts for both coniferous and broadleaved roundwood in 2014. These indicated that potential availability of coniferous roundwood in Britain was forecast to start falling in about 2030. Considered in isolation, a reduction in potential availability need not necessarily be a matter of major concern, other than a potential loss of economic opportunities, but it could be if the potential demand for wood fibre exceeds supply at that point and the situation continues. Without knowing the likely future scale of demand for wood fibre, the seriousness of the situation, and when it might occur, cannot be properly assessed.
- Companies in the forest sector have made investments in new equipment and processing lines over the last 5 years and some have plans for future expansion so they need to have a clear picture of future wood fibre availability for their operations if they are to proceed with their investment plans.
- Awareness has increased that Britain may be getting closer to reaching the limits of the availability of coniferous roundwood and other wood fibre grown in Britain and, if this is so, what is the best way to use any remaining additional wood fibre that is potentially available over the next 15 years and what are the implications for existing users?

1.6. This report aims, with the help of the many contributors, to provide as accurate assessment of the situation as possible over the next 20 years in order to provide the information required to assess these and other issues. However, it should be recognised that the UK is the third largest importer of wood and wood products in the world which, in total, amounted to a value of £7.179 billion in 2014 and the quantities amounted to some 7.31 million tonnes of pulp and paper, 6.43 million cu m of sawn wood, 3.26 million cu m of wood-based panels and 8.39 million cu m of other wood products (FC, 2014). The findings in this report therefore only cover a small proportion of the annual total demand for wood and wood products in Britain.

Defining Wood Fibre & Coverage of Report

1.7. The term "wood fibre" is defined and used in this report in a similar way to the 2010 report and it covers a variety of types and sources of wood fibre. Traditionally wood fibre was mainly thought of as originating in one form or another from logs harvested from forests or woodlands. Over the last decade, attention has been given to the possibility of obtaining more wood fibre than arises from conventional management and harvesting of existing woodlands. In woodlands this has included using forest residues and stumps, and in managing woods in less traditional ways such as Short Rotation Forestry (SRF). Different ways of sourcing wood fibre outside woods and forests have included establishing Short Rotation Coppice (SRC) crops on land previously used for agriculture and collecting more parts of trees that are pruned or felled as part of arboricultural work in urban areas. Attention has also been given to using, or

¹ John Clegg Consulting Ltd, 2010. Wood Fibre Availability & Demand in Britain 2007 to 2025

re-using, more of the wood fibre that is in existence, or is no longer needed in its original uses that would otherwise have been burnt or put into landfill.

1.8. These changes have evolved mainly as a result of public interest in the environment and the influence of an increasing range of related Government policies centred broadly on delivering sustainable economic, social and environmental development. What was once a relatively simple wood fibre market is developing, and is expected to continue to develop, into an increasingly complex and inter-linked set of different markets that now includes the importation of wood fibre in various forms from overseas.

1.9. There are separate sections in the rest of the report on the potential availability and demand for the following sources of wood fibre in Britain:

- Coniferous roundwood
- Coniferous sawmill products
- Forest residues
- Recovered wood
- Short rotation coppice
- Arboricultural arisings
- Broadleaved wood fibre
- Imports of wood fibre & substitutes

1.10. It is important to recognise that coniferous sawmill products are not a separate additional source of wood fibre in Britain as they come directly as a result of sawing coniferous roundwood grown in Britain into pieces of timber. Strictly speaking this wood fibre is therefore already included in the wood fibre available from round logs presented in this report and not additional to it. Similarly recovered wood is simply re-using existing wood fibre rather than being an additional source of wood fibre. Ultimately the available wood fibre for users is obtained either by growing roundwood or other sources of wood fibre in this country, or importing it. These other fibre sources, and their supply chains are presented in this report as separate fibre sources. This is to provide a more complete picture as they are either an important source of income for producers, or an important source of fibre to users, irrespective of where the fibre comes from.

1.11. The report examines the potential availability of these fibre sources in relation to the demand from the existing wood processing industry and wood energy plants, and in relation to the possible **additional** future wood fibre requirements of the forest industry and the numerous wood energy plants that are in the planning phase. For the purposes of this report wood pellet plants and wood fired energy plants that produce heat and / or electricity have all been categorised under the general heading of 'wood energy plants'. The methodology that has been used in undertaking this study is explained in section 13 in the annex to this report.

IMPACT OF PRICES

1.12. The wood fibre market is very dynamic and it therefore responds fairly quickly to changes in wood fibre availability and demand through the price mechanism. This report presents an essentially static assessment of future potential availability of wood fibre and demand that has been shaped by the economic conditions and assessments of the future situation that existed during 2015. For example, if the value of Sterling changes adversely to other currencies, or a new market opens up in Great Britain where the user is prepared to pay significantly more for roundwood or sawmill products, then, say, the present exports of logs to Ireland and Scandinavia could cease. If that happened there would be a slightly greater volume of roundwood available for utilisation in Great Britain. Relative changes in the prices of different types of wood fibre may also result in their utilisation patterns changing where this is technically possible.

1.13. Some wood processing and wood energy plants are already using, for example, a mix of coniferous roundwood and sawmill products as well as recovered wood. Other wood energy plants are using arboricultural arisings and forest residues, as well as recovered wood. In this report we have used the percentages of the different wood fibre mixes that companies have indicated. In practice the mix of wood fibre used may well change depending on the availability of the different fibre sources and their costs at any particular point in time. Total plant capacity figures may not therefore precisely match forecast coniferous roundwood use.

CONFIDENTIALITY & PRESENTATION OF RESULTS IN THIS REPORT

1.14. The report covers 141 existing plants or planned developments in the wood processing and energy sectors by 94 companies. Seventy-five per cent of all the companies contacted contributed confidential information about their present and future wood fibre use. Within the forest sector the response rate was 81%, and 57% for companies that use wood fibre to generate energy or manufacture wood pellets.

1.15. In the case of the few companies in the forest industry that refused or did not provide information, it has been possible to obtain estimates of their wood fibre use through other industry sources or, in the case of wood energy plants, to use published information or local sources so that the coverage is complete. The report has also benefitted from the confidential views and observations very kindly provided by a number of these companies. An undertaking was given to them all that any information provided for this study would only be presented once aggregated so that commercially confidential information about any individual business could not be identified. Where necessary we have adjusted boundaries or restricted details to ensure this happens.

ACKNOWLEDGEMENTS

1.16. This study has been commissioned by the Confederation of Forest Industries (Confor), the Wood Panel Industries Federation (WPIF), the UK Forest Products Association (UKFPA) and the Forestry Commission.

1.17. The strategic value of this report depended on obtaining comprehensive information on the present and future demand and production of coniferous roundwood and sawmill products from existing businesses in the forest sector, and from companies already in or planning to go into wood fired energy production. The response to our request for information has been outstanding and we would like to thank all the businesses for their help and co-operation which we have greatly appreciated. Their support has meant that a fairly accurate assessment of present and future demand has been built up.

1.18. We would especially like to thank Stuart Goodall (Confor), Alastair Kerr (WPIF), David Sulman (UKFPA) and Andy Leitch (Forestry Commission) for their support throughout the study and for their subsequent comments on the draft of the final report.

1.19. The study has been funded by the following leading forest sector based companies in the UK, whose names are given below, and by the Forestry Commission.

A W Jenkinson Forest Products	James Jones & Sons Ltd
BSW Timber Plc	Kronospan Ltd
Egger (UK) Ltd & Egger Forestry Products	Munro Sawmills Ltd
ETC Sawmills Ltd	Norbord Europe Ltd
Euroforest Ltd	Pontrilas Timber & Builders Merchants Ltd
Glennon Bros Timber Ltd	Scottish Woodlands Ltd
Iggesund Paperboard (Workington) Ltd	Taylor-made Timber Products Ltd
James Callander & Son Ltd	Tilhill Forestry Ltd
John Gordon & Son Ltd	

2. CONIFEROUS ROUNDWOOD POTENTIAL AVAILABILITY & FORECAST DEMAND IN BRITAIN

2.1. This section provides information on the potential availability and demand for coniferous wood fibre in Britain from 2013 to 2035.

2.2. Detailed information about the forecast of coniferous roundwood availability is given in section 14 of the annex to this report. In it, detailed information is given by zones within England and Scotland and it also shows that there is considerable movement of roundwood geographically between zones and countries. This section therefore draws together all this information to provide an overall picture of the potential availability of coniferous roundwood in Britain.

2.3. The forecasts of potential availability do not take into account the issue of whether the coniferous roundwood that is potentially available is from woodlands that are certified under the UK Woodland Assurance Standard (UKWAS). All the woodlands managed by Forestry Commission Scotland (FCS), Forestry Commission England (FCE) and Natural Resources Wales (NRW) are, but only 32% of the woods in Britain managed by all other organisations are. With much of the additional supply forecast to come from woods not managed by FCS, FCE or NRW, the potential availability of coniferous roundwood from certified woods can be expected to be much less than indicated in this section. Some woodland owners presently wait until shortly before felling to have their woods certified to keep costs down so the potential availability of coniferous roundwood from certified woods may be more than present figures indicate, but this issue could still be an important one for companies that are already committed to meet the required environmental standards.

2.4. A further very important issue that is not taken into account in the Forestry Commission's roundwood availability forecasts included in this report is the quality of the coniferous roundwood that is potentially available. This is of particular concern to companies who are operating sawmills who generally require straight logs with low numbers of small diameter branches. The quality of the roundwood with a t.e.d of 16 cm or more that is forecast to be potentially available may not be as large as indicated because the quality may not be good

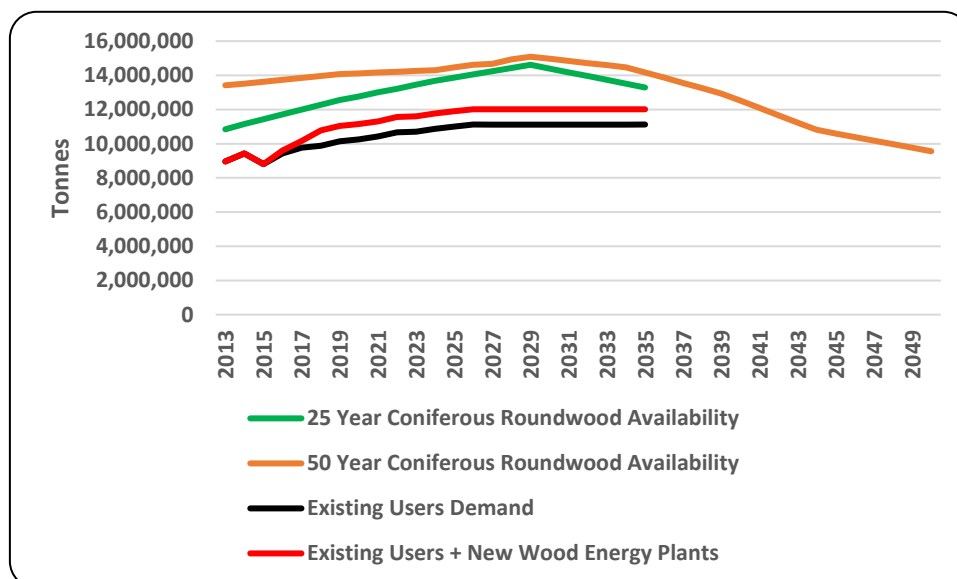
enough. However, these logs will still be suitable for some other uses such as woodfuel or for chipping.

2.5. The forecast demand is based on information collected from companies as part of this study. Most of the demand originates in Britain, but there are relatively small but significant export markets for roundwood and sawmill co-products. Over the last 20 years or so there has been a small but varying quantity of coniferous SRW exported from Scotland to Scandinavia for pulp and paper making, because of its excellent fibre quality. In the last few years, small quantities of coniferous SRW have also been exported to mainland Europe mainly for panelboard production. Over the last five years or more coniferous sawlogs have been exported to Ireland from Scotland on a regular basis as well as some to Europe. Small quantities of high quality hardwood logs have been exported to mainland Europe over many years. More detailed information on coniferous roundwood exports that are included in the demand figures is given towards the end of this section.

CONIFEROUS ROUNDWOOD AVAILABILITY & DEMAND BALANCE

2.6. The potential availability and demand balance for coniferous roundwood in Britain is shown in chart 2.1.

Chart 2.1: Coniferous Roundwood: Total Forecast Potential Availability & Demand in Britain 2013 - 2050

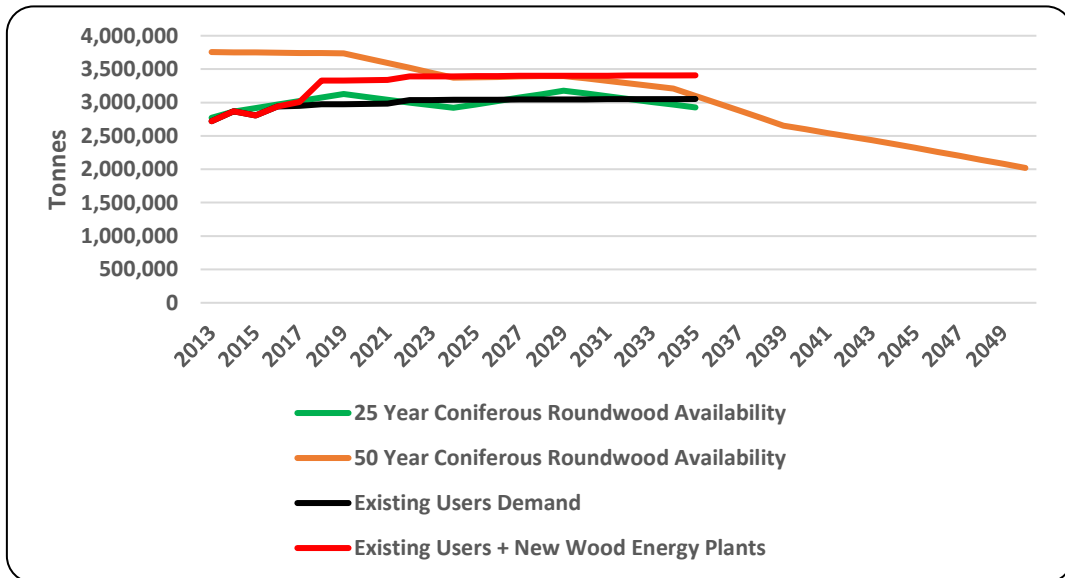


2.7. The chart shows that total potential availability of coniferous roundwood is forecast to grow until about 2029 and after that it starts to fall. At present the potential availability of coniferous roundwood in Britain exceeds the demand of existing users, and also when taking into account the roundwood that may be used in new energy plants. It should also be noted that since 2000 there has been a steadily increasing gap between the forecast potential availability of coniferous roundwood and actual production, and in 2013 the gap between the two was 2.48 million tonnes with just over half this total accounted for by the woods in the private sector. The actual gap between demand and availability of coniferous roundwood may therefore be significantly narrower in practice than the chart indicates due to a variety of constraints on potential availability. However, higher prices could bring some more of this potentially available roundwood onto the market.

2.8. However, by about 2039 demand may start to exceed potential coniferous roundwood availability based on present projections.

2.9. The balance between wood fibre availability and demand is different in England, Scotland and Wales as charts 2.2, 2.3 and 2.4 show. These charts take no account of the amounts of roundwood transferred between countries, and zones within countries, but this movement is identified in sections 15 to 21 in the annex to this report. It should be noted in comparing the three charts that they are presented on different scales.

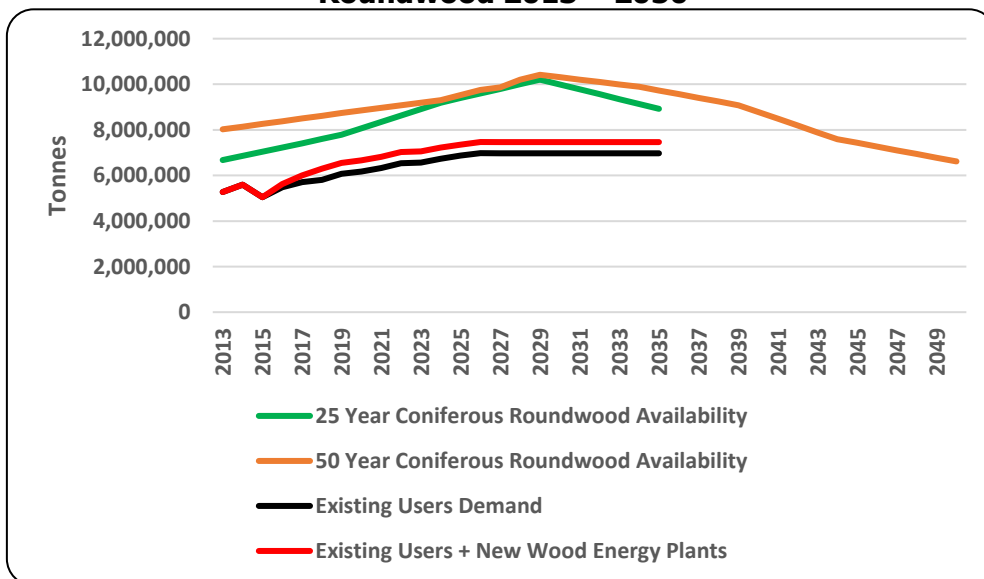
Chart 2.2: England: Forecast Potential Availability & Demand for Coniferous Roundwood 2013 – 2050



2.10. The chart shows that by 2018 overall demand for coniferous roundwood in England will exceed forecast potential availability in England, based on figures in the 25-year availability forecast, and this situation is forecast to continue. In about 2030 the demand exceeds the potential availability based on the 50 year forecast.

2.11. A more detailed analysis of the situation geographically in England is given in sections 18, 19 and 20 in the annex. This shows that it is in the Northern and Central England zones where demand already exceeds potential availability.

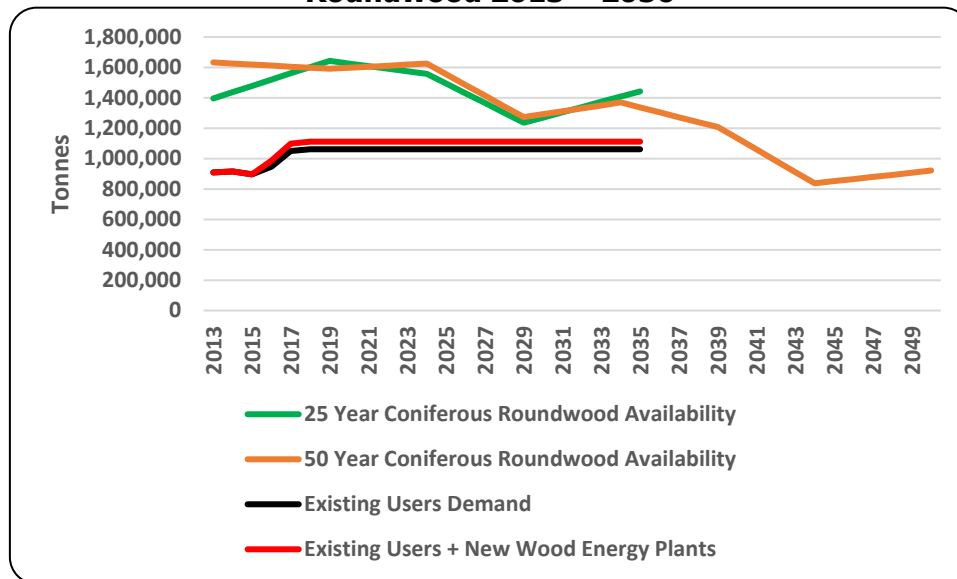
Chart 2.3: Scotland: Forecast Potential Availability & Demand for Coniferous Roundwood 2013 – 2050



2.12. The chart shows that in Scotland as a whole coniferous roundwood availability is forecast to exceed potential demand for the next 30 or so years based on present information. The situation is very different geographically (Annex sections 15,16 and 17) with forecast potential roundwood availability exceeding demand for most of the next 20 or so years in the Northern and Central zones of Scotland. In South Scotland forecast availability and demand will be finely balanced for the next 5 years or so before forecast availability is expected to slightly exceed demand before falling quite sharply below demand in about 15 years' time in 2030.

2.13. Chart 2.4 shows the situation in Wales.

Chart 2.4: Wales: Forecast Potential Availability & Demand for Coniferous Roundwood 2013 – 2050

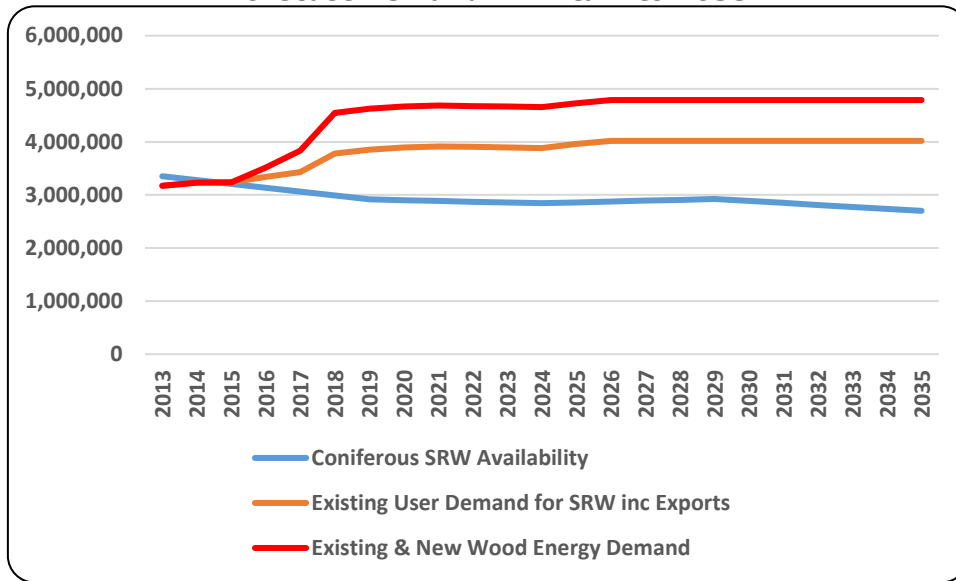


2.14. The chart shows that potential availability overall exceeds potential demand in Wales, but the difference will almost disappear in about 2029, before widening slightly and then dipping below potential demand.

POTENTIAL AVAILABILITY & DEMAND FOR ROUNDWOOD BY SIZE CATEGORY

2.15. Coniferous roundwood has traditionally been divided into categories according to its end use. For the purposes of this analysis SRW has been defined as roundwood with a top diameter of less than 16cm. (see Terminology & Definitions on page 3). SRW is mostly used by roundwood fencing providers, the panelboard industry and energy plants. Roundwood that has a top diameter of 16 cm or more tends to be used primarily by the sawmilling industry, although this separation is becoming less distinct with the introduction of new technology and changes in the prices of the two size categories. The availability and demand for coniferous SRW in Britain up to 2035 are shown in charts 2.5.

Chart 2.5: Potential Availability of Coniferous Roundwood under 16 cm t.e.d & Forecast Demand in Britain to 2035

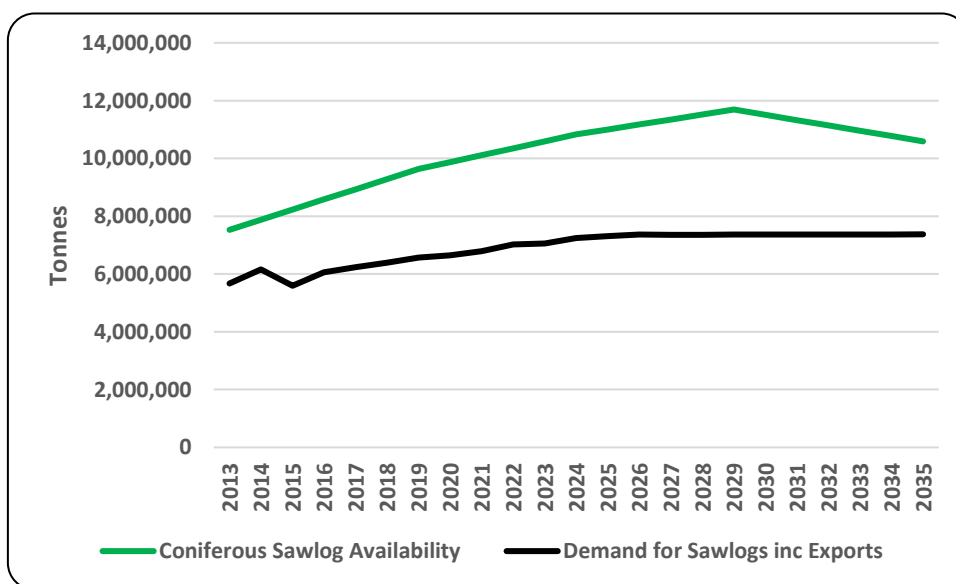


Footnote: SRW is defined as roundwood with a t.e.d. of 16 cm or less

2.16. The chart shows that the estimated total combined demand for logs with a t.e.d of less than 16 cms in Britain by the existing forest industry and existing energy plant users significantly exceeds the potential availability of coniferous logs of that size. The situation varies from zone to zone. If the new wood energy plants that propose to use some coniferous roundwood are all built, the total annual demand for coniferous roundwood with a top diameter of 16 cms or less in Britain will substantially exceed its potential availability. The smaller sawmills producing pallets and fencing material, and producers of round fencing material are likely to find securing supplies increasingly price competitive.

2.17. The situation for coniferous sawlogs in Britain is shown in chart 2.6.

Chart 2.6: Potential Availability of Coniferous Roundwood over 16 cm t.e.d & Forecast Demand in Britain to 2035

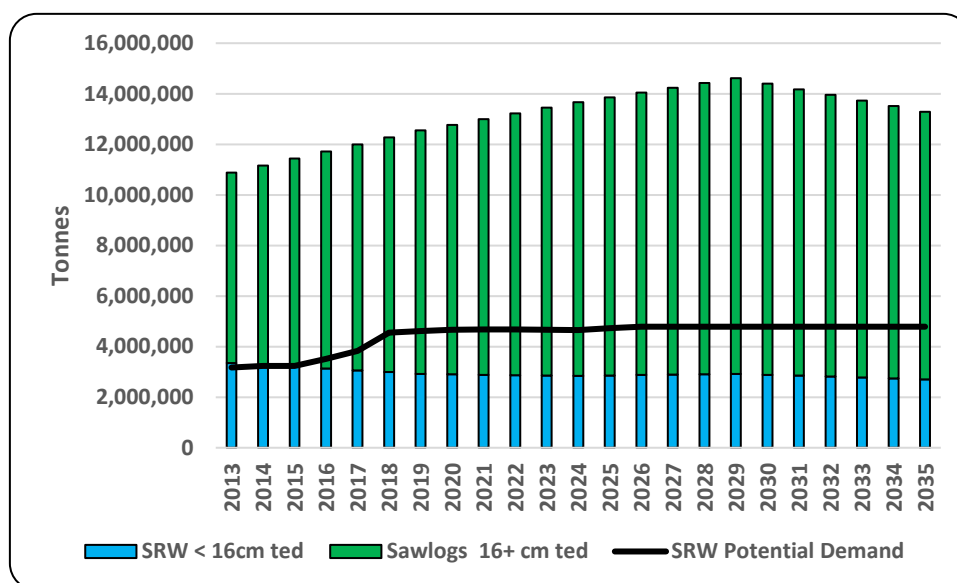


Footnote: Forecast demand is based on sawmills potentially taking roundwood down to 14 cms t.e.d

2.18. This shows that potential availability of coniferous roundwood with a t.e.d of 16 cm and over significantly exceeds the demand for roundwood with a t.e.d down to 14 cm from the sawmilling industry over the period to 2035 although the situation varies in different zones throughout Britain.

2.19. As the potential demand for SRW for use in the forest industry, wood energy and other uses exceeds forecast availability, the potential demand can only be met through those users purchasing roundwood with t.e.d in excess of 16 cm as chart 2.7 shows.

Chart 2.7: Potential Demand for SRW and Sawlog Availability 2013 – 2035



2.20. The chart shows that sawmills are likely to find increasing competition for roundwood with smaller dimensions.

2.21. The conclusions that can be drawn are:

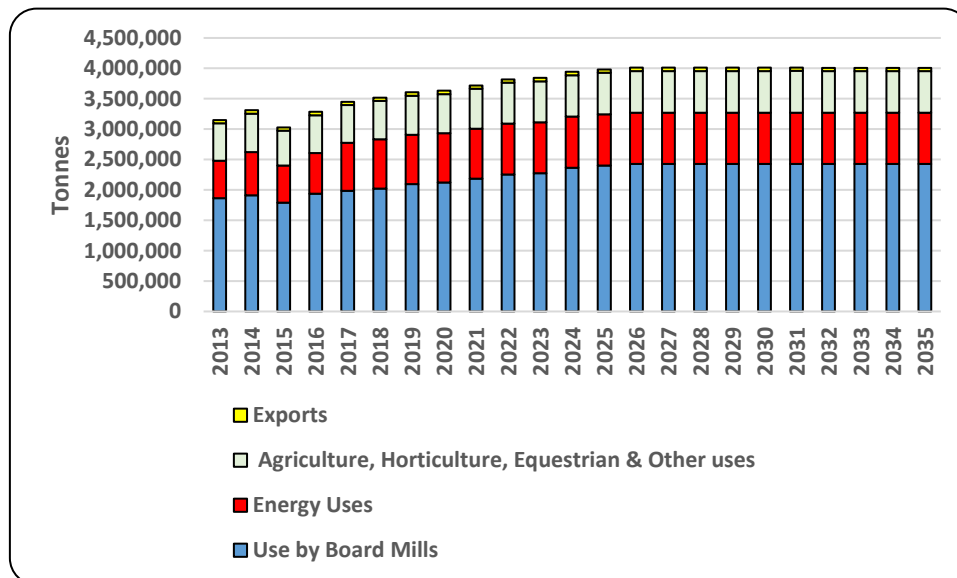
- *As many of the coniferous woods planted in Britain in the 1970s and 1980s are growing older they provide less small diameter roundwood, and there has been relatively little new planting of coniferous woods that could have the potential to provide the smaller sized logs through thinning them, for example.*
- *The latest wood fibre availability forecast indicates that there could be more coniferous roundwood available of 16 cm t.e.d or more than had previously been forecast and corresponding less roundwood under 16 cm t.e.d.*
- *Although a number of wood energy plants that were being planned five years or so ago have not come to fruition. There is still significant demand for the smaller log sizes from round fencing producers and the panel board industry that have traditionally targeted what has until recently been relatively lower priced material.*
- *The price differential between smaller logs and larger ones may continue to narrow and this may put significant pressure on some of the companies that have traditionally used smaller logs. It may also have potentially serious consequential displacement impact of depriving the sawmilling industry of raw materials.*

3. CONIFEROUS SAWMILL PRODUCTS POTENTIAL AVAILABILITY & FORECAST DEMAND IN BRITAIN

3.1. Sawmills processing coniferous logs produce sawn timber, wood chips, sawdust, pin chips, shavings, slab wood and bark. For the purposes of this report the term “coniferous sawmill products” or “sawmill products” relates to all the products *except* sawn timber. *It is important to note that these products are not an additional source of wood fibre to coniferous roundwood as they are derived from coniferous roundwood whose potential availability and demand was analysed in section 2.* Their potential availability depends almost entirely on the potential availability of logs.

3.2. Coniferous sawmill products are considered in this report as they play a significant part in the wood fibre supply chain for a number of companies and end uses as chart 3.1 shows. Very small quantities of sawmill products are imported but these quantities are not included in this graph.

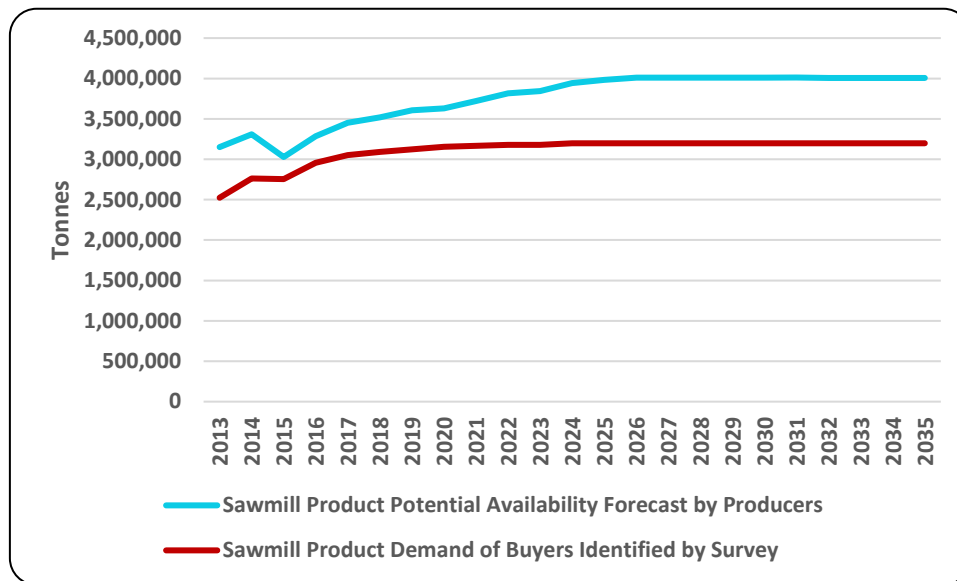
Chart 3.1: Sawmills’ Present and Expected Future Uses of Coniferous Sawmill Products in Britain to 2035



3.3. The potential availability and the expected end uses of sawmill products within each country, and the zones within them, has been analysed and the results are given in annex sections 15 - 21. Agricultural, horticultural and equestrian and other uses for sawmill products tend to be more important in the south and east of England zones while the use of sawmill products for making panelboards tends to be more important in Scotland, North of England and Wales where the panel board mills are located. As would be expected the size of geographical availability of sawmill products is directly related to the location of the size of the sawmilling industry within a zone.

3.4. It is not possible to provide a zonal analysis of demand for sawmill products as this would be commercially sensitive in some zones, but chart 3.2 shows the total forecast demand for sawmill products in Britain *based on user information* along with their total potential availability *based on information provided by sawmills*.

Chart 3.2: Producers' Forecast of Annual Total Potential Availability of Sawmill Products in Britain & Buyer Demand for them Identified by the Survey 2013 – 2035



3.5. The chart shows that there is a gap between the two which suggests that we have not identified all the end users of sawmill products. This is probably because the small number of companies that handle the sawmill products have a variety of smaller customers that they are reluctant to disclose on the basis of commercial confidentiality.

3.6. The chart also shows that potential availability of sawmill products is expected to rise over the next 15 years or so as the potential availability of sawlogs increases. However, the chart does not show any reduction in forecast sawmill product availability as sawmills have not yet started to factor in any reduction in forecast roundwood availability in 15 or so years' time.

4. CONIFEROUS FOREST RESIDUES

4.1. This section looks at the present use of coniferous forest residues and their potential availability and possible demand over the next 15 years. Broadleaved forest residues are covered in section 9.

4.2. Until the last few years the normal forestry practice when coniferous woodlands and forests were felled was to utilise all the stems of the trees down to about a top diameter (t.d.) of 7 cm, provided the trees were live and their stems were reasonably straight. The tops of the trees, branches, foliage and poor quality stems, collectively known as 'brash', are normally left in the woodlands and forests after harvesting as there has been little or no market for the material. This material has been used as a woodfuel in Scandinavia for a number of years so this suggested that it might also be used in Britain as the potential demand for woodfuel increased as new large scale energy plants were being planned, or built in Britain from about the year 2000 onwards.

POTENTIAL CONIFEROUS FOREST RESIDUE AVAILABILITY

4.3. In theory the potential availability of forest 'brash' and stumps comes at the time of clearfelling trees and industry sources suggested that 'brash' can yield up to 75-100 tonnes of wood fibre per ha, and tree stumps about the same amount. The total potential availability of this material is therefore directly related to the size of the annual felling programme of conifers

in Britain which is of the order of 10,000 to 12,000 hectares per annum.

4.4. The potential of using this material as a source of wood fuel for large electricity generators and CHP boilers was investigated about 5 years ago and a number of large scale trials were undertaken by commercial companies in the Britain in conjunction with the Forestry Commission. While it was found that it was technically possible to harvest 'brash' and tree stumps, there were a number of environmental and commercial issues that would significantly limit its availability.

4.5. The most significant constraints are operational costs and environmental ones that Forest Research^{2&3} identified as being:

- Ground damage
- Soil carbon loss
- Soil fertility
- Acidification

4.6. These issues can be particularly sensitive in upland areas where most of the managed coniferous woodlands have been planted. There the topography can be steep and the soils are often peats or peaty gleys and consequently environmental issues often make them unsuitable for brash and stump removal. As a result the contribution that forest residues can actually make to the supply of wood fibre in Britain compared with its potential availability is very much more limited than at first sight, although good site planning, management and harvesting practices can mitigate the impact that brash harvesting and stump extraction can have on some sites.

4.7. The guidance provided by Forest Research, based on work conducted by Tilhill Forestry Ltd, also suggests that the removal of both brash and tree stumps from the same site is unlikely to be acceptable for environmental reasons.

4.8. Operationally there are a number of practical issues connected with the handling and transporting of brash. The most practical way of doing so was found to involve bundling the brash into bales which requires specialist equipment. This operation is usually done as part of the harvesting operation while the material is still green and flexible. Once in a bundle it can take some time for the material to dry out and the material at the centre dries more slowly than the other material which makes it less easy to control the efficiency with which the material is burnt, but this does not prevent its use. Stump material once removed from a site has to be cleaned of soil and stones before use and it also has to be dried and chipped before it can be used as a fuel. This makes it a less attractive woodfuel compared with using brash.

4.9. Commercially there are costs associated with the harvesting and bundling of brash and some sites are also a long way geographically from where energy plants might be sited, so actual production may not make financial sense after allowing for transport costs.

4.10. It is not possible with the information available to be able to predict the size of the potential available forest residues, or their geographical location, as availability will be site specific. There is undoubtedly some potential for using them, but all the indications are that the availability is very much less than theoretical availability. While an increase in the price of woodfuel might lead to some increase in availability, the overall constraints in Britain will

² Forest Research: 2009 Guidance on Site Selection for Brash Removal

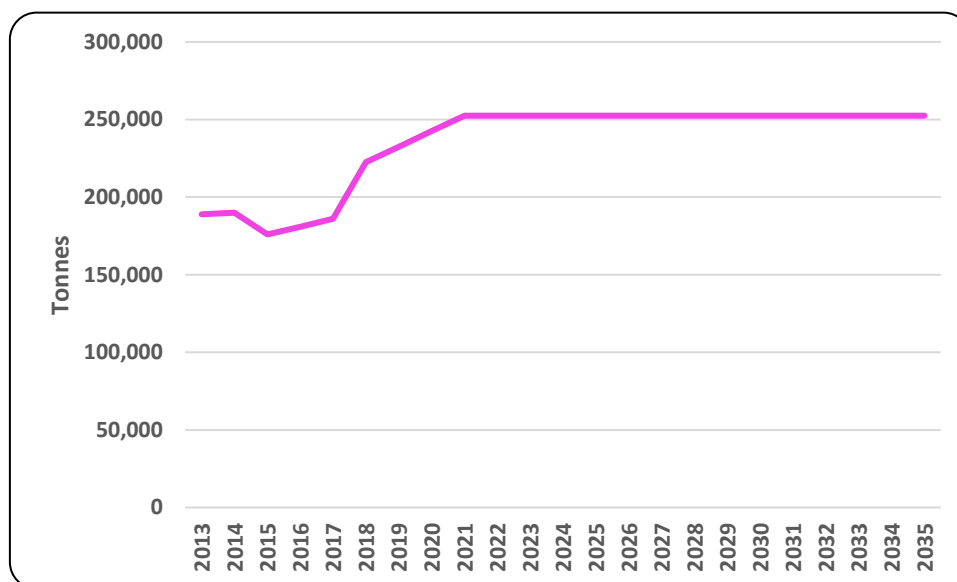
³ Forest Research, 2009: Stump Harvesting: Interim Guidance on Site Selection and Good Practice

always be environmental ones.

FORECAST USE OF FOREST RESIDUES

4.11. Forest residues are really only suitable at present as a fuel in large-scale wood energy boilers. Five companies are using them as a woodfuel and three other companies have plans to start using them which will bring total use to about 250,000 tonnes per annum as Chart 4.1 shows.

Chart 4.1: Estimated Use of Forest Residues & Stumps by Wood Energy Companies in Britain 2013 - 2035



4.12. The graph indicates that the harvesting of coniferous forest residues is likely to increase slightly over the next five years, but then their use as a woodfuel may level off at about 250,000 tonnes per annum based on the survey results. Where there are no technical limitations to wood energy plants using forest residues as a source of fuel, the scale of future use of forest residues as a wood fuel will depend on the relative prices of different sources of wood fibre.

4.13. Although the total use of forest residues could increase if the price of woodfuel rises as forest residues would be a useful additional source of woodfuel. The potential of sites to provide wood fibre for wood energy from brush and stumps will be limited in practice by costs and environmental constraints such as ground damage, soil carbon loss, loss of soil fertility and acidification.

5. RECOVERED WOOD

5.1. The wood based panel industry in the UK has recycled recovered post-consumer, and a small quantity of pre-consumer wood, to produce particleboards for well over a decade. This recovered wood now accounts for a very high percentage of the fibre used to make particle board. Recovered wood is also recycled into a number of other uses such as animal bedding products, and landscaping and horticultural products. Over the last 10 years or so recovered wood has also been used as a potential source of fuel for wood energy plants.

POTENTIAL AVAILABILITY OF RECOVERED WOOD IN BRITAIN

5.2. The most recent publication on the recovered wood market is one published by Defra in

2012⁴ which draws together the findings of seven reports on wood waste completed between 2010 and 2012. The information in this section on the availability of recovered wood is drawn from this report unless identified otherwise.

5.3. A number of studies have tried to quantify the overall UK wood waste tonnages and the quantities arising from each source. These have not always agreed. The most recent estimates are given in table 5.1.

Table 5.1: Estimates of the Size of the Wood Waste Market in the UK (tonnes as delivered)

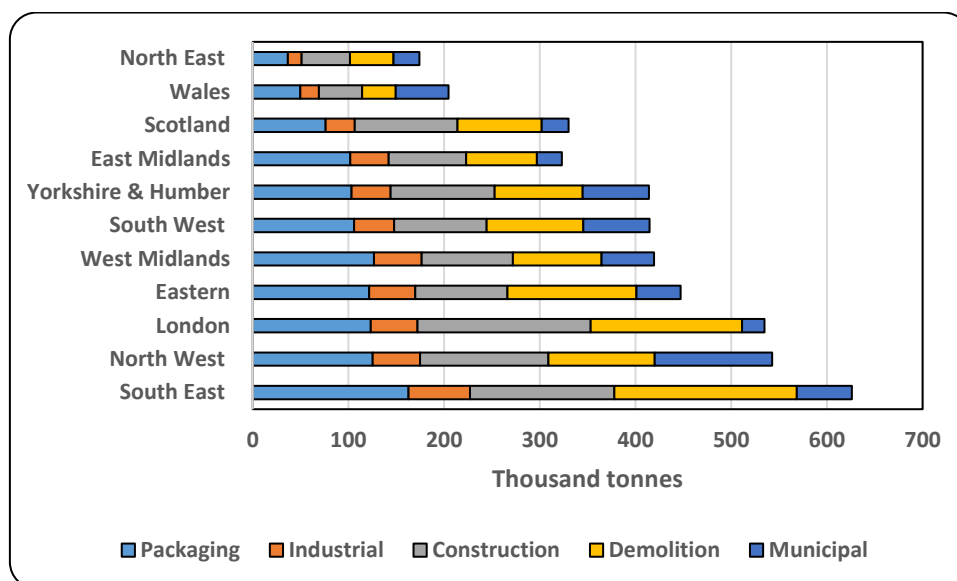
Source of Wood Waste	WRAP 2009 Report ⁵	WRAP 2012 Report
Packaging / Commercial	1,600,000	998,000
Industrial		393,000
Construction	2,300,000	854,000
Demolition		1,068,000
Local Authority Collected Waste	600,000	1,015,000
Total	4,500,000	4,327,000

Source: Defra, 2012

5.4. The Waste & Resources Action Programme (WRAP) charity considers the latest and best estimate of the size of the wood waste market as being 4.3 million tonnes per annum.

5.5. Some indication of where the waste streams come from geographically is provided in the 2009 WRAP report and these results are shown in chart 5.1.

Chart 5.1: Estimated Wood Waste Streams arisings by Region



Source: WRAP, 2009

Footnote: ¹ WRAP report regional boundaries do not coincide precisely with the zonal boundaries used in this report.

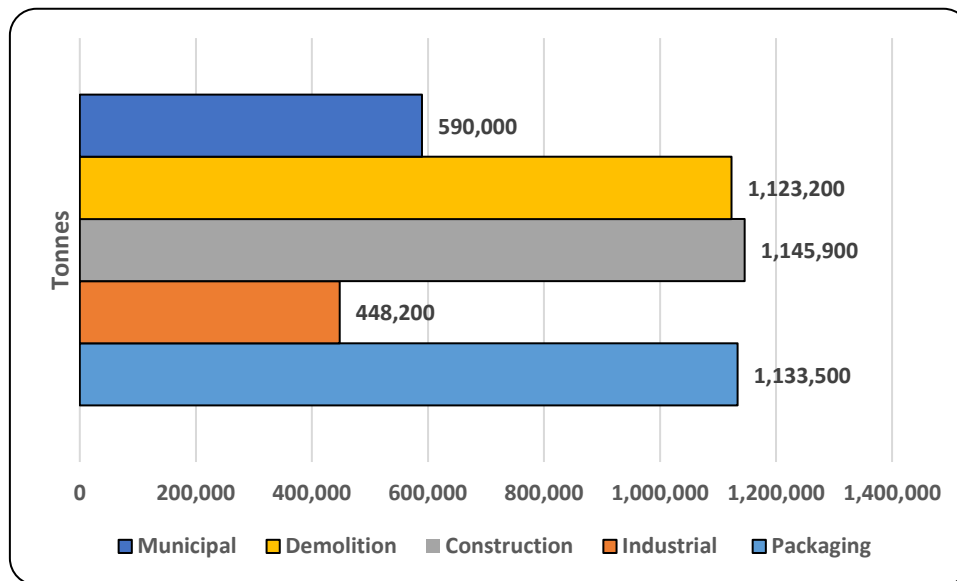
5.6. The majority of the waste originates in England with only 6.8% and 4.6% originating in Scotland and Wales respectively. Within England, the figures show that most waste originates in the North West and South East of England and London.

⁴ Defra, 2012: Waste Wood: A short Review of Recent Research

⁵ Poyry Forest Consulting, 2009: Wood Waste Market in the UK

5.7. The total quantities of wood arising from the different waste streams is given in chart 5.2.

Chart 5.2: Estimated Quantities of Wood arising from the different Waste Streams



Source: WRAP, 2009

5.8. The quantity and quality of recovered wood that is potentially available depends on:

- How much of the total estimated quantity of recovered wood can realistically be re-used and sorted into grades at an economic price.
- The end use that is being considered, as only certain grades of recovered wood are suitable for particular uses.

5.9. One of the major issues in recovering and re-using wood and wood products is the presence of physical or chemical contaminants in, on or attached to the wood. Wood and wood products that are discarded can often contain nails, screws and pieces of metal and have other materials attached to them. They can also have surface coatings of paints, glues and other types of coatings. In addition, they can be mixed in with all sorts of other materials such as glass, plastics and rubber. Some of the wood may also have been chemically treated. Although all this material is potentially available, one of the major challenges is to collect it and sort it which may often need to be done by hand where the waste streams are mixed up. Actual availability may therefore be less than the estimated size of the market as it may not be economical to sort small quantities of materials into appropriate grades.

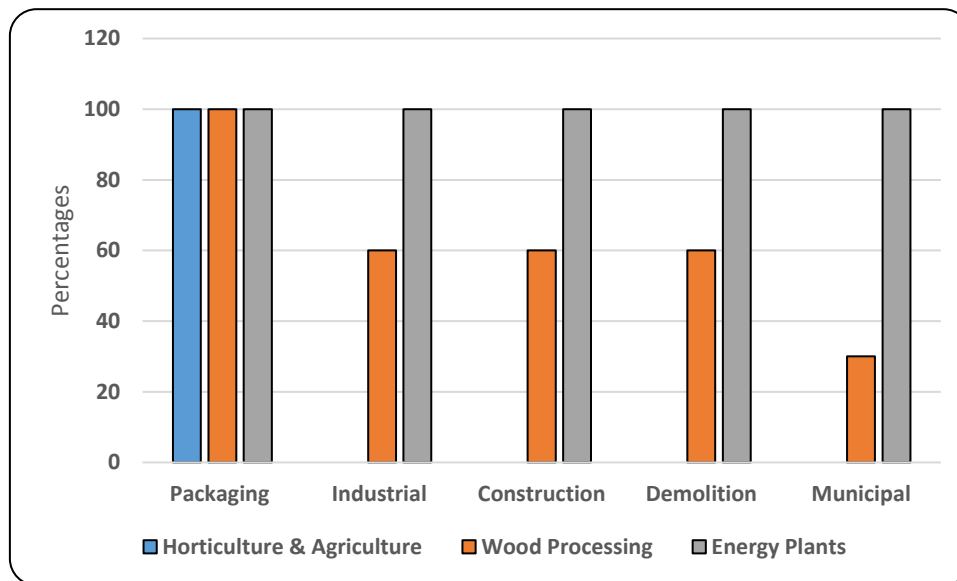
5.10. Wood waste is graded according to its quality and the classification developed and used by the Wood Recyclers Association is given in table 5.2.

Table 5.2: Waste Recyclers Association Recoverable Wood Grades Classification

Wood Grade	Waste	Typical Markets	Typical Sources of Raw Material for Recycling	Materials within Wood Grades	Typical Non-Wood Content Prior to Processing
Grade A 'Clean' Recycled wood		Manufacture of products such as animal bedding, horticultural mulches and the panelboard sector. Fuel in non WID installations, or manufacture of pellets / briquettes.	Distribution Retailing Packaging Secondary Manufacture Pallets	Solid softwood and hardwood, packaging waste, scrap pallets, packaging cases and cable drums. Process off-cuts from joinery / manufacturing.	Nails & metal fixings. Minor amounts of paint, and surface coatings.
Grade B Industrial Feedstock		A feedstock for industrial wood processing.	As Grade A plus construction & demolition operations and Transfer stations.	May contain up to 60% Grade A material as above plus building and demolition materials and domestic furniture made from solid wood.	Nails / metal fixings. Some paints, plastics, glass, grit, coatings, binders and glues. Limits on treated or coated materials as defined by WID.
Grade C Fuel Grade		Biomass fuel for use in the generation of electricity and / or heat in WID compliant installations.	All the above, plus municipal collections, recycling centres, transfer stations and civic amenity recycling sites.	All the above plus: Fencing products, flat pack furniture made from board products and DIY materials. High content of panelboard products such as chipboard, MDF, plywood, OSB & fibreboard.	Nails & metal fixings. Paint coatings and glues, paper, plastics and rubber, glass, grit. Coated & treated timber (non-CCA or creosote).
Grade D Hazardous Waste		Requires disposal at special facilities.	All the above plus fencing, track work & transmission pole contractors.	Fencing, transmission poles, railway sleepers and cooling towers	Copper / chrome. Arsenic preservation treatments. Creosote.

5.11. The quality, or grade of recovered wood that arises from these different sources varies and certain end uses can only use certain qualities of recovered wood as chart 5.3 shows.

Chart 5.3: Potential Technical Suitability of Recovered Wood According to End Use



Source: WRAP, 2009 & Forest Industry estimates

5.12. The graph shows that technically all recovered wood can be burnt provided the plant is WID compliant, and it also shows that only packaging of sufficient quality can be used for agricultural and horticultural end uses. The technical suitability of recovered wood for use in wood processing varies from 100% of packaging material to about 30% of the wood coming from municipal sources.

5.13. In practice the value that the horticultural and agricultural end users add to recovered wood is higher than in wood processing so the wood processing industry can usually obtain only about 40% of the recovered packaging material it requires and so it sources the rest of its recovered wood requirements from the other recovered wood streams. There is therefore a conflict in using recovered wood to meet the needs of the forest industry for panelboard production and burning recovered wood for producing energy.

ESTIMATED END USES OF RECOVERED WOOD USED

5.14. This study has been supported by a number of companies that use recovered wood either in their panelboard manufacturing operations or as a fuel for energy generation. They have provided confidential information on the quantities of recovered wood that they are presently using and are expect to use in the future. Published data has also been obtained on several new energy plants in England that are advanced in their planning or construction of new energy plants.

5.15. The amount of recovered wood that is used for agricultural and horticultural purposes has been estimated by the Wood Recyclers Association and their estimates are shown in table 5.3.

Table 5.3: Quantity of Recovered Wood used for Agricultural & Horticultural Purposes in Britain in 2011 & 2012

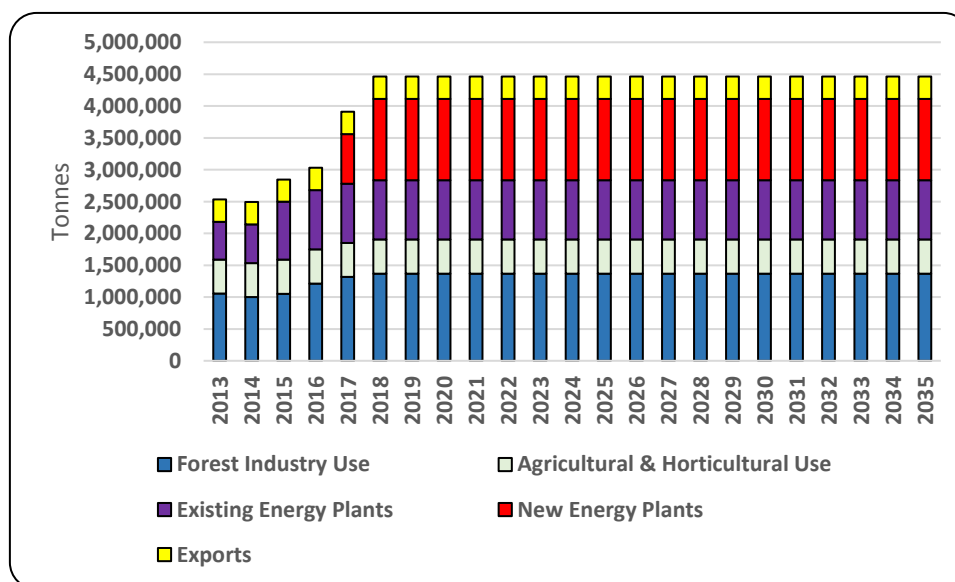
End Use	2011	2012
	Tonnes	
Animal / poultry bedding	280,000	303,000
Equine surfaces	44,000	40,000
Mulches, soil conditioners & composting	141,000	119,000
Pathways & coverings	7,000	6,000
Total	472,000	468,000

Source: WRA, 2013

5.16. Some WRA members are exporting lower grades of recovered wood to the continent, and the WRA estimated that this was of the order of 590,000 tonnes per annum in 2012 which we have assumed will continue at this level into the future, but market conditions and prices may change. Approximately 84% of the recovered wood exported was destined for wood energy plants.

5.17. The available information on the uses of recovered fibre in Britain from 2013 to 2035, excluding any that might be used for co-firing, is shown in Chart 5.4.

Chart 5.4: Estimated Usage of Recovered Wood in Britain by End Use from 2007 to 2025 excluding any used for Co-firing



5.18. Chart 5.5 shows the potential availability and demand for recovered wood fibre from 2013 to 2035 including exports.

**Chart 5.5: The Potential Availability & Demand for Recovered Wood in Britain
2013 – 2035**



5.19. Present use of recovered wood in Britain is just over 2.75 million tonnes per annum including exports. The chart shows that the potential availability of recovered wood presently exceeds demand and this is probably largely as a result of the closure in 2012 of the Sonae panelboard plant on Merseyside, which used some 350,000 tonnes of recovered wood per annum. Demand from existing users is expected to increase to just about 3.25 million tonnes per annum by 2017 and to rise significantly after that as plans for 7 new wood energy plants in northern England have been announced, with at least one now under construction.

5.20. *The gap between the potential availability and demand for recovered wood is expected to close very rapidly in the period to 2018 assuming all the planned wood energy plants are built. The potential demand includes exports from 2018 so the tightness of supplies relative to demand may result in exports ceasing which would provide a slight cushion. The major unknown is whether the estimated total potential availability of 4.5 million tonnes per annum of recovered wood can be realised and can be delivered under contract to the companies seeking supplies, given the diversity of supply chains, the need to sort materials and the varied treatments that recovered wood has received. The quality of the recovered wood will also be critical.*

6. SHORT ROTATION COPPICE

6.1. Short rotation coppice (SRC) is a potential source of fuel for generating heat and power but is otherwise of little use to the existing wood processing industry. This section therefore looks at SRC as a potential source of fuel for new bio-energy plants or for co-firing in existing coal fired electricity generating plants. The ability of a wood fired boiler to use SRC as a source of fuel will depend on the equipment and type of boiler that has been installed.

6.2. This report does not consider the potential availability of wood fibre from Short Rotation Forestry (SRF) i.e. trees grown at closer initial planting distances and cut after about 20 years or so, because SRF is still only at the trial stage. In the longer term it may well have potential based on overseas experience.

6.3. This section identifies what the potential area of SRC could be, what area of SRC crops

has been established, what some of the constraints are for expanding this area and what the potential demand might be for SRC material over the next 15 years.

POTENTIAL AREAS AVAILABLE FOR SRC CROPS

6.4. Various studies have been undertaken in the past which have indicated that there is a considerable area of land that could be used for growing SRC. For example, a study by Andersen, Towers and Smith in 2005 identified that there are between 170,000 and 520,000 ha of land in Scotland alone that is suitable for growing SRC and a further 1.2 to 1.3 million ha are moderately suitable (*Andersen R. S., Towers W. and Smith P. (2005). Assessing the Potential for Biomass Energy to Contribute to Scotland's Renewables Energy Needs. Biomass and Bioenergy 29:73-82*). There is therefore considerable potential for SRC in Britain.

ACTUAL AREA OF SRC CROPS

6.5. There is still no single definitive source of information held by any Government department or organisation on the total area of SRC that has been planted in England, Scotland and Wales so it makes it very difficult to assess the total areas. The three largest companies that were actively involved in establishing and managing SRC in England and Scotland were: Coppice Resources Ltd, Renewable Energy Growers Ltd and Renewable Fuels Ltd. Based on confidential information kindly provided by the three companies in 2005/06, it was estimated at that time that there were approximately 2,130 ha of SRC established in England and 150 ha in Scotland. Since then there have been a few further small areas planted in England. The majority of the SRC in England was established in Yorkshire, Nottinghamshire and Lincolnshire in anticipation of supplying the Arbre wood fired power station (now closed) and the Cottam, Drax and West Burton coal-fired power stations.

6.6. Enquiries suggest that there has not been any major planting of SRC since 2005/06 for a variety of reasons that includes the absence of grants, attitudes and perceptions of farmers, prices and markets and opportunities for alternative crops.

6.7. There were grants available in England to encourage the planting of Miscanthus for a number of years but there is no official information on the total area that has been established.

6.8. There are now no grants being offered by Natural England or the Forestry Commission to encourage more land owners to plant SRC or Miscanthus crops. For these reasons it appears unlikely that there will be a major increase in planting additional areas of SRC in the short term, unless there is a significant increase in the level of grants, or fuelwood prices rise.

POTENTIAL AVAILABILITY OF SRC

6.9. If the total area of established SRC crops in Britain is about 2,500 ha and the mean annual increment of SRC is assumed to be 20 'green' tonnes (10 dry tonnes) per hectare per annum then the mean annual increment of the existing SRC crops could be up to 50,000 'green' tonnes per annum on a sustainable basis. The availability profile of this SRC material in England, Scotland and Wales cannot be projected with any accuracy because the planting dates for these crops in the different countries is not known but the majority will be in England.

6.10. Any possibility of SRC crops becoming a major source of wood fibre for energy plants would require a major change in the attitudes and perceptions of farmers, and in the financial support they are offered under the Common Agricultural Policy. Rapid changes in land use over a relatively small geographical area may also not be easily accepted by local people.

POTENTIAL DEMAND FOR SRC

6.11. Publicly available information showed that in 2014 Drax power station used 6,154 tonnes

of British grown SRC. The company also used 97,520 tonnes of British grown Miscanthus that was converted into pellets. This is likely to be from crops that have been grown in the surrounding areas to the plant. No other companies who have provided information to support this study have indicated that they expect to use these more recently established SRC crops as a source of fuel. Elsewhere one company is investigating the possibility of using some long established coppice crops in the vicinity of their planned plant.

6.12. *The available information suggests that none of the existing or planned energy plants expect to use or depend on supplies of SRC as a fuel source in the foreseeable future.*

7. ARBORICULTURAL ARISING

7.1. Arboricultural arisings is defined for the purposes of this report as material that becomes available as a result of tree surgery in, for example, parks, streets, school grounds and private gardens and from site clearance for building, construction and road developments. This section looks at the potential annual availability of arboricultural arisings and makes an estimate of their use for energy production based on the findings of this study.

7.2. This material is suitable for wood energy production using appropriately designed boilers, but is not suitable for panelboard production.

SOURCES & USES FOR ARBORICULTURAL ARISING

7.3. The main catchments for arboricultural arisings are the urban areas such as the Central Belt of Scotland, Manchester, Liverpool, Newcastle, Birmingham and London. The responsibility for managing civic amenity sites is often sub-contracted out by Councils to waste management or environmental service companies.

7.4. Historically most arboricultural arisings were sent to landfill sites or were chipped and spread around the site. Arboricultural contractors were frequently required to dispose of the arisings that came about from their tree surgery work as a condition of being awarded a contract. Many have therefore developed local markets in order to minimise the cost of transporting material. Stems and the larger branches were often used to supply a local household firewood market. Smaller material was often converted to a mulch or used for surfacing paths. Some is now being used as a fuel for energy production.

ESTIMATED POTENTIAL AVAILABILITY

7.5. The more recent published estimates of the potential annual availability of wood fibre biomass from arboricultural arisings remain those published by McKay, H (2003), based on a survey of arboricultural companies, tree officers and local authorities, and the results England, Scotland and Wales are given in table 7.1. The report gave estimates in oven dry tonnes per annum, but the figures in the table have been doubled to bring them to an equivalent green tonnes to make them more comparable with roundwood and forest residue volumes given elsewhere in this report.

Table 7.1: Estimated Potential Availability of Arboricultural Arisings in England, Scotland & Wales in 2003 in tonnes per annum

Country	Arboricultural Contractor Arisings	Collected Arisings	Utility Work Arisings	Total
England	890,050	319,670	22,400	1,232,120
Scotland	32,292	25,742	11,400	69,434
Wales	22,000	12,012	5,400	39,412
TOTAL	944,342	357,424	39,200	1,340,966

Source: McKay, H. 2003. Woodfuel Resource in Britain

7.6. The figures in the table indicate that there is a significant quantity of arboricultural arisings that is potentially available in Britain that could be used as woodfuel. The table also shows the relatively small quantities of arboricultural arisings that are estimated to be potentially available in Scotland and Wales relative to England.

7.7. No forecasts were made as to how these quantities might change in the future. The quantities in table 7.1 are not thought likely to change much in the period to 2035, but they may increase slightly over time as more trees are planted in urban areas, legislation influencing the use of this material becomes tighter and it attracts higher prices as a potential wood fuel. Wood fuel boilers will need to be designed to take this material.

PRESENT & FORECAST DEMAND

7.8. There are no official statistics on the quantity of arboricultural arisings that are used in England, Scotland and Wales. This study has identified that four companies are using them as woodfuel at present and another company is exploring the feasibility of using a small quantity. The total amounts to some 100,000 tonnes per annum at present and the total could rise to about 110,000 tonnes per annum.

7.9. *If there is an increased demand for wood fibre for generating energy at some stage in the future, there may be some opportunity for companies to use more arboricultural arisings.*

8. BROADLEAVED WOOD FIBRE

8.1. Broadleaved woodlands account for approximately 43% of the woodland area of Britain and this section looks at the potential availability and demand for broadleaved wood fibre from these woodlands.

8.2. The distribution and ownership of broadleaved woodlands in England, Scotland and Wales is shown in table 8.1.

Table 8.1: Areas of Broadleaved Woodlands in England, Scotland & Wales in 2015 (ha)

Country	Forestry Commission	Other Owners	Total
England	64,000	901,000	965,000
Scotland	40,000	335,000	375,000
Wales	19,000	136,000	156,000
Total	123,000	1,372,000	1,496,000

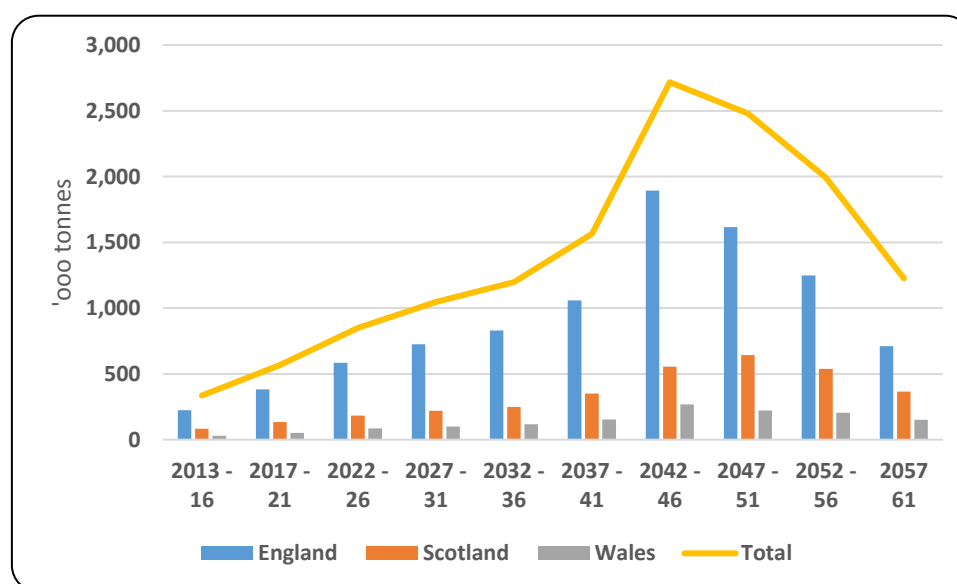
Source: Forestry Commission, 2015

8.3. The figures in the table show that most of the broadleaved woodlands in Britain are not managed by the Forestry Commission, but are in the ownerships and management of other organisations and individuals. Most of the woods are individually small and scattered throughout the countryside.

POTENTIAL AVAILABILITY

8.4. The Forestry Commission has prepared a 50 year forecast of broadleaved roundwood availability⁶, based on those areas where the National Forest Inventory showed there were signs of recent thinning activity, and this is shown in chart 8.1.

Chart 8.1: 50-Year Forecast Broadleaved Roundwood Availability in Britain 2013 – 2061, based only on Sites Showing Recent Thinning Activity



8.5. The chart shows that the potential availability of broadleaves in England, based on sites showing recent thinning activity, is expected to increase very significantly over the next 30 years before starting to decline quite sharply after about 2042. Broadleaved roundwood availability is still forecast to be small compared with coniferous roundwood availability.

8.6. The Forestry Commission also estimated the potential availability of broadleaved

⁶ Forestry Commission, 2014: NFI Statistical Analysis Report. 50-Year Forecast of Hardwood Timber Availability

roundwood, based on the biological potential of all broadleaves in Britain, was an average of 5.63 million tonnes per annum over the 50-year period. The difference between this volume and the forecast in chart 8.1 illustrates the potential impact of bringing more broadleaved woodland into management than is presently the case.

ESTIMATED ROUNDWOOD PRODUCTION

8.7. The Forestry Commission has produced estimates of broadleaved production in Britain for the years ending 31st March 2010 to 2014 and these are given in table 8.2.

Table 8.2: Estimated Production of Broadleaved Roundwood in Britain 2010 – 2014 (tonnes)

Year to 31 st March	Forestry Commission	Other Owners	Total
2010	70,000	465,000	535,000
2011	75,000	465,000	541,000
2012	55,000	478,000	532,000
2013	78,000	451,000	529,000
2014	71,000	461,000	532,000

Source: Forestry Commission, 2015

8.8. The estimated production represents approximately 9.5% of the forecast potential average annual 50-year biological production of broadleaved roundwood (para 8.6).

8.9. There are no official individual country statistics on broadleaved / hardwood roundwood production for England, Scotland and Wales, but the majority is likely to be coming from England.

8.10. Separate Forestry Commission statistics (Facts & Figures, 2015) show that only some 75,000 to 81,000 tonnes per annum of broadleaved roundwood was delivered to sawmills over the 5-year period and almost all the rest was used as woodfuel.

POTENTIAL AVAILABILITY & DEMAND

8.11. Actual production of broadleaved roundwood appears to be closely matched to its potential availability at present, but future availability is forecast to increase significantly. This would indicate that there is potential to double, triple or even quadruple production and use of broadleaves in Britain. However it may be difficult to do this because owners have a wide variety of objectives in owning and managing their woodlands, and commercial roundwood production is usually only one of several, and owners often give timber production a relatively low priority compared with other objectives.

8.12. In addition the felling of trees in broadleaved woodlands is subject to a number of constraints because the woodlands are recognised by the Forestry Commission and planning authorities as making an important contribution to the landscape and biodiversity. Many broadleaved woodland owners also value their woodlands for their visual appearance; for the sporting activities they offer, or for their conservation value. There are also numerous other technical and economic constraints to any commercial timber production because the woodlands are often relatively small and scattered; access difficult or impossible; and the stem

form and timber quality poor. Most of the better quality timber is found on the bigger estates where the woodlands are larger, and where they have been well managed over many years. For these reasons present identifiable roundwood production is relatively small, and is primarily driven by the market for hardwood sawlogs.

8.13. Any increase in officially recognised commercial hardwood roundwood production is likely to be driven by: higher prices for hardwood sawlogs; technical developments that will allow poorer quality material to be used economically through reprocessing; or the development of new markets for poorer quality sawn timber. There is no evidence at present of any of these developments happening in the near future.

FORECAST DEMAND FOR WOOD ENERGY

8.14. *Although there appears to be significant potential for using broadleaves in Britain, the quality of much of the timber prevents its use as sawn timber on any scale. The poor quality would suggest that woodfuel would make an ideal alternative use. Use of the roundwood as a fuel for one or more large-scale energy plants is limited by the scattered locations of the woods, owners' objectives, environmental and landscape reasons, and the lack of any large scale supply chains. For this reason broadleaves are likely to be most suitable as a local woodfuel in small scale boilers.*

9. IMPORTS & EXPORTS OF WOOD FIBRE

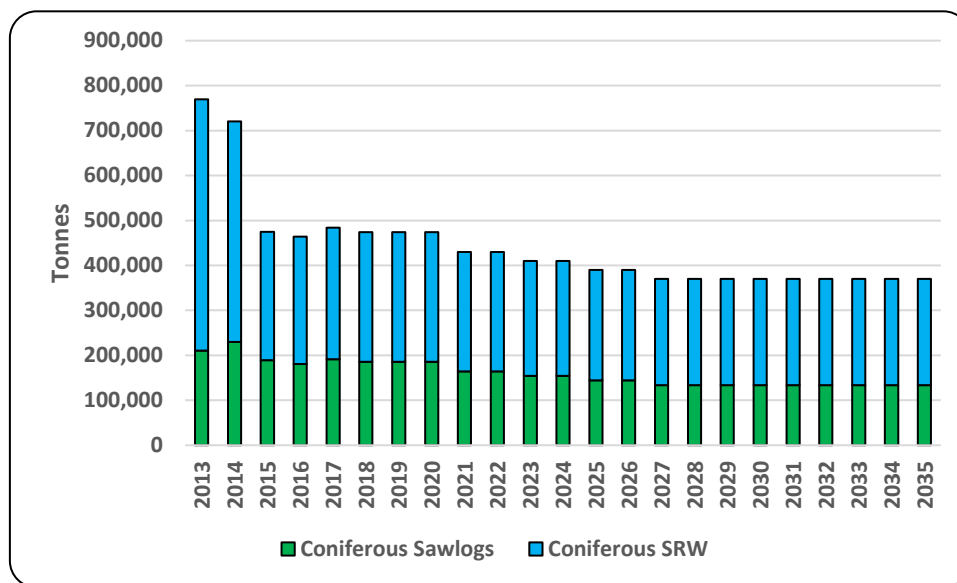
9.1. Britain has long been part of the international trade in wood and wood products that has involved mainly processed products such as sawn timber, pulp and paper and panel board products. Log imports have occurred from time to time when there have been surpluses in continental Europe, such as following major storm damage. This section looks at the available information on exports of wood fibre sourced in Britain and imports.

EXPORTS OF WOOD FIBRE

Coniferous Roundwood

9.2. There are seven companies that have exported, or plan, to export logs from Britain over the next 15 years and the information that they have provided has been aggregated and is shown in chart 9.1. These quantities have been included in the graphs previously presented in section 2 in this main part of the report, and in the sections in the annex, as 'existing usage' as the companies involved are all well established in the forest sector.

Chart: 9.1: Quantity of Coniferous Roundwood that has been Exported, or is Expected to be Exported, from Britain 2013 – 2035



9.3. The graph shows that companies are planning to continue to export coniferous logs from Britain. In 2010 it was expected that quantities would run at just over 650,000 tonnes per annum, but the graph shows that these have dropped back to around 400,000 tonnes per annum. The size of the export trade is very much influenced by economic conditions and exchange rates.

9.4. Most of the exports since 2013 have been, and are expected to continue to be sourced in the Central and Northern zones of Scotland with the vast majority of the SRW going to Sweden and Finland and the rest going to mainland Europe. The sawlogs have all been exported to Ireland. The companies involved in exporting expect to continue to do so in the future, but this is likely to depend on prices, and the duration and terms of their supply contracts.

Sawmill Products

9.5. Sawmill products, primarily in the form of sawdust, have been exported annually from Britain by a very small number of sawmills. These companies are anticipating that the quantities will remain about the same in the future at around 135,000 tonnes per annum.

Recovered Wood

9.6. Various informal published information sources suggest that about 300,000 to 350,000 tonnes of recovered wood is being exported at the present time to countries lying close to Britain's east coast. This could end if the proposed wood energy plants using new technology go-ahead.

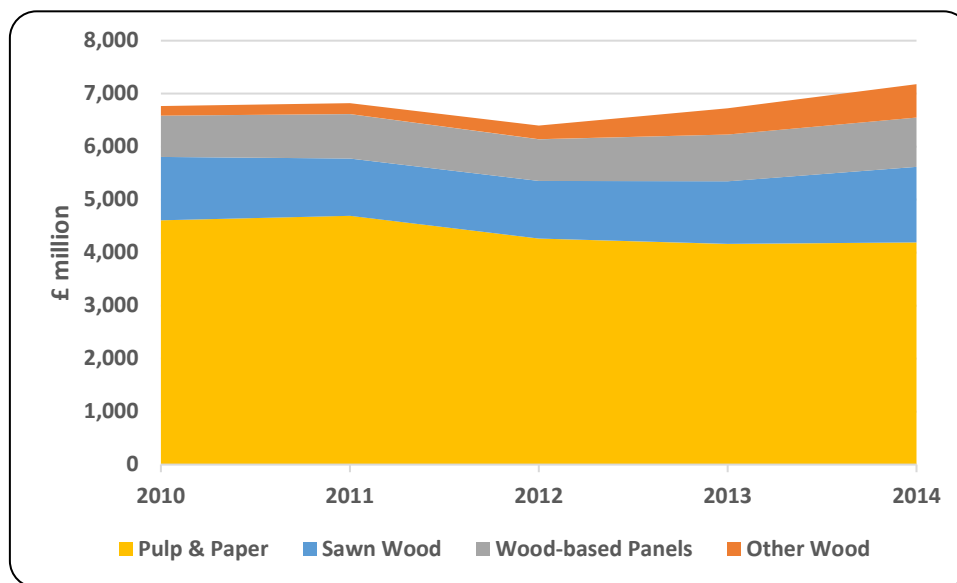
Hardwoods

9.7. Some high quality hardwood logs are exported to mainland Europe as well as some poplar logs, but total quantities are thought likely to be less than 100,000 tonnes per annum.

IMPORTS OF WOOD FIBRE

9.8. The UK is the third largest importer of wood and wood products in the world and the composition and size of these imports, by value, are shown in chart 9.2.

**Chart 9.2 The Value of the UK's Imports of Processed Wood & Wood Products
2010 – 2014**



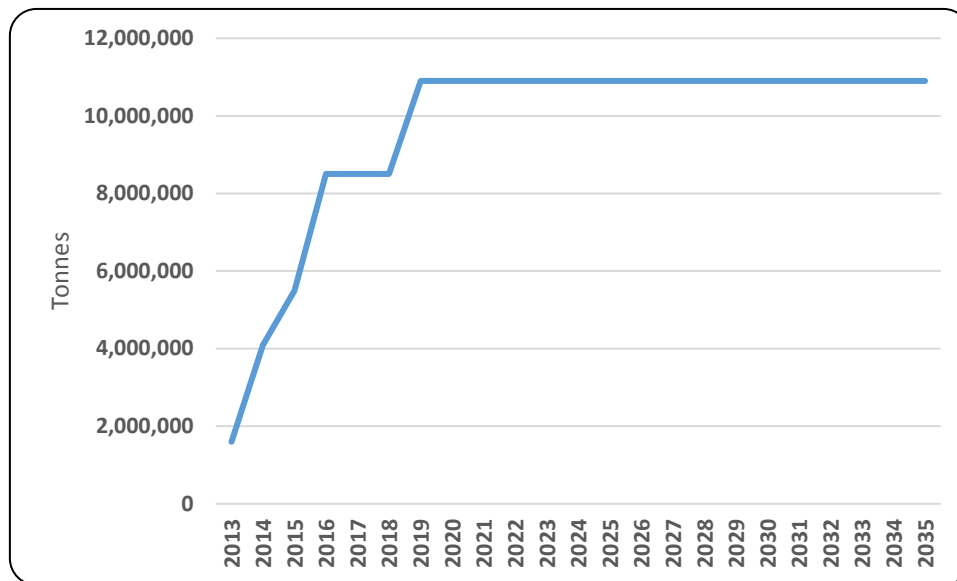
9.9. This report, and this section, looks only at the use and flows of primary fibre and these are the products which will be classified as falling into the 'Other Wood' category shown in chart 9.2.

9.10. Very small quantities of peeled coniferous roundwood, hardwoods and sawdust have recently been imported into Britain and similar amounts are planned to be imported in the future.

9.11. Although Britain has a number of smaller scale plants making wood pellets to supply biomass boilers providing heat, there are understood to be small scale imports of pellets from time to time.

9.12. There are also quantities of kiln dried firewood being imported into Britain from Eastern Europe to supply the domestic firewood market.

9.13. Drax power station has converted two of its boilers over to using imported wood pellets, and the company has indicated that it would like to convert its other boilers to using wood pellets as well, if it has the necessary financial support from the Government. There are similar plans to convert the Lynemouth power station over to using wood pellets from coal, but there are a number of uncertainties about whether this will happen. The plant is now owned by Energetický a průmyslový holding EPH. The economics of converting the plant depend on a subsidy contract awarded by the UK Government in April 2014, which has subsequently won state aid approval from the European Commission. If the conversion can be completed in time, the plant will operate to 2027. A new plant is at an advanced stage of planning at Teeside, which is also expected to use imported wood pellets. The forecast total imports of wood pellets, if the latter two plants do proceed as planned, as well as Drax's on-going operations, is given in chart 9.3.

Chart 9.3: Forecast Imports of Wood Pellets into Britain 2013 - 2035

9.14. The pellets being used are imported from a variety of sources that include Canada, USA, Estonia, Latvia and Portugal and there is potential in the longer term for supplies to come from South America. The pellets are made from material that comes from a variety of sources that include bark, sawdust, slabwood, sawmill co-products, forest residues, storm salvage and diseased wood and short and long rotation forestry.

9.15. *Britain is now exporting and importing primary wood fibre. Exports are on a relatively small scale and the trade is heavily influenced by exchange rates and prices. Imports are on a potentially much larger scale and are almost entirely linked for the foreseeable future to the demands of three major electricity generating plants in England.*

10. WOOD FIBRE USE BY WOOD ENERGY PLANTS

10.1. This section briefly examines the impact that energy production has had, and may have, on the use of wood fibre in Britain and also at the other types of fuel that have been developed.

10.2. In Britain in 2010 there were 16 plants that were using wood fibre to generate energy, or make wood pellets, and a further 47 wood energy plants that were at the planning stage. In addition, some major electricity generators were also using some wood fibre, and other forms of biomass, for co-firing which they were mainly importing. At the present time there are 24 wood energy and pellet plants operating in Britain and there are a further 13 plants that are either under construction, or are still at the planning stage that expect to use wood fibre if they become operational.

New Technology

10.3. It is thought that all but 5 relatively small plants are planning to use wood fibre to produce conventional steam based energy generation technology. We understand the five plants are expecting to use gasification technology and to use coniferous roundwood as their source of wood fibre. Their potential wood fibre use has been included in the figures in this report. However, there have been separate public announcements of plants ranging in size from 2.5MWe to 21.5MWe in Cheshire, Northamptonshire, Birmingham, Plymouth and Dartmoor using either gasification or pyrolysis technology and we understand that there may

be other plants also at the planning stage using one or other technology. These new technologies are supported with attractive grants offered by the Government under its 2012 UK Bioenergy Strategy. We do not feel competent to make any judgement about the success or otherwise of these new technologies, but we understand that the ABRE and Wick biomass plants tried to use gasification technologies unsuccessfully. As there do not appear to be any plants successfully operating yet using either of these new technologies, we have not taken their potential fibre use into consideration in this report. If they are built and operate successfully, these plants expect to use recovered wood waste and so this would obviously significantly increase the demand for recovered wood.

Co-Firing with Biomass

10.4. Changes in Government energy policy since 2010 have meant that the financial support available to major electricity generators for co-firing using biomass has been significantly reduced, and a number of coal fired power stations that were using, or were considering using biomass for co-firing have closed. As a result there seems to be little demand for biomass for co-firing in Britain at present, although one plant is expecting to use a very small quantity of British grown wood fibre for the next two years, but is uncertain whether this will continue after that. Where major electricity producers are using, or are planning to use biomass, they appear to be focusing on using imported wood pellets rather than British grown wood fibre (see section 9).

Other Fuel Sources

10.5. Other fuel sources have been developed as the cost of sending municipal waste to land fill sites has increased, and climate change levy charges rose for companies that were heavy energy users such as the cement industry. These fuels have reduced some of the pressure for companies to use biomass to generate energy.

10.6. There are two different types of fuel that can be made out of Municipal Solid Waste (MSW):

Solid Recovered Fuel (SRF): SRF is a high quality alternative to fossil fuel produced from commercial waste including paper, card, wood, textiles and plastic. It can be produced to a range of specifications. It has a high calorific value and a moisture content of less than 15 per cent and is used in facilities such as cement kilns.

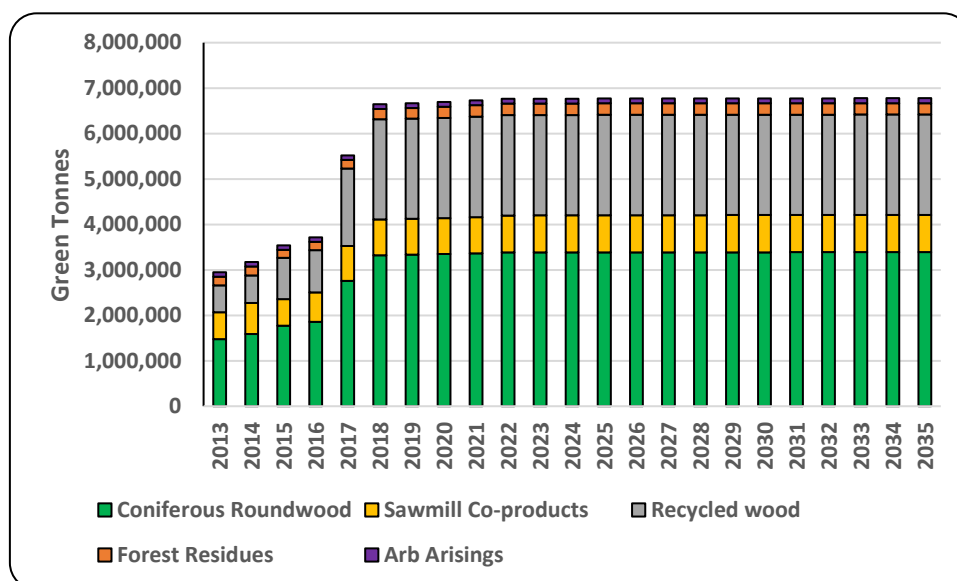
Refuse-Derived Fuel (RDF): RDF consists largely of combustible components of municipal waste such as plastics and biodegradable waste. It has a lower calorific value than Solid Recovered Fuel. Refuse derived fuel is used in combined heat and power facilities, many of them in Europe where they produce electricity and hot water for communal heating systems in the local area. There is therefore an export trade in this type of material at present.

10.7. RDF processing facilities are normally located near a source of MSW and, while an optional combustion facility is normally close to the processing facility, it may also be located at a remote location. SRF can be distinguished from RDF in the fact that it is produced to reach a standard such as CEN/343 ANAS. In Europe where the RDF is capable of being combusted cleanly, or in compliance with the Kyoto Protocol, we understand that RDF can provide a funding source where unused carbon credits are sold on the open market via a carbon exchange.

Types & Scale of Wood Fibre Use

10.8. Wood fibre is used in a variety of different forms in Britain to generate electricity or provide heat directly, or in the form of pellets. Chart 10.1 shows the importance of the different sources of fibre and the overall amounts that are used.

Chart 10.1: Types & Scale of Wood Fibre Used for Generating Electricity, Providing Heat or Making Pellets 2013 – 2035 but excluding Wood Pellet Imports



10.9. Although other fuel sources have been developed which may provide alternative fuels to wood fibre, the chart shows that if all the planned wood energy plants start operating as planned, the amount of wood fibre used to generate energy will almost double in the next 3 years with the largest increases occurring in the form of recovered wood and coniferous roundwood.

11. POLICY INFLUENCES ON BRITISH WOOD FIBRE AVAILABILITY & DEMAND

11.1. The previous sections in this report have examined existing and potential wood fibre availability and demand. The present situation partly reflects a number of past and present government policies, strategies, regulations and incentives and partly prices, exchange rates and the commercial interests of companies both in Britain and abroad. This section focuses on some of the main policies in Britain that have been, and are influencing the availability of wood fibre and how it is being, and will be, used.

Land Use Policies

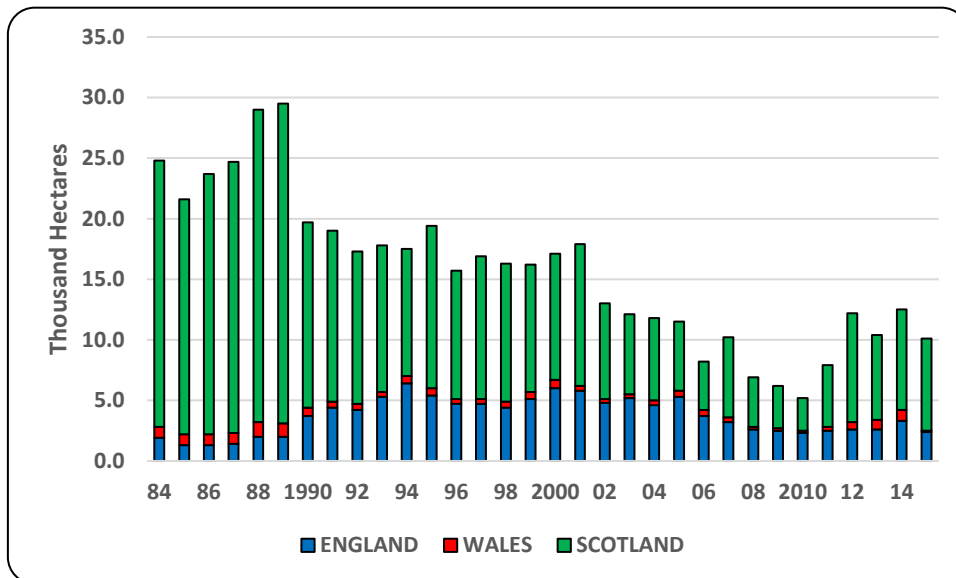
11.2. There is a significant quantity of broadleaved roundwood that is potentially available (Section 8), mostly in England, but owners of broadleaved woods have a variety of objectives in owning them and these seldom include commercial timber production. Broadleaved woods also tend to be small and scattered and valued for their contribution to the landscape which means that it is difficult to base any commercial developments of any scale on the potential availability of broadleaved roundwood.

11.3. The majority of the large scale commercial developments of the forest industry and energy production have been based on the use of conifers and their further long term sustainable growth in Britain, based on British grown fibre, will depend on the future sustainable availability of coniferous wood fibre grown in Britain. Additional wood fibre can be obtained for wood energy plants by using agricultural land for growing short rotation coppice, Miscanthus or other biomass crop, but there are no grants offered for planting either crop at

present. It therefore appears that the majority of any additional wood fibre will need to come from planting more coniferous trees in Britain.

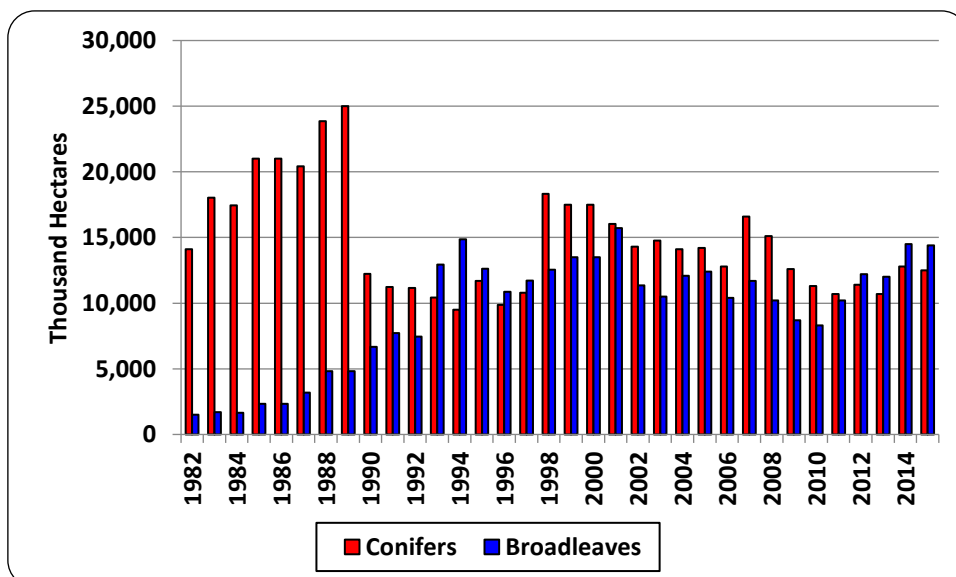
11.4. Much of the present scale of the availability of coniferous roundwood can be directly traced to the planting of new woods in the 1970s and 1980s, which was towards the end of a period when significant areas of new coniferous woodlands were established supported by the use of tax incentives. Since the end of the 1980s when the tax incentives were withdrawn and replaced by grants, the area of new planting has dropped dramatically as chart 11.1 shows.

Chart 11.1: Area of New Planting of Conifers & Broadleaved Trees in England, Scotland & Wales 1984 - 2015



11.5. Chart 11.2 shows that in the early 1980s conifers were used predominantly when establishing new woods, or re-stocking after felling, and since about 2000, the proportions are now almost equal.

Chart 11.2: Conifers & Broadleaves Used in New Planting & Re-stocking in Britain 1982 - 2015



11.6. It should be noted that a potential consequence of the adoption of the UKWAS restocking

guidelines, which promote a more diverse forest structure, could result in a reduction in the area of productive conifers. This will become clearer with future updates of the National Forest Inventory.

11.7. The effects of the significantly reduction in new planting and the increased use of broadleaved trees are now starting to become apparent in the shape and scale of the future availability of coniferous roundwood as the graphs in section 2 show.

11.8. *New woodland creation, and increased planting of conifers will both need to have higher policy priorities if the contributions that wood fibre can provide are to be increased in the longer term, and to do this there will need to be some changes in the land use policy which is heavily influenced by support offered under the EU's Common Agricultural Policy and conservation policies.*

Landfill & Recycling Policies

11.9. Recovering wood and putting it to a further use rather than committing it to a landfill site creates an additional source of wood fibre. This practice has been stimulated by the principles of the European Commission's 5th Programme of Policy and Action in relation to the environment and sustainable development which required the UK government to prepare a waste strategy. The waste strategy policy on landfill is to promote landfill practices which will achieve stabilisation of landfill within one generation. This resulted in the UK Government introducing a Landfill Tax which is presently set at £80.00 per tonne (as of April 2014), except for certain lower risk wastes where the tax is £2.50 per tonne.

11.10. *The size of the landfill tax has encouraged companies to pay greater attention to recycling material that would otherwise gone to landfill. The quality of the material remains an issue in determining its suitability for particular end uses. Changes in present policies relating to recycling, and the size of the landfill tax, will affect the amount of recovered wood that is potentially available.*

Climate Change & Renewable Energy Policies

11.11. There have been a number of major changes in the Government's energy policies over the last 15 years and further changes are continuing, particularly in relation to encouraging the use of renewable energy.

11.12. The regulatory framework for renewable energy in the UK is driven by the 2009 EU Renewable Energy Directive and the 2008 Climate Change Act. The EU Renewable Energy Directive 2009 (EU RED) requires the UK to source 15% of its energy from renewable sources by 2020. In order to achieve this target, it is expected that 30% of electricity generation would need to come from renewable energy. The Climate Change Act 2008 established the world's first legally binding climate change target, with a commitment to reduce the UK's greenhouse gas emissions by at least 80% (from the 1990 baseline) by 2050. The fourth carbon budget committed the UK to reducing its CO₂ emissions 50% by 2027. However, while the UK has a carbon reduction target, it does not have a renewable energy target other than that set out in the EU RED.

11.13. Set against this regulatory framework the UK and Scottish Government have actively encouraged the use of renewable energy derived from wind, wave power and biomass. The major driving force was the financial incentives offered under the Renewables Obligation Order 2009 in the form of Renewable Obligation Certificates. In 2010 this incentive was subsequently changed to ones called Contracts for Difference and Feed in Tariff for electricity producers.

11.14. Initially the Forestry Commission supported DECC in encouraging the use of biomass

in the form of roundwood and sawmill products for generating renewable heat by providing grants towards the cost of installing smaller scale boilers that provided heat. In November 2011 the Renewable Heat Incentive (RHI) was introduced and this provided incentive payments (tariffs) for a range of renewable heating technologies (including wood-fired systems) to support renewable heating at all scales, including businesses, offices, public sector buildings and industrial processes in large factories. Subsequently the scheme was extended to domestic dwellings. The government made a commitment that it will remain open for new projects until at least 2020.

11.15. In 2015 the UK Government announced it wanted all coal fired power stations shut by 2025, which is in line with stricter emissions rules that will become effective in 2016. Levy Exemption Certificates generated as a result of the Climate Change Levy had provided vital financial support for renewable energy producers, but these have now been withdrawn.

11.16. In 2015 the UK Government announced a package of reforms to take control of the costs of renewable electricity subsidies under the Levy Control Framework (LCF). This was because the forecast spend on renewable energy subsidy schemes was set to be higher than expected when the schemes under the LCF were established. The Government has set a limit of £7.6bn in 2020-2021 (in 2011/12 prices), so the current forecast is £1.5bn above that limit. This is due to accelerated developments in technological efficiency, higher than expected uptake of demand-led schemes and changes in wholesale prices. This means that the forecast of future spend under the LCF is now estimated at around £11.4bn (in nominal prices) or £9.1bn (in 2011/12 prices) in 2020/21. As a result a number of the financial incentives were reduced. This also coincided with a dramatic fall in the price of a barrel of oil.

11.17. *A significant amount of wood fibre is presently being used to generate heat and electricity (section 10) and any policy changes leading to an increase in financial support for wood fibre use for energy production is likely to result in reduced potential availability for other wood fibre users.*

Housing & Use of Sustainable Materials Policy

11.18. In 2006 the UK Government introduced the Code for Sustainable Homes with the aim of achieving higher standards of sustainable house building practices. These requirements became encapsulated in the UK Government's Code for Sustainable Homes which is being superseded. The UK's target for all new homes to meet the Zero Carbon Standard from 2016 comes in advance of the Energy Performance of Buildings Directive (EPBD) target for all new buildings in the EU to be 'Nearly Zero-Energy Buildings' from 2020. This has meant increased attention is being given to the carbon footprint of building materials, whole life building costs, the quality of the buildings being constructed and the energy use of buildings once constructed.

11.19. *Of all the building materials presently used, timber has the best characteristics for most easily meeting these higher building standards. British grown timber can help to meet some of these policy objectives as well as making an economic contribution.*

Interrelationship of Policies

11.20. The diversity of wood fibre uses means that its demand and potential availability can be directly or indirectly influenced by a number of Government policies. When policy changes are designed *directly* to influence wood fibre availability and demand, the consequences can be seen and measured. The bigger challenge is where policy changes on the use of wood fibre are *indirect*, such as energy policies as these may not be recognised. It is hoped that this report will make a useful contribution to understanding the many important uses of wood fibre in Britain and how they inter-relate.

12. CONCLUSIONS

12.1. Wood fibre is a versatile renewable natural resource. Most of the wood fibre in Britain is presently used by the forest products sector, and by users generating energy in the form of electricity and / or heat, but there are other significant users in the agricultural, horticultural and equestrian sectors.

12.2. The conclusions in this final section of the report on the potential availability, and demand of users of British wood fibre in Britain, from 2013 to 2035 are based on confidential information that has been directly supplied by 119 companies operating 141 separate plants that have declared an interest either officially, or unofficially, in using or supplying wood fibre in Britain. Within the forest sector the response rate was 81%, and 57% for companies that use or plan to use wood fibre to generate either electricity or heat. Information on the operations of companies that did not contribute to the survey has been obtained from other industry sources, or from published or unpublished information sources.

12.3. As the response rate was so high, and data relating to the operations of companies not responding has been identified through indirect means and has been included, the information given in this report can be regarded as a complete and very accurate picture of wood fibre availability and demand in Britain up to 2035 based on presently available information from the larger wood users. There will be a number of small scale users who in aggregate may increase overall demand and as a result the analyses in this report could underestimate total demand. In this report plans for using new pyrolysis and gasification technology at a commercial scale to generate energy were identified and, if successful, it will increase the demand for recovered wood fibre very significantly. This type of potential new development suggests that this report could underestimate the potential future demand for wood fibre in Britain.

12.4. The potentially available supplies of wood fibre grown in Britain are limited. The main sources are coniferous roundwood, forest residues, short rotation coppice and broadleaved roundwood. Wood fibre is also available as coniferous sawmill products which cannot strictly speaking be regarded as an additional source of wood fibre as they are derived from sawing roundwood, but they are still an important fibre source for a number of companies within the forest sector and for energy production. Recovered wood arising from products made from trees grown in Britain as well as from imported wood and wood products is another important fibre source. Imports of fibre, particularly pellets can add to available wood fibre supplies in Britain, but the economic benefits derived from this are less than if the wood fibre was grown in Britain.

12.5. The findings presented in this report only cover a small proportion of the annual total demand for wood and wood products in Britain. In 2014 Britain imported £7.179 billion of wood and wood products and comprised some 7.31 million tonnes of pulp and paper, 6.43 million cu m of sawn wood, 3.26 million cu m of wood-based panels and 8.39 million cu m of other wood products. Overall Britain is the third largest importer of wood and wood products globally.

Summary of Main Findings

12.6. The main findings of this study are:

Wood Fibre Availability

12.7. The quantities of wood fibre given in this report as being used in 2013, 2014 and 2015 are actual or best estimates of actual use, or production, in those years by most of the companies. Overall total demand may be significantly underestimated because no account has been taken of the quantity of wood fibre used by numerous very small users in Britain.

12.8. The most recently prepared detailed 25-year and 50-year forecasts of potential coniferous roundwood availability, prepared by the Forestry Commission using information collected as part of the National Forest Inventory, indicate that potential availability of coniferous roundwood in Britain will continue to increase for the next 15 years or so until about 2030.

12.9. The quantities of wood fibre that are given as being available from 2015 onwards are quantities that are "potentially" available which means they are the maximum quantities of commercially suitable wood fibre that are theoretically available. Whether these quantities are "commercially" available will depend on a whole range of different factors such as cost, and technical and planning issues. *The actual "commercial" availability may therefore be significantly less than the "potential" availability of a wood fibre source.* A recent Forestry Commission report has shown that since 2000 there has been a steadily increasing gap between the forecast potential availability of coniferous roundwood and actual production. In 2013, the gap between the two was 2.48 million tonnes with just over half this total accounted for by the woods in the private sector. The actual gap between demand and availability of coniferous roundwood may therefore be significantly narrower in practice than the charts in this report indicate.

12.10. Another factor which may reduce the potential 'availability' of roundwood for sawmillers is its quality in terms of straightness and branch parameters and the Forestry Commission's coniferous roundwood availability forecasts does not include any assessment of this.

12.11. Almost no increase is forecast in the potential availability of roundwood comprising logs of t.e.d of 16 cm or less. It is all expected to be sawlog material with a t.e.d of 16 cm or more.

12.12. The quantity and timing of potential availability of both coniferous and broadleaved roundwood assumes that there will be no significant outbreak of disease in trees in Britain. Should one occur it will have very significant implications.

12.13. Almost all the increase in production is expected to come from woods in a wide variety of ownerships rather than ones managed by Forestry Commission England, Forestry Commission Scotland or Natural Resources Wales.

12.14. Only about one third of the woods not managed by the Forestry Commission or Natural Resources Wales are certified as being sustainably managed under the UK Woodland Assurance Standard (UKWAS) so a significant proportion of future coniferous roundwood availability may not be certified and this will have important implications for companies whose products are sold as being obtained from woods that are being sustainably managed. A number of owners do join UKWAS shortly before felling trees so the shortfall may not turn out to be as serious as present figures would suggest.

12.15. There is potentially a large quantity of broadleaved roundwood available, principally in England. This is mainly in small scattered woods in a very wide range of ownerships and managed to meet a variety of objectives other than commercial roundwood production. The

quality of much of the timber is relatively poor, but the poorer quality material can still be used as a fuel.

12.16. There has been little or no recent planting of new areas of short rotation coppice or Miscanthus that could add to supplies of wood fibre available for generating electricity or heat, and there are no grants presently being offered to encourage the planting of either crop.

12.17. Some forest residues are being collected for use as wood fuel, but the scale of these operations is limited by soils, site types and environmental concerns.

12.18. There may be some opportunity to increase the recovery of wood from waste streams from present levels using new technology for sorting material, and also if the wood in waste streams increases in size because of a greater use of wood in construction, but the amounts are expected to remain relatively small.

12.19. As sawmill products are derived from the roundwood that the mills use, its availability is directly related to roundwood availability and sawmilling activity.

12.20. Potential availability of coniferous roundwood is forecast to start falling in Britain in about 2030 and from then to fall quite sharply. In some parts of Britain, such as Central England the reduction in potential availability is not expected to start occurring until 2035, and in Northern Scotland until 2040, but then it is also forecast to fall.

12.21. A potential consequence of the adoption of the UKWAS restocking guidelines which promote a more diverse forest structure could result in a reduction in the area of productive conifers. This will become clearer with future updates of the National Forest Inventory.

12.22. The establishment of new coniferous woodlands will increase the potential availability of coniferous roundwood, but this is unlikely to have any impact for another 30 or 40 years, although some smaller dimension roundwood may become available sooner if the woods can be thinned.

Demand of UK Users of Wood Fibre

12.23. Wood fibre is presently used by the forest industry and for generating electricity and heat, and also for agriculture, horticultural and equestrian purposes.

12.24. The figures for forecast demand for wood fibre given in this report for 2013, 2014 and 2015 are actual or best estimates of actual use, or production, by most of the companies.

12.25. The forecast demand for wood fibre is based on confidential information supplied on 104 separate forest industry and wood energy plants, and projections made on the estimated existing wood fibre use in 37 other small companies who did not supply information for this study.

12.26. At least two companies in the forest sector have plans to expand, and detailed planning is underway to build a further 13 new plants that will use wood fibre, and of these 13, six are based in the north of England and are planning to use only recovered wood.

12.27. Some 3 million tonnes of wood fibre sourced in Britain is presently used to generate energy and this total will rise to about 6.5 million tonnes by 2018 if all the planned wood energy plants start operating at their full production levels.

12.28. Drax imports pellets for almost all its wood fuel requirements and Lynemouth power station will also do this as well if it proceeds with its conversion to biomass. MGT is a new plant being planned and it is expected to base its operation on imported pellets. Total imports

of wood fibre in the form of pellets could then reach in excess of 10 million tonnes per annum by 2019. As the pellets are not derived from wood fibre sourced in Britain they have been treated separately in this report.

12.29. There are several wood energy plants that have been announced in different locations in England that will use either a gasification or pyrolysis process to generate energy. If either of these processes can be developed successfully on a large operational scale, this will result in further demand for wood fibre; probably in the form of recovered wood. This has not been allowed for in the demand projections made in this report.

Wood Fibre Availability & Demand

12.30. After a long period when the potential availability of wood fibre in Britain exceeded demand, the difference is now narrowing. The difference may be tighter in practice than the figures in this report show as the roundwood that becomes available commercially is likely to be less than the quantities that are forecast to be potentially available in the Forestry Commission forecasts. It has also not been possible to take account of the roundwood quality, or whether it is UKWAS certified; both are of increasing importance and may reduce the quantities of roundwood that is available commercially to the forest industry.

12.31. In the North of England demand for coniferous roundwood exceeds potential availability, and to a lesser extent in the Central England zone, and potential availability and demand is very finely balanced in South Scotland for the next 10 years. The balance is slightly less critical at present in other parts of Britain.

12.32. Imbalances already exist in certain parts of the country between the potential availability of coniferous roundwood locally and the coniferous roundwood requirements of companies located there. Companies overcome the situations they face by buying roundwood elsewhere and transporting it back to their plants. With the tightening of potential wood availability relative to demand, the movement of coniferous roundwood is likely to increase as companies are forced to source their supplies in areas where there is greater potential availability of coniferous roundwood.

12.33. The demand for coniferous roundwood in Britain with a t.e.d of 16 cm or less has been almost the same as demand for the last 3 years and this has resulted in higher prices for growers, but it has also meant that smaller sawmills and other users of SRW have found it increasingly difficult to source supplies at competitive prices.

12.34. Potential demand for coniferous roundwood with a t.e.d of 16 cm or less is forecast to exceed potential availability in 2018 when a number of smaller energy plants expect to start operating. This will create extra sourcing pressures for users of the smaller sizes of roundwood. It could also have a consequential impact on all sawmillers as traditional users of smaller sizes of roundwood source are forced to meet their roundwood requirements by buying larger log sizes which could result in a reduction in the quantity of wood chips, sawdust, pin chips, shavings, slab wood produced by sawmills.

12.35. It is difficult to forecast the impact of the reduction in the potential availability of coniferous roundwood in about 15 years' time in 2030, but it could mean that when the time comes, competition to purchase supplies may raise prices to such a level that it becomes increasingly difficult for companies to survive financially. Alternatively, more companies may have to start importing wood and wood products which will reduce the economic benefits that the sector has been contributing, or the sector has the potential to provide if roundwood was potentially available.

12.36. At present the total potentially available quantity of recoverable wood appears to exceed demand in Britain and so a significant amount is exported. This situation looks set to

change significantly in 2018 if all the planned new energy plants become operational. After that the potential availability of recoverable wood is forecast to match demand and this situation is likely to mean a very competitive pricing situation.

Commercial Implications of Findings

12.37. The information in this report shows that overall in Britain coniferous roundwood potential availability is forecast to increase and that it will exceed demand for the next 15 years. This situation varies in different regions with companies in South Scotland and the North and Central England zones already facing a situation where demand exceeds potential availability. In South Scotland the balance between the two is very close. Companies are already overcoming the lack of local coniferous roundwood availability by buying roundwood in other areas and transporting it to their plants. This way of balancing potential availability and demand is expected to grow in importance over time.

12.38. After the next 15 years the potential availability of coniferous roundwood is forecast to fall fairly sharply in most parts of Britain to present levels in about 2037 before continuing to fall over the period up to 2050 when it bottoms out before starting to rise again. This is largely because of the lack of planting of new coniferous woods since the late 1980s. This longer term prospect of a reduction in potential roundwood availability is likely to influence companies' longer term expansion plans and investment decisions on new plant and equipment.

12.39. In the past coniferous roundwood sourced from woods managed by the Forestry Commission or Natural Resources Wales made up over half the roundwood coming to market. The balance is now shifting so that much of the future increase in potential coniferous roundwood availability is forecast to come from other, mostly privately owned woods. The prospect of sourcing roundwood from an increasing large number of woods in diverse ownerships, and the prospect of tightening supplies relative to demand in many zones, is starting to result in companies paying greater attention to finding ways to increase the security of their future coniferous round wood supplies.

12.40. The quality of the coniferous roundwood, its accessibility and whether it comes from sustainably managed woods will be other important issues for all companies who expect to use coniferous roundwood.

12.41. Although the total availability of recovered wood has exceeded demand recently, and some has been exported, this situation is forecast to change quite significantly in 2018 if a number of new wood energy plants become operational. The potential availability and demand for recovered wood is then expected to be very tight which could result in prices for recovered wood rising quite significantly. The quantities of wood recovered, and its separation into grades, can then be expected to gain increased attention.

Strategic & Policy Implications of Findings

12.42. The information in this report has shown that there is a limited quantity of wood fibre in Britain to meet a growing demand for it.

12.43. The present availability and demand for wood fibre is shaped by a number of different past and present Government policies, strategies, incentives and regulations involving several Government departments. Given the interconnectivity of wood fibre markets, there is a need for a clear overview and policy co-ordination to achieve the maximum public benefits for wood fibre use in Britain over the long term. Any policy changes connected with wood fibre use that take place without considering the potential consequential changes on the delivery of other policies may have a number of unintended results.

12.44. The present potential availability and demand situation in South Scotland and the North of England is resulting in increasing transport distances as roundwood is moved from areas with potentially more roundwood to those that have less. This movement is set to continue and may be expected to increase as the balance in potential availability and demand for coniferous roundwood gets tighter over the next 15 to 20 years. Transport issues are therefore likely to be of increasing importance.

12.45. The economic and policy consequences for the findings presented in this report are that:

- There is a need to continue to focus on wood product innovation, and in finding operational and manufacturing efficiencies in the way wood fibre is used as its availability is limited.
- Ways must be found to increase the quantities of virgin wood fibre grown in Britain by planting more trees. Even then there may be a dip in potential availability for a period until these trees can reach a size suitable for harvesting.

12.46. Given the scale and variety of demands for wood fibre, the prospects of its reduced availability over the longer term will undoubtedly reduce the economic contributions that the domestic forest sector and wood energy industry can make in the future.

John Clegg Consulting Ltd

June 2016

ANNEXES

13. STUDY METHODOLOGY

13.1. The study has been primarily a desk based one and the methodology used is described in more detail in this annex.

Geographical Coverage & Data Presentation

13.2. The study covers England, Scotland and Wales. To identify geographical variations in wood fibre availability and demand in England and Scotland both these countries have been divided into zones. The zones are based on ones that the Forestry Commission used in conducting the National Forest Inventory (<http://www.forestry.gov.uk/inventory>).

13.3. In carrying out the fieldwork and presenting the results, the Forestry Commission used a total of 14 different geographical zones in Great Britain. This study has been based on those zones, but some of the zones have been amalgamated to protect the confidentiality of some commercially sensitive information provided by companies in support of this study. Table 13.1 shows which zones have been amalgamated for the purpose of this study.

Table 13.1: Zone Names Used in this Study and in the National Forest Inventory

Names of Zones in Present Study	Forestry Commission NFI Zones
Northern Scotland Zone	North Scotland
	North East Scotland
Central Scotland Zone	West Scotland
	East Scotland
South Scotland Zone	South Scotland
Northern England Zone	North East England
	North West England
	Yorkshire & the Humber
Central England Zone	West Midlands
	East Midlands
	East of England
South England Zone	South West England
	South East England & London
Wales (Zone)	Wales

13.4. Map 13.1 shows the geographical boundaries of the zones that have been used in this report.

Map 13.1: Study Zones Based on the 2012 NFI Forecast of Coniferous Roundwood Availability



Based on: Forestry Commission, 2012

13.5. There has only been one significant boundary change by the Forestry Commission since the 2005 coniferous roundwood availability forecast and that is in the boundary between the Forestry Commission's East of Scotland and South Scotland zones. While this has little impact on the potential availability of coniferous roundwood per se, it does change the number of wood users in those two zones compared with the previous study⁷.

Identification of Potential Users & Exporters of Wood Fibre

13.6. The initial task was to update the identification of as many sawmills, pulp and paper mills, and panelboard mills as possible that use coniferous roundwood in England, Scotland and Wales. This was done using information on the company's files and published information sources. All of the larger operations have been identified, but some of the smaller roundwood fencing operations that use coniferous roundwood could have almost certainly been missed. A breakdown showing the numbers, types of plant and their geographical locations of the plants included in the survey is given in table 13.2.

⁷ John Clegg Consulting Ltd, 2010: Wood Fibre Availability & Demand in Britain 2007 – 2025

Table 13.2: Geographical Locations & Types of Plants Included in this Report

Zone	Plant Type						Total All Plants No
	Sawmill Plants	Panelboard Mills	Paper Mills	Existing Energy Plants	Proposed Energy Plants	Other	
Northern Scotland	9	1		5			15
Central Scotland	9	1		3 (1)	4 (1)		17
South Scotland	16	1	1	3	0		21
Northern England	17 (6)	1	1	4	4 (3)		27
Central England	14 (4)			5 (5)	0		19
South England	15 (9)	1		1	3 (2)		20
Wales	9 (2)	1		3 (1)	2 (1)		15
Other / Exports						7	7
Total	89	6	2	24	13	7	141

Footnotes: Figures in brackets show the number of companies that have not directly contributed information to this study. Industry sources or publicly available information has been used to estimate their wood fibre availability and demand.

One company that is using some British wood for co-firing is included in the existing energy plant total.

Plants involved in the production of horse bedding have been classified as sawmills for the purpose of this survey.

One company that is using British wood fibre for its CHP boiler is classified in this table as an existing energy plant as it only uses recycled paper.

Wood pellet manufacturers have been included under the category of wood energy plants.

Some companies own and operate more than one plant counted in the table.

13.7. The survey has not covered:

- The wood used by the sawmills, pulp and paper and board mills for generating their process heat or running kilns as the wood fibre has been allowed for in their roundwood intake, or in their estimates of other products they have used.
- The estimated 1,832 boilers installed in domestic buildings in Scotland which are using about 14,500 green tonnes per annum of wood fuel mostly in the form of pellets.
- The quantity of hardwood logs burnt in domestic fires.
- The sawmills using broadleaved / hardwood roundwood as they are all small and geographically scattered and their total demand for broadleaved roundwood is very small in relation to its potential availability, and in relation to the size of coniferous roundwood availability and demand. (See section 9 main report).

13.8. Table 13.3 compares the present coverage of this study with the one conducted in 2010.

Table 13.3 Numbers of Plants Included in 2010 and 2016 Studies

Type of plant	2010 Study	2016 Study
Sawmill Plants	61	89
Panelboard Mills	7	6
Paper & Paperboard Mills	2	2
Existing Energy Plants	16	24
Proposed Energy Plants	47	13
Other	6	7
Total	137	141

13.9. This shows that the number of sawmills included in the present study is higher than the 2010 study and the reason for this is that more smaller sawmills have been included than previously. The other major change is in the number of proposed new energy plants that have been identified which is significantly lower than the figure identified in 2010. This is probably almost entirely explained by changes in energy policy which are detailed in the main report.

Survey Form Design

13.10. It was agreed with the study sponsors that very similar forms to those used in the 2010 study would be used again as they were found to be satisfactory in the last survey. There were separate forms for sawmills, pulp and paper mills and board mills, log exporters and energy plants. The forms asked companies to supply information on the quantity of roundwood they used in 2013 and 2014, what they expect to use annually up to 2035, and the zones from which the roundwood was being or could be sourced in the future. In addition, sawmills were asked to supply information on the types and quantities of sawmill products (e.g. unbarked/barked chips, slab wood, sawdust and bark) they estimated they produced, or are likely to produce, and what the uses of these products were, or might be in the future. The panelboard and paper mills were asked about the wood fibre types they used and their zonal sourcing.

13.11. Respondees were asked to identify from which zones they expected to source their logs by providing average annual percentages. As other companies do not know these sourcing plans, the competition may be higher than anticipated and buyers may change their purchasing intentions and buy roundwood in other zones, thus shifting potential demand around between zones. Total purchasing intentions in a zone could also work out to be higher than expected so the net availability of coniferous roundwood may not be a precise figure for a particular year, but it will provide a useful indication of potential demand for coniferous roundwood in that particular zone.

13.12. Discussions prior to the previous study about what roundwood size categories to use resulted in the conclusion that few mills kept a detailed inventory of the size categories of roundwood they used so there would be no merit in seeking to collect this information and trying to match it to the forecasts of potential roundwood availability.

Distribution of Survey Forms & Responses

13.13. The survey forms were mostly emailed out in the middle of November 2015. When companies had taken part in the 2010 study, their previous returns were scanned and returned with the email about this new study. Reminder emails were sent out in December 2015 and further follow up emails and phone calls were made in early January 2016.

13.14. The final response rate obtained was 75% and suggests that all parties recognised the importance of the findings of the study. Of those companies who failed, or refused to provide information, 20 were in the wood using sector in England and Wales and comprised small or relatively small sawmills, 2 were existing wood energy plants and 13 were proposed new energy plants. To overcome this, we have used information from a variety of sources within the industry, and published information, to obtain data on all these companies' existing, or proposed production, or use of wood fibre and estimates for these companies are included in the results. While this extra data may not be precise, it does mean that the coverage is complete for all the companies that have been identified.

Analysis of Results

13.15. The confidential information on the returned survey forms was entered on Excel spreadsheets where it was analysed. Some practical issues that were identified in analysing the data were:

- the returns from some sawmills covered only single shift working, while for others it covered extended or double shift working. Potentially all sawmills could move to double shift working if there was the demand and there was suitable quality coniferous roundwood available at an acceptable price.
- The locations of some sawmills and wood energy plants are very close to zonal boundaries and so there will be some distortions arising from this in the zonal transfer data for coniferous roundwood and sawmill products.

13.16. As the response rate was so high and the data relating to the operations from companies not responding has been identified through indirect means and has been included, the information given in this report can be regarded as a complete and very accurate picture of the potential wood fibre availability and demand in Britain up to 2035 based on the information presently available from the larger users. The study has not covered the numerous small users so the scale of demand may be underestimated significantly.

14. CONIFEROUS & BROADLEAVED ROUNDWOOD AVAILABILITY FORECASTS

14.1. This section begins by providing information on Britain's woodlands and describing where the forecasts of coniferous and broadleaved roundwood availability have come from that are used in this report. It then goes on to consider a number of technical issues starting with a brief analysis of the different contexts in which the term 'availability' can be used before explaining how the term is defined for the purposes of this report. The factors that will shape the overall future availability of coniferous roundwood in England, Scotland and Wales are then identified, along with the technical information that any forecast should ideally provide if it is to bring the greatest strategic and operational benefits to businesses. The remainder of the section then presents the results for the 25-year coniferous roundwood availability forecast published by the Forestry Commission in 2012 and the 50-year availability forecasts for softwood and hardwood timber published in 2014.

Composition of Woodlands in Great Britain

14.2. A summary of the composition and ownership of Britain's woodlands in 2012 when the forecast of coniferous and broadleaved roundwood availability forecast were published are given in table 14.1.

Table 14.1: Species Composition and Ownership of Woods in England, Scotland and Wales in 2012

'000 hectares

	Conifers	Broadleaves	Total Woodland
FC/ NRW			
England	154	60	214
Wales	100	17	117
Scotland	448	33	481
Non-FC/ NRW			
England	180	900	1,081
Wales	51	136	187
Scotland	610	302	912
All Woodland			
England	334	961	1,295
Wales	151	153	304
Scotland	1,058	335	1,392
UK	1,543	1,448	2,992

Source: Forestry Commission, 2015. Forestry Facts & Figures

Source of Forecasts on Roundwood Availability

14.3. The wood availability forecasts used in this study have been prepared and published by the Forestry Commission and are based on National Forest Inventory data. More detailed information about the methodology used to conduct the inventory and the statistical accuracy of the estimates can be found on the Forestry Commission's website: <http://www.forestry.gov.uk/inventory>. The results for the woodland area and the associated maps were first published in May 2011.

14.4. The following three estimates of coniferous and broadleaved roundwood availability in Britain have been prepared and published by the Forestry Commission and have been used in

this report:

- A 25-Year Forecast of Softwood Availability for the UK – July 2012.
- A 50-year Forecast of Softwood Timber Availability – April 2014
- A 50-year Forecast of Hardwood Timber Availability – April 2014

14.5. Updated 25-year and 50-year forecasts of coniferous roundwood availability in Wales have just been prepared by the Forestry Commission (2016) and they have been used in this report rather than the earlier ones that have been used for the other zones. A published update of the 25 year forecast by the Forestry Commission in 2016 only gave revised forecasts for England, Scotland and Wales and not by regions. As the regional analysis is considered an important part of this study, the revised country forecasts have not been used.

14.6. The methodology used in presenting the individual forecasts is given in the respective reports and is therefore not repeated here.

TECHNICAL ISSUES

DEFINING AVAILABILITY

14.7. The terms 'roundwood production' and 'roundwood availability' are sometimes used interchangeably in certain contexts. In this report the term 'roundwood production' is taken to be the actual outturn of roundwood that is produced as a result of harvesting operations. 'Roundwood availability' refers to the roundwood that is available in the forest and it may be described as being either 'potentially' or 'commercially' available. The distinction between the two terms is very important. Where roundwood is described as being 'potentially' available it is taken to mean the maximum quantity of commercially suitable roundwood that could theoretically be harvested for commercial purposes. i.e. the biological potential. In practice there will be a number of planning, environmental, landscape, social, harvesting cost and location factors that commercial users will need to take into account in developing roundwood harvesting plans and these are likely to mean that commercial availability will be less than 'potential availability' to a greater or lesser degree at local, regional and national levels.

SOME IMPORTANT FACTORS RELATING TO THE WOOD AVAILABILITY FORECAST

Size of Woods

14.8. The NFI includes woods of 0.5 hectares and over and consequently the potential availability figures given in this report include the quantities of roundwood from these small woods which can often not be considered to be commercially viable to harvest.

Differences Between Forecasts for the Forestry Commission & NRW Managed Woods & Privately Owned Ones

14.9. It is important to note that the forecast of coniferous roundwood availability has been developed using two quite different approaches. The forecast produced by Forest Enterprise and NRW has been developed using detailed information on growing stock in each Forest District, together with harvesting prescriptions from current design plans and crop management regimes. The output is therefore built up from the stand/felling coupe level and represents a production plan for the first five years and thereafter an indicative forecast of production.

14.10. The forecast for the private sector is based on much broader information about crops obtained from the National Forest Inventory (NFI). An important limitation on the private sector forecast is that the private sector woodlands are in a multiplicity of ownerships and the management and production assumptions do not include firm individual or collective plans to harvest timber at a particular time, although they are based on a set of management prescriptions

provided by the larger woodland management companies.

Harvesting Scenarios

14.11. The potential availability forecasts will be influenced to some extent by when and how woods are harvested, particularly in the private sector and these scenarios are explored in the wood availability reports published by the Forestry Commission.

Stands Beyond Rotation Age or 'Overdue' Timber in Private Sector Owned Woods

14.12. The existence and treatment of 'overdue' timber is a very important aspect of the forecasts used in this report. The Forecast reports state that "'overdue timber' is timber contained within stands that are already over the age prescribed for felling according to the management scenario used for a forecast at the start of the forecast period. Application of the rules of the scenario dictates that such stands be immediately felled on day one of the forecast. With this being the case, this prescription is followed in the implementation of the forecast, but the volumes immediately felled by reason of being 'overdue' are reported separately from other harvested volumes – in recognition that this is an artificial and unlikely occurrence."

14.13. "The fact that, in the private sector especially, the volume of overdue timber represents a significant amount of total standing volume at the start of the forecast indicates that a portion of the estate is not currently being managed according to the assumed scenario. For 'biological potential' scenarios, this in turn implies that the current practice on at least a portion of the private sector estate is to leave some stands beyond the age of maximum mean annual increment (MAI). Since such stands are currently being managed in a way contrary to the assumed prescription, these, and some other stands that are currently below the age of maximum MAI, are also not likely to be managed in the assumed way in the future. Reasons for the observed 'delayed felling' leading to the presence of overdue timber at the start of the forecast are not known", but in the 25-year coniferous roundwood forecast the estimated amount was some 42 million cubic metres standing and most of this is in private sector owned woods. Whether this timber is 'available' for harvesting or not will depend upon a number of factors, including management objectives and environmental constraints. In practice a wide array of felling and retention practices will apply to these stands, with some being retained and some felled at different points in time in the future.

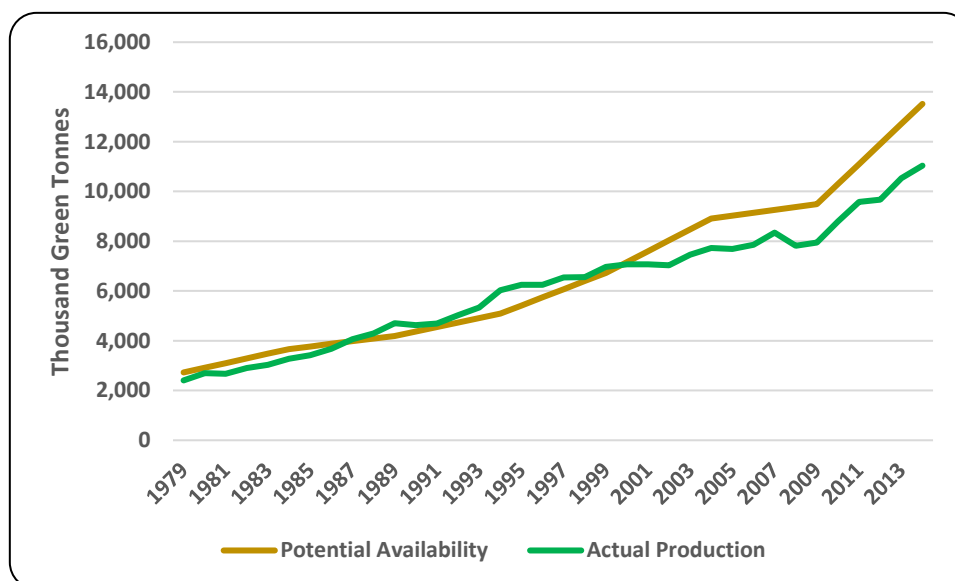
14.14. "All areas felled as overdue will be restocked in the forecast on a like-for-like basis, as is the case for any other felled stand in the forecast period. In most scenarios, this approach will not materially impact on the forecast timber volumes as the replacement stands will not mature within the forecast period. For more information about the Inventory methodology, see the *National Forest Inventory forecasts methodology overview*."

Comparison Between Forecasts of Potential Availability & Actual Production

14.15. The Forestry Commission has recently published the results of an analysis comparing forecasts of potential coniferous roundwood availability and actual production⁸ and these are shown in chart 14.1

⁸ Forestry Commission, 2016. 25 Year Forecast of Softwood Timber Availability (2016)

Chart 14.1: Comparison of Forecasts of Potential Coniferous Roundwood Availability and Actual Production



14.16. The chart shows that since 2000 there has been an increasing gap between the coniferous roundwood that is forecast to be potentially available and the coniferous roundwood that is actually harvested. In 2013 the actual production was 2.48 million tonnes less than the coniferous roundwood that was forecast to be potentially available. While there will undoubtedly be a number of reasons for the differences, this gap is potentially very significant as potential availability and demand for coniferous roundwood becomes increasingly tight.

Differences in Forecasts Between 25-year and 50-year Coniferous Roundwood Availability Forecasts

14.17. The methodology used in developing the two forecasts is broadly the same and is described in detail in both reports, but the main reasons for differences are in the private sector forecasts and have been identified as:

- Age class structure
- Harvesting activity
- Overdue timber

14.18. For further information, see the Forestry Commission's Forecast Availability reports.

CONIFEROUS ROUNDWOOD POTENTIAL AVAILABILITY FORECAST

14.19. The forecast of potential roundwood availability is based on the areas of woodland, their composition and ownership in 2012 given in table 13.1.

14.20. The Forestry Commission's 25-year forecast is given in table 14.2 and it shows forecast average annual availability of coniferous roundwood above 7 cm t.e.d. in England, Scotland and Wales by zones for each five-year period after converting from standing volumes to roundwood outturn in tonnes.

Table 14.2: Forecast Coniferous Roundwood Availability for England Scotland & Wales - converted to '000 tonnes of Roundwood

Top-diam Class	2012-2016				2017-2021				2022-2026				2027-2031				2032-2036				
	FC	PS	Total	% Spruce	FC	PS	Total	% Spruce	FC	PS	Total	% Spruce	FC	PS	Total	% Spruce	FC	PS	Total	% Spruce	
Northern Scotland																					
7-14 cm	196	272	468		125	230	356		121	246	367		116	306	422		107	370	477		
14-16 cm	70	89	159		51	100	151		52	96	148		51	109	160		45	138	183		
16-18 cm	66	89	155		51	108	159		54	112	166		53	129	182		48	158	206		
18 + cm	356	707	1,063		360	924	1,284		391	1,014	1,405		403	1,155	1,558		392	1,491	1,883		
Total	687	1,158	1,845	37	587	1,363	1,950	45	618	1,467	2,085	47	623	1,699	2,322	45	592	2,157	2,749	48	
Central Scotland																					
7-14 cm	261	309	570		248	278	526		220	253	472		221	276	497		162	278	440		
14-16 cm	121	115	235		116	128	244		107	128	235		101	139	239		81	130	212		
16-18 cm	127	117	244		124	152	276		116	165	281		111	176	287		92	166	258		
18 + cm	668	750	1,419		685	1,274	1,959		686	1,510	2,195		677	1,754	2,430		632	1,774	2,406		
Total	1,177	1,292	2,468	79	1,173	1,832	3,004	86	1,128	2,055	3,183	86	1,109	2,345	3,454	84	968	2,348	3,316	85	
South Scotland																					
7-14 cm	289	276	564		242	266	508		192	371	563		163	387	550		144	221	365		
14-16 cm	131	113	244		116	121	237		95	183	278		82	186	268		71	113	185		
16-18 cm	138	124	262		125	145	270		105	227	332		93	236	330		80	144	225		
18 + cm	654	820	1,474		684	1,127	1,811		663	2,089	2,752		647	2,632	3,279		547	1,751	2,298		
Total	1,212	1,333	2,544	89	1,166	1,659	2,825	89	1,055	2,871	3,925	93	986	3,442	4,427	94	843	2,229	3,072	88	
North England																					
7-14 cm	153	99	252		116	89	204		102	76	178		90	118	208		86	103	189		
14-16 cm	66	38	103		52	38	89		46	39	85		43	43	86		40	34	74		
16-18 cm	66	43	108		52	45	97		48	49	97		45	51	96		40	38	78		
18 + cm	304	371	675		282	578	860		257	570	827		243	708	951		227	541	768		
Total	588	550	1,138	60	501	749	1,251	66	452	735	1,187	71	421	920	1,342	65	394	715	1,109	62	
Central England																					
7-14 cm	58	49	107		34	41	75		25	28	53		18	42	60		17	76	93		
14-16 cm	16	21	36		13	17	30		10	14	24		7	12	19		6	24	30		
16-18 cm	14	23	37		16	22	38		12	17	30		9	16	25		7	28	35		
18 + cm	187	340	527		207	440	647		228	408	636		236	428	664		223	582	805		
Total	275	433	708	18	270	521	790	31	276	467	743	25	270	498	768	23	253	710	964	37	
South England																					
7-14 cm	35	106	141		26	85	112		21	77	98		16	105	121		16	114	130		
14-16 cm	12	40	52		11	37	48		7	28	35		7	30	37		5	34	39		
16-18 cm	12	46	58		11	45	57		9	36	45		7	34	41		6	38	43		
18 + cm	150	615	765		153	716	868		147	665	812		157	713	870		134	549	684		
Total	210	807	1,017	27	201	883	1,084	27	184	806	990	31	187	882	1,068	38	161	736	896	33	
Wales																					
7-14 cm	160	81	241		161	75	236		139	73	212		107	72	179		125	96	221		
14-16 cm	69	35	104		66	34	100		61	34	95		50	28	78		59	42	101		
16-18 cm	73	40	113		69	46	115		65	43	107		57	33	90		69	50	119		
18 + cm	484	495	979		506	686	1,192		468	676	1,144		437	452	889		506	461	967		
Total	786	652	1,437	64	802	841	1,643	72	732	826	1,558	68	651	585	1,236	68	759	649	1,408	76	
Total																					
7-14 cm	1,151	1,192	2,344		952	1,064	2,016		819	1,124	1,943		731	1,306	2,037		658	1,257	1,916		
14-16 cm	484	451	935		425	475	900		377	522	900		340	547	887		308	515	822		
16-18 cm	495	482	977		447	563	1,010		409	649	1,058		376	674	1,050		342	622	964		
18 + cm	2,804	4,098	6,902		2,876	5,746	8,621		2,839	6,931	9,770		2,799	7,842	10,642		2,662	7,149	9,810		
Total	4,934	6,224	11,158		4,699	7,848	12,548		4,444	9,227	13,671		4,247	10,370	14,617		3,970	9,543	13,513		

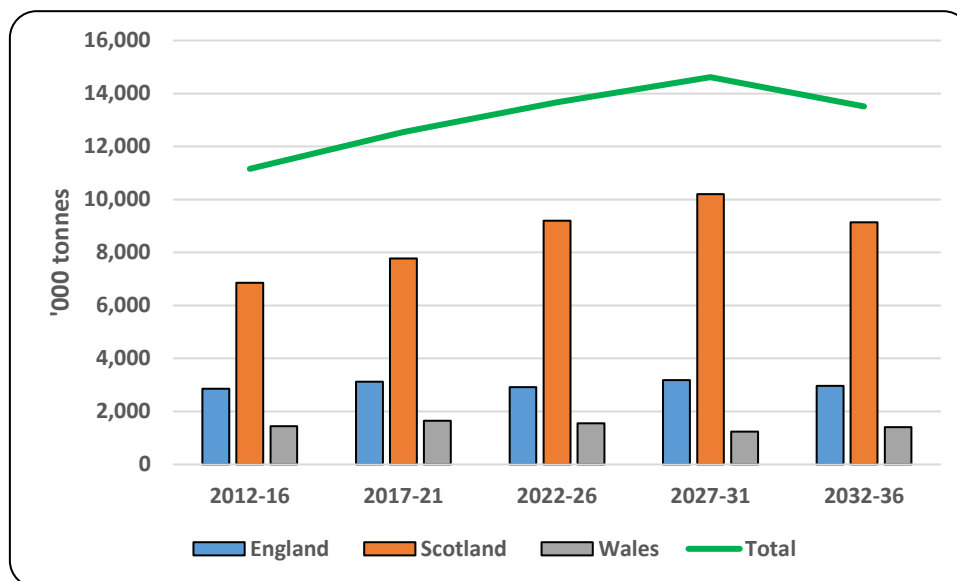
Source: Forestry Commission, 2012

Footnote: FE = Forest Enterprise. PS = Private Sector

Footnote: The forecast of coniferous roundwood availability figures for Wales in the table are the most recently released ones (2016)

14.21. This forecast is shown graphically in chart 14.2 for England, Scotland and Wales for each of the five year periods.

Chart 14.2: Potential Availability of Coniferous Roundwood in England, Scotland & Wales 2013 -2035



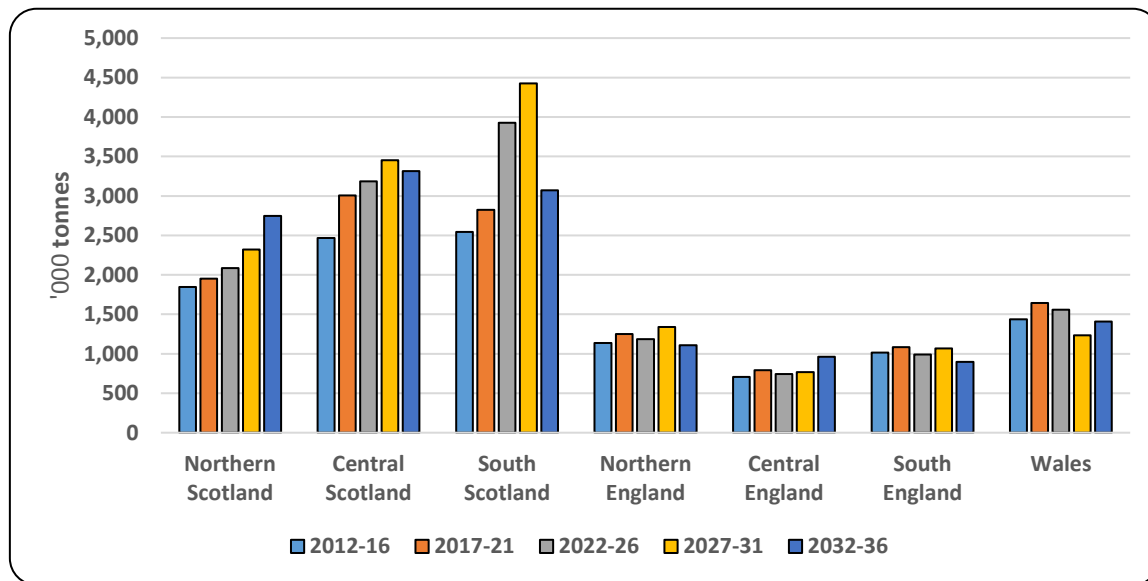
Source: Forestry Commission, 2012

14.22. This chart shows that the potential average annual availability of coniferous roundwood (and therefore by implication sawmill products) is small in Wales, and also in England given the size of the country's total woodland area relative to Scotland's. The chart also shows that the total potential availability of coniferous roundwood is forecast to rise until about 2030 and then it starts falling. Almost all the forecast increase over the next 15 years is expected to occur in Scotland.

14.23. The location of the coniferous roundwood that is forecast to be potentially available is very important for industry. Roundwood located a long way from an existing wood processing or wood energy plant may be uneconomic to purchase and transport, particularly at a time of rising fuel prices and global price competition. At present it is not possible to use GIS to show the FC's forecast availability of coniferous roundwood at a greater local detail other than zones, nor can the locations of the coniferous woods and forests underlying the forecast be shown.

14.24. The potential availability of coniferous roundwood by zones and by 5-year periods up to 2035 within England and Scotland is shown in chart 14.3, along with the potential coniferous roundwood availability in Wales.

Chart 14.3: Potential Average Annual Availability of Coniferous Roundwood by Zones in England and Scotland and in Wales by Five-Year Periods from 2013 to 2035



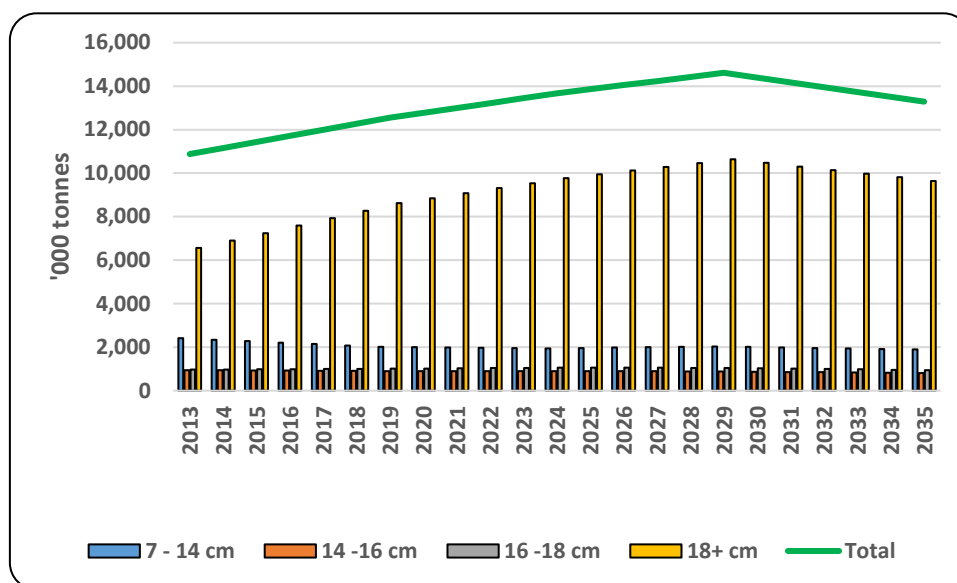
14.25. This shows that in the next 15 years the greatest increases in annual average coniferous roundwood availability is forecast to occur in Scotland and very little change in potential availability is expected in any of the zones in England or in Wales. Another notable feature is that the potential availability of coniferous roundwood is forecast to *fall* sharply in South Scotland after 2030 and this is where a significant part of the wood processing industry is located.

14.26. The FC's potential coniferous roundwood availability forecast is given as an average annual volume over a 5-year period throughout the rest of the report. For the purpose of presenting the data in this report, the forecast has been smoothed to show changing annual quantities on the assumption that the forecast annual quantities for a five-year period occur in the mid-point of the Forestry Commission's five-year forecasting period.

POTENTIAL QUANTITY & DIMENSIONS OF CONIFEROUS ROUNDWOOD

14.27. The forecast potential availability of roundwood by size categories is shown in chart 14.4 based on the information in table 14.3.

Chart 14.4: Potential Availability of Coniferous Roundwood by Top End Diameter Size Categories in Britain 2013 - 2035



Source: Forestry Commission, 2012

14.28. The chart shows that the future growth in availability of coniferous roundwood in England, Scotland and Wales will be in sawlogs with a top diameter of 18 cm or more, and not in SRW. Little increase is forecast in the future availability of coniferous SRW.

14.29. The size of coniferous roundwood will have a major influence on its suitability for different end uses. Roundwood with a top diameter from 7 cm to 16 cm has been defined as small roundwood (SRW) for the purposes of this study and is mostly used for industrial wood processing. It is also normally lower priced than sawlogs. For these reasons this size of material is considered most suitable for use by wood fired energy plants. Roundwood with a top diameter of 16 cm and upwards has been defined in this study as a sawlog.

QUALITY OF CONIFEROUS ROUNDWOOD

14.30. The quality of potentially available roundwood is of considerable importance to the sawmilling industry, particularly in relation to the straightness of a log and the size of the branches, as this will have a major influence on its suitability for different end uses. Straight logs of 3 metres or more in length, preferably with small branches, known as 'green' logs, are required if the material is to be used to produce sawn timber for the very large construction market. Other markets for domestically grown timber are smaller; more localised and are already fairly well supplied. The quality of the roundwood is not as critical for other commercial end users as the material is mostly debarked and then chipped or flaked.

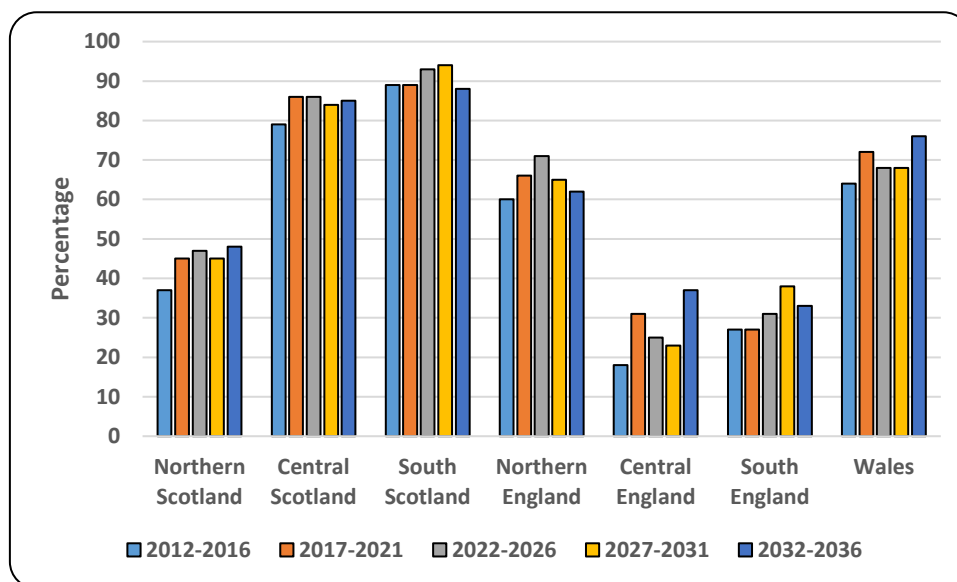
14.31. The quality of the roundwood resource is therefore critical to the expansion of the British sawmilling industry and therefore to the future potential availability of sawmill products. The FC's potential coniferous roundwood availability forecast does not give information on the quality (straightness) of the roundwood that is potentially available.

SPECIES COMPOSITION

14.32. The species of tree from which the roundwood comes is important for some end uses because of the type of wood fibres it contains. Some end use processes are dependent on using spruce, such as paper and paperboard making and MDF production, but for other purposes a variety of other coniferous species can be used e.g. particle board production and

wood fired energy plants. For the purposes of this study it was agreed with the Steering Group that the roundwood should be categorised into Spruce (predominantly Sitka spruce) and Non-spruce. This coincides with the categorisation used in the wood availability forecasts. The spruce : non-spruce composition of the roundwood forecast in each zone or country does not vary by more than 2 or 3% points either way over the next 15 years so the average percentages for each zone in England and Scotland and for Wales have been calculated for the 15-year period and they are shown in chart 14.5.

Chart 14.5: Weighted Average Percentage of Spruce in Forecast Roundwood Availability by Zones 2012 - 2035



Source: Forestry Commission, 2012

14.33. The chart shows that the highest percentages of spruce roundwood are available in the Central and South Scotland zones and in Wales. In the Northern England zone approximately 60% of the coniferous roundwood that is forecast to be potentially available is spruce, and the figure for the Northern Scotland zone varies between slightly less than 40% and 50%. In Central and South England zones, the percentages are much lower with the non-spruce material comprising a mix of other species but with pines and larches predominating.

CONCLUSIONS ON CONIFEROUS ROUNDWOOD AVAILABILITY

14.34. *There are a number of uncertainties surrounding the forecast potential availability of coniferous roundwood from the private sector over the next 20 years for the reasons explained earlier in this section, but there are some fairly clear conclusions that can be drawn from the available information:*

- *The potential availability of coniferous roundwood is forecast to increase over the next 15 years up to about 2030 with the majority of the increase forecast to occur in Scotland.*
- *After 2030, the potential availability of coniferous roundwood is forecast to decline quite sharply and this is particularly acute in South Scotland.*
- *Whether the forecast potentially available all comes to market after allowing for constraints due to cost, planning and other technical issues is unknown.*
- *The majority of the forecast additional roundwood will be sawlog material of 18cm*

+ ted and that has cost and technical utilisation implications.

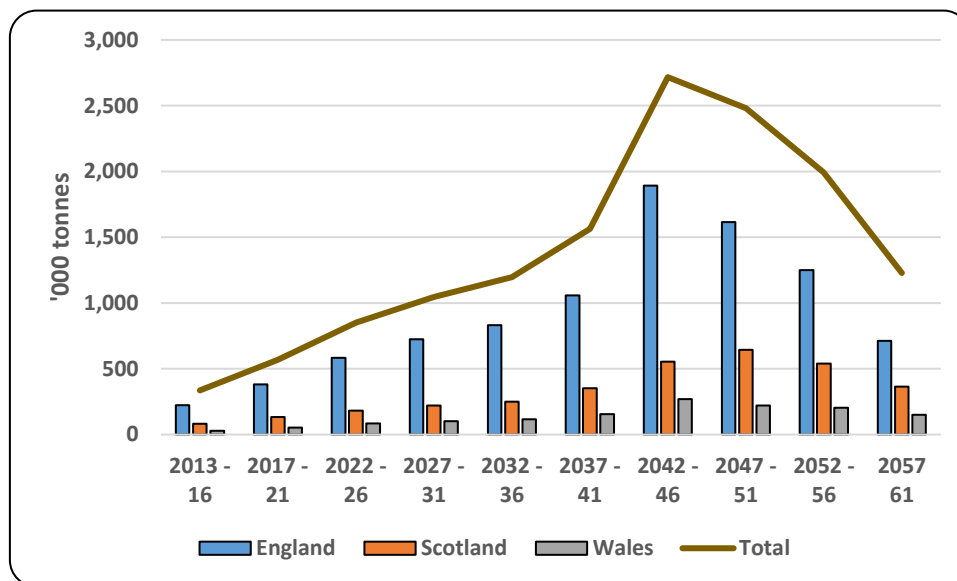
- The quality of the roundwood that is forecast to become available is unknown, but it will influence what the roundwood can be used for.

14.35. More detailed analyses of the potential availability and demand for coniferous roundwood by zones are given in the following sections.

BROADLEAVED ROUNDWOOD POTENTIAL AVAILABILITY FORECAST

14.36. The methodology used to produce a 50-year forecast of broadleaved availability in Britain is given in the Forestry Commission report from which this information has been taken. The forecast is shown in chart 14.6 and is based on sites showing recent thinning activity.

Chart 14.6: 50-Year Forecast of Hardwood Timber Availability



Source: Forestry Commission, 2014

14.37. The chart shows that potential availability of hardwood timber is forecast to rise over the next 35 years and that the majority of broadleaves will be in England. Eighty to ninety percent of the potential availability is forecast to be in the private sector.

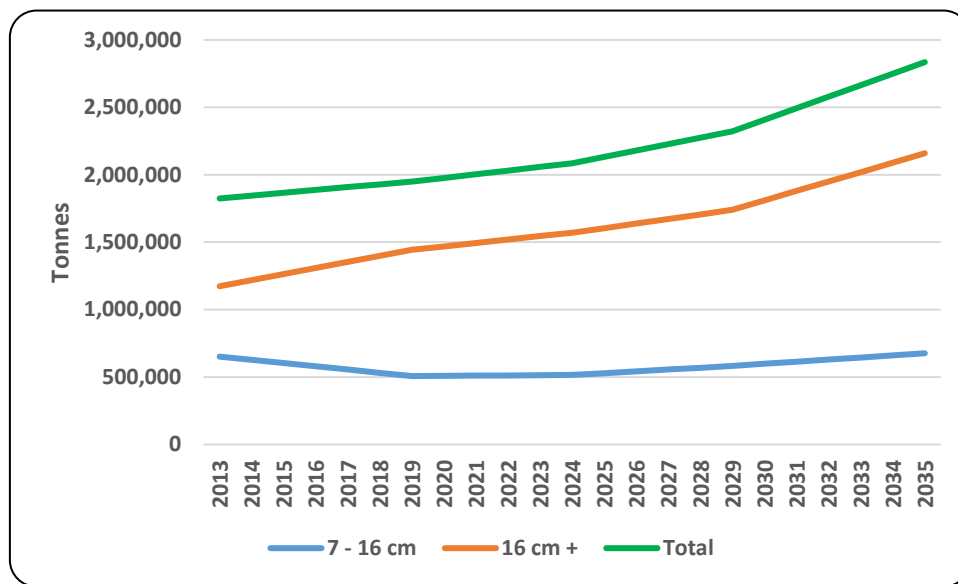
15. NORTHERN SCOTLAND ZONE: CONIFEROUS ROUNDWOOD & SAWMILL PRODUCTS FORECAST AVAILABILITY & DEMAND

15.1. The information given in this section is for the area defined as the Northern Scotland zone (see map 13.1). This section of the report has been divided into two parts. The first part presents the situation for coniferous roundwood and the second part presents the results for coniferous sawmill products.

CONIFEROUS ROUNDWOOD

15.2. The forecast potential annual availability of coniferous roundwood from the woods in the Northern Scotland zone over the next 20 years is shown in chart 15.1 for logs in the 7-16cm and 16cm + t.e.d size categories along with their combined total.

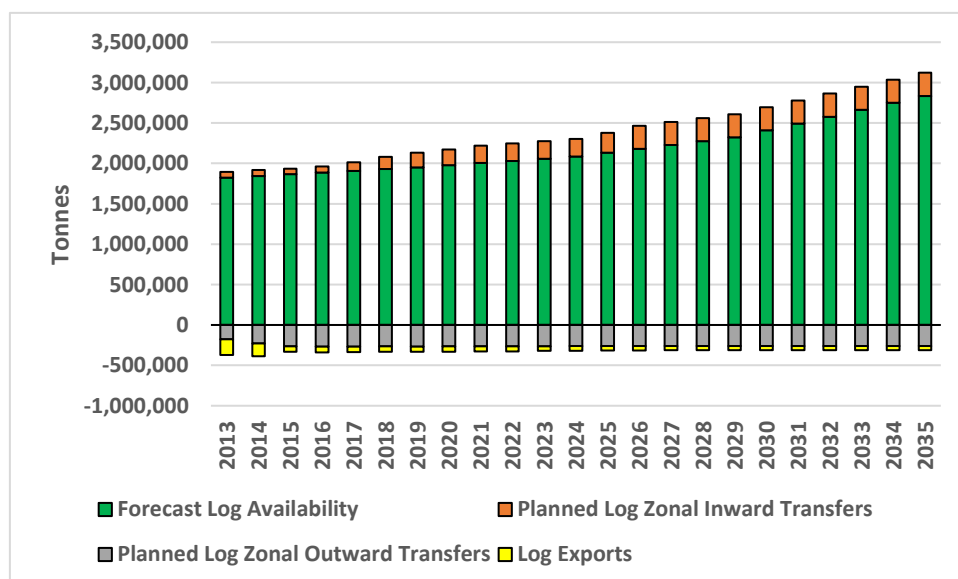
Chart 15.1: Northern Scotland Zone: Forecast Potential Coniferous Roundwood Availability 2013 – 2035



15.3. The chart shows that the potential availability of coniferous roundwood from woods in the Northern Scotland zone is forecast to rise by over 50% over the next 20 years, with most of the increase in potential availability forecast to come from privately owned woods. The majority of this increase will be as logs of 16cm or more t.e.d.

15.4. The potential availability of coniferous roundwood for wood users in the Northern Scotland zone is not just the forecast potential availability of coniferous roundwood from woods in the zone, but also needs to take account of the planned movement of coniferous roundwood into and out of the Northern Scotland zone. The situation is shown in chart 15.2.

Chart 15.2: Forecast Potential Coniferous Roundwood Availability from Woods in the Northern Scotland Zone with Expected Zonal Log Movements



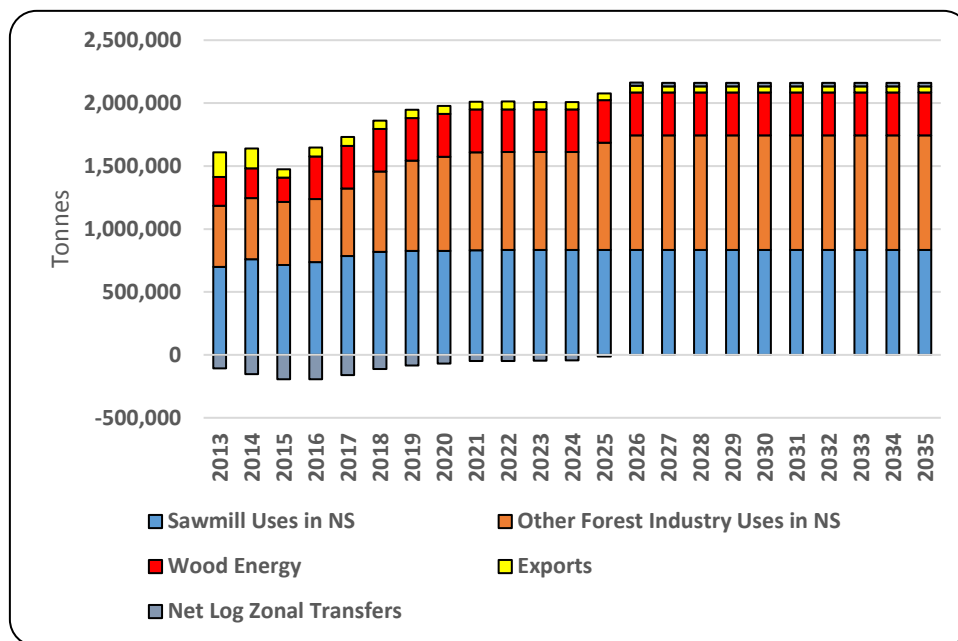
Source: FC, 2015 & Survey Data

15.5. Movements of coniferous roundwood into the zone are expected to increase over time,

while log exports are expected to reduce from their present level. Overall the forecast zonal movements of coniferous roundwood and log exports are relatively small compared with forecast roundwood availability from woods in the Northern Scotland zone and transport distances as well as the present road and rail infrastructure may be factors influencing this.

15.6. The forecast use by the forest industry and by energy users in the Northern Scotland zone of the coniferous roundwood grown in woods in the zone is shown in chart 15.3.

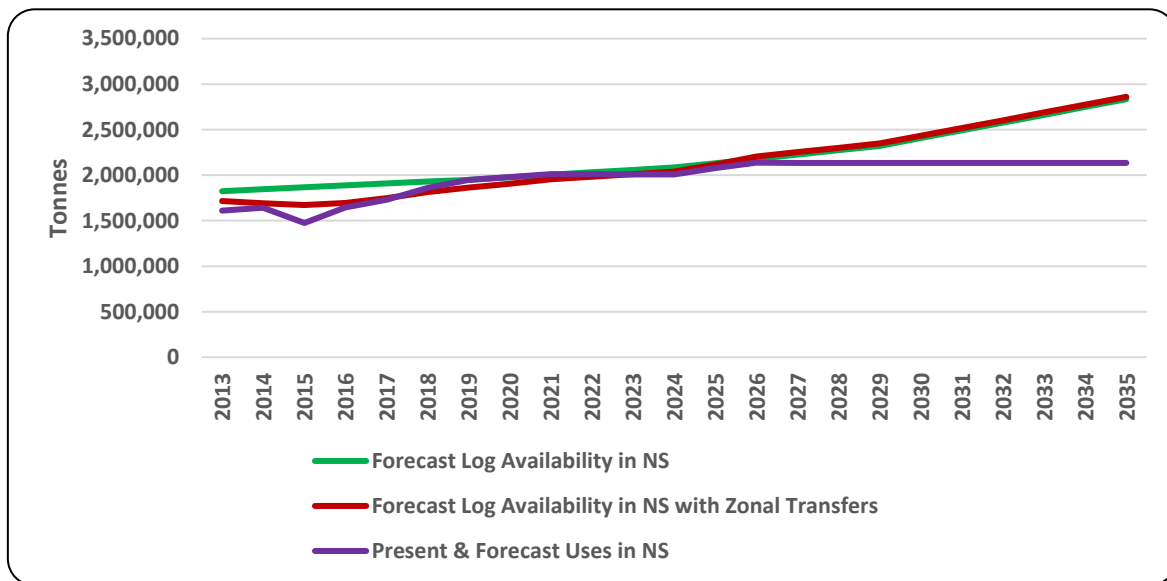
Chart 15.3: Northern Scotland: Planned Use of GB Grown Coniferous Roundwood 2013 – 2035



15.7. The chart shows that anticipated use by sawmills is expected to be fairly steady for the next 20 years, but other users, notably Norbord, will be substantially increasing their use of coniferous roundwood over the next 10 years. The amount of coniferous roundwood used for the large scale generation of energy under present energy policies is expected to remain fairly constant.

15.8. Chart 15.4 shows the potential availability of coniferous roundwood along with the total of all the expected future uses for it in the Northern Scotland zone.

Chart 15.4: Northern Scotland: Comparison of Coniferous Roundwood Potential Availability & Demand 2013 - 2035

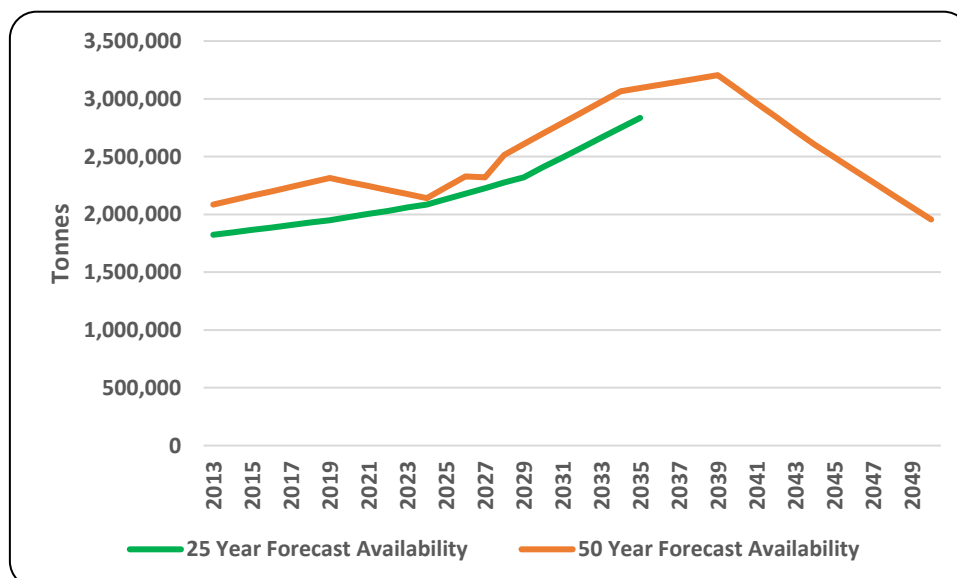


Footnote: Present and forecast uses includes exports

15.9. The chart shows that while forecast potential availability for coniferous roundwood has been, and still is slightly in excess of potential demand, this situation is expected to change around 2018. After that, there is expected to be a period of about 10 years when coniferous roundwood potential availability and demand will be very finely balanced. Thereafter, starting in about 2028, there is expected to be a period of time when potential coniferous roundwood availability will be in excess of demand.

15.10. A 50-year coniferous roundwood availability forecast has been made by the Forestry Commission using slightly different assumptions to the 25-year forecast (see annex section 14). Both the 25-year and 50-year coniferous roundwood availability forecasts are given in chart 15.5 and confirm an upward trend for the next 20 years.

Chart 15.5: Northern Scotland: Forestry Commission 25-Year and 50-year Forecasts of Potential Coniferous Roundwood Availability 2013 - 2050



Source: Forestry Commission, 2015

15.11. The 50-year forecast shows that the peak in potential coniferous roundwood availability doesn't occur in the Northern Scotland zone until about 2039. This is about 10 years after other zones and reflects the later planting of significant areas of new woods in this zone in the 1980s compared with other ones in Britain.

15.12. The chart shows that according to the 50-year forecast the potential availability of coniferous roundwood can be expected to be in excess of the expected forecast maximum demand of 2.138 million tonnes per annum until about 2040 before potential roundwood availability starts to drop quite sharply.

15.13. This forecast reduction of coniferous roundwood availability after about 2040 reflects a number of issues which include slightly different forecast assumptions, but more significantly reduced areas of new planting in the zone mostly in the 1980s and changes in forestry practices such as leaving larger areas unplanted for landscape or environmental reasons.

SAWMILL PRODUCTS

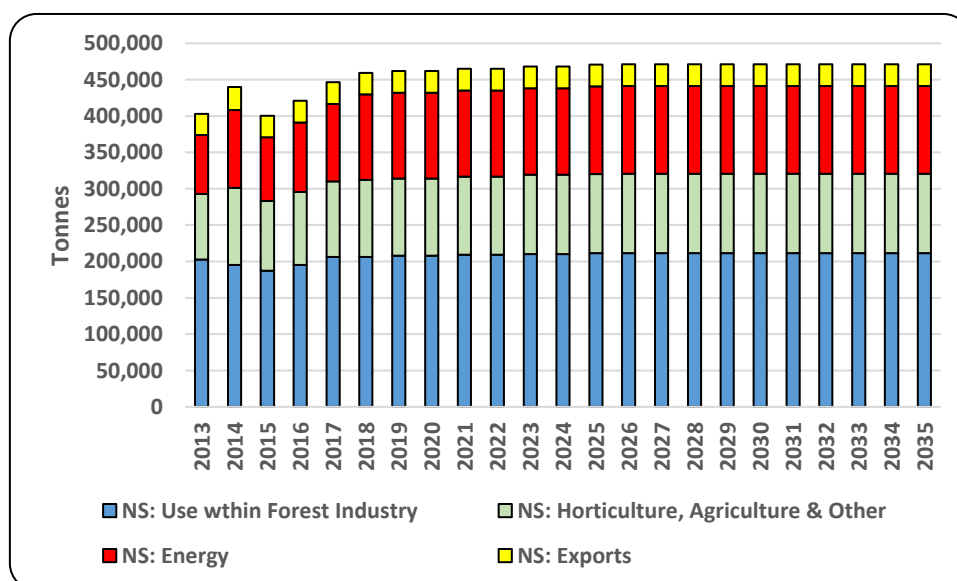
15.14. Coniferous sawmills produce sawn timber, wood chips, sawdust, pin chips, shavings, slab wood and bark. For the purposes of this report the term "coniferous sawmill products" or "sawmill products" relates to all the products *except* sawn timber.

Uses

15.15. The existing supply of sawmill products (chips, sawdust, slab wood and bark) produced by sawmills located in the Northern Scotland zone is sold into a variety of markets. The markets in the Northern Scotland zone can be broadly categorised as the panelboard mills, export, agriculture and horticultural markets with a number of other small miscellaneous ones. By far the largest market overall in Britain at present for sawmill products is the panelboard industry.

15.16. The past and forecast future uses of sawmill products in the Northern Scotland zone, based on information provided by sawmills in the Northern Scotland zone, are shown in chart 15.6.

Chart 15.6: Past & Forecast Future Production & Use of Sawmill Products Originating within the Northern Scotland Zone 2013 – 2035



15.17. The chart shows that that the forest industry is expected to provide a market for approximately half the sawmill products originating in the zone with energy, exports, horticulture, agriculture and other uses making up the rest. The quantities of chips that are

exported annually are very small.

Zonal Roundwood Transfers

15.18. It is not possible to present any accurate data on sawmill product flows because many sawmills are uncertain for what purpose some of their sawmill products eventually get used. This is because the purchase and sale, and the logistics of moving most larger quantities of sawmill products between producers and purchasers is undertaken by a small number of specialist companies. These companies would consider providing detailed information on their sawmill product movements as being commercially confidential.

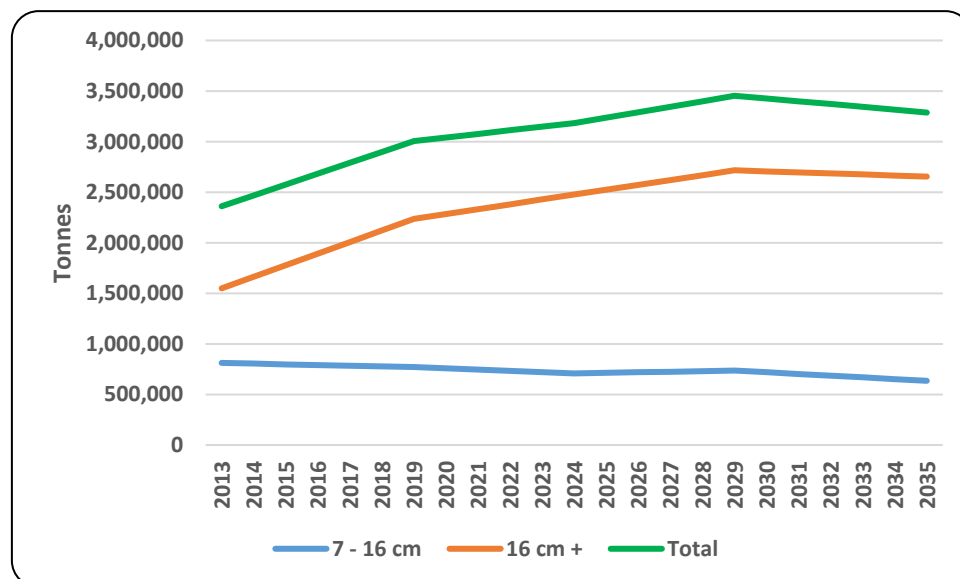
16. CENTRAL SCOTLAND ZONE: CONIFEROUS ROUNDWOOD & SAWMILL PRODUCTS FORECAST AVAILABILITY & DEMAND

16.1. The information given in this section is for the area defined as the Central Scotland zone (see map 13.1). This section of the report has been divided into two parts. The first part presents the situation for coniferous roundwood and the second part presents the results for coniferous sawmill products.

CONIFEROUS ROUNDWOOD

16.2. The forecast potential annual availability of coniferous roundwood from the woods in the Central Scotland zone over the next 20 years is shown in chart 16.1 for logs in the 7-16cm and 16cm + t.e.d size categories along with their combined total.

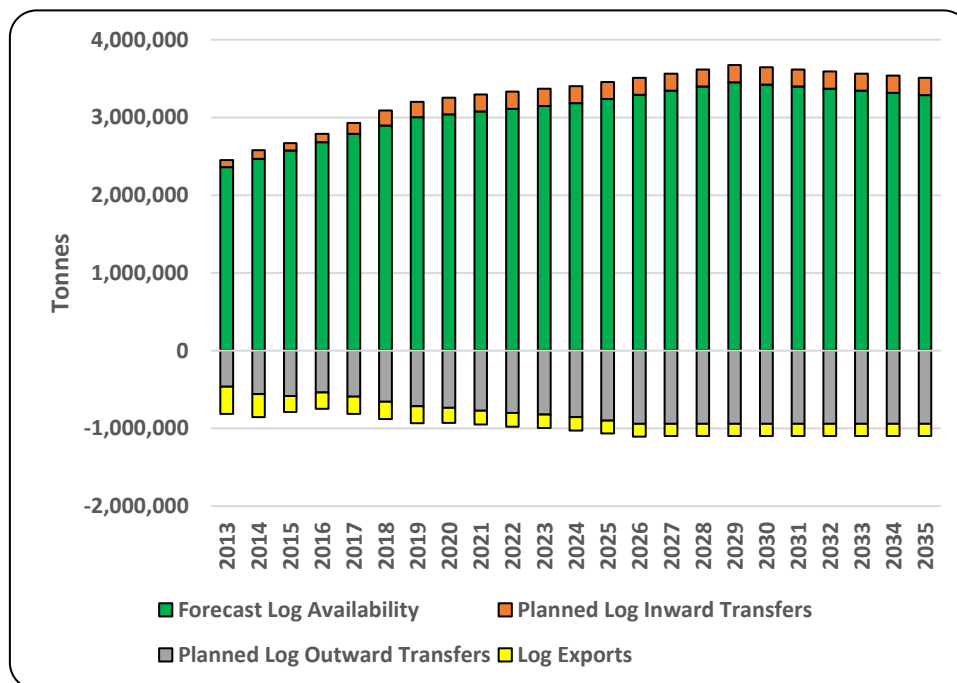
Chart 16.1: Central Scotland Zone: Forecast Potential Coniferous Roundwood Availability 2013 – 2035



16.3. The chart shows that the potential availability of coniferous roundwood from woods in the Central Scotland zone is forecast to rise by about 40% over the next 20 years. All the increase in potential coniferous roundwood availability is forecast to be as logs of 16 cm or more t.e.d. Almost two thirds of the potential roundwood availability is forecast to be in the West of Scotland and the majority of the increased availability is forecast to come from privately owned woods.

16.4. The potential availability of coniferous roundwood for wood users in the Central Scotland zone is not just the forecast potential availability of coniferous roundwood from woods in the zone, but also needs to take account of the planned movement of coniferous roundwood into and out of the Central Scotland zone as well as exports. These anticipated movements of coniferous roundwood are shown in chart 16.2.

Chart 16.2: Forecast Potential Coniferous Roundwood Availability in the Central Scotland Zone with Expected Zonal Log Movements



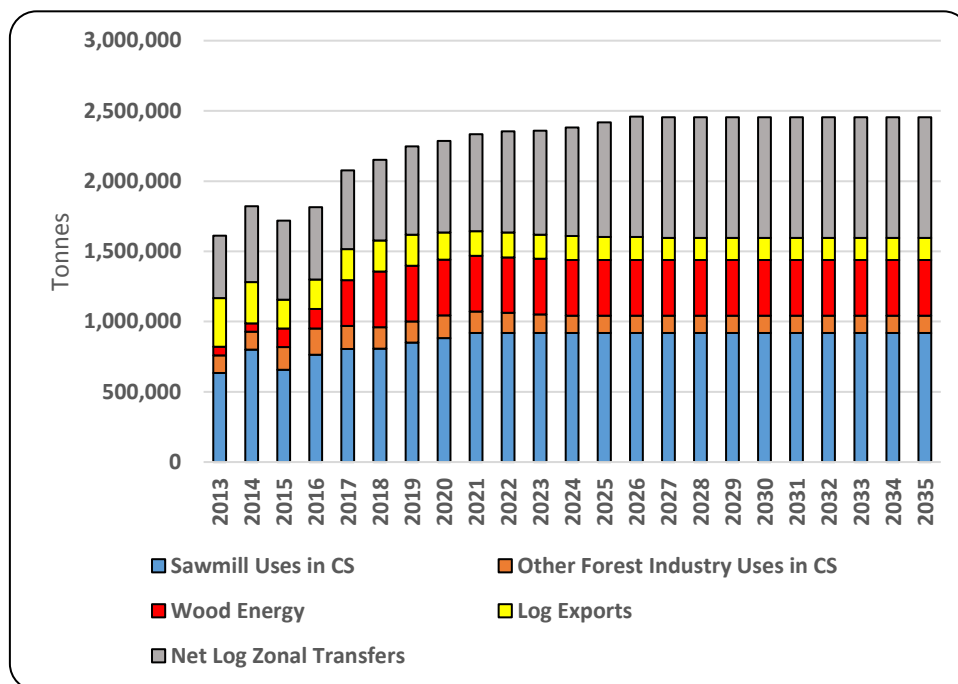
Source: FC, 2015 & Survey Data

16.5. At present some 85,000 to 110,000 tonnes per annum is moved from the West Coast to South Scotland by boat with financial support from the Scottish Government provided through the Forestry Commission's Timberlink programme.

16.6. Users of coniferous roundwood located outside the zone are expecting to source an increasing amount of the coniferous roundwood that they require within the Central Scotland zone with the total amounting to almost 1 million tonnes per annum in about 10 years' time.

16.7. The forecast use by the forest industry and by energy users in the Central Scotland zone of the coniferous roundwood grown in woods in the zone is shown in chart 16.3.

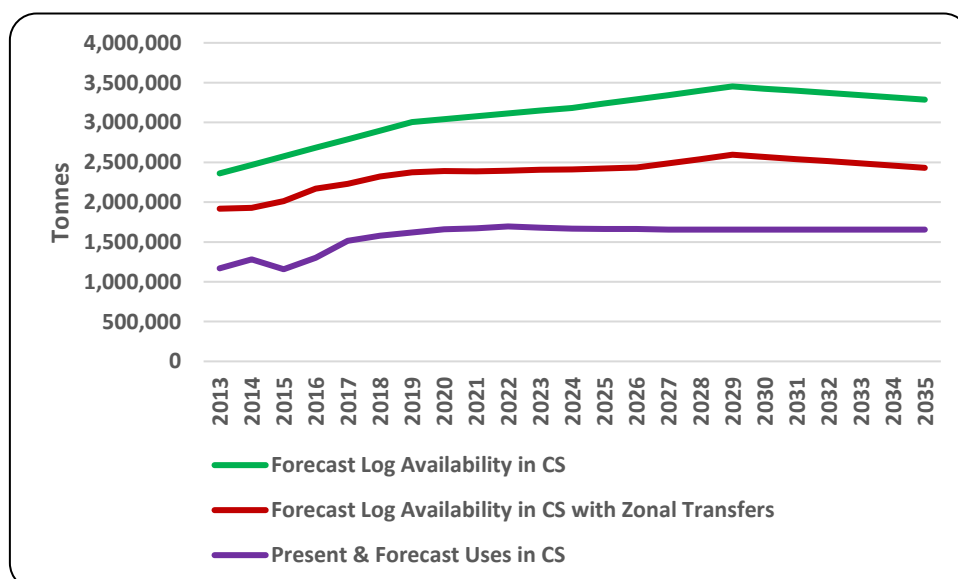
Chart 16.3: Central Scotland: Planned Uses of GB Grown Coniferous Roundwood 2013 – 2035



16.8. The chart shows that there will be a significant growth in demand for coniferous roundwood over the next 10 years and then it will level out. Anticipated use by sawmills and other forest industry wood users is expected to be fairly steady for the next 20 years, but the amount of coniferous roundwood used for the larger scale energy generation is expected to increase over the next two to three years, if various planned energy developments go-ahead. After that it is then expected to remain fairly constant under present energy policies. The quantities of logs exported or transferred out of the zone by other users is expected to gradually increase over the next 10 years with exports of both sawlogs and SRW continuing.

16.9. Chart 16.4 shows the potential availability of coniferous roundwood along with all the expected future uses for it in the Central Scotland zone.

Chart 16.4: Central Scotland: Comparison of Coniferous Roundwood Potential Availability & Demand 2013 - 2035

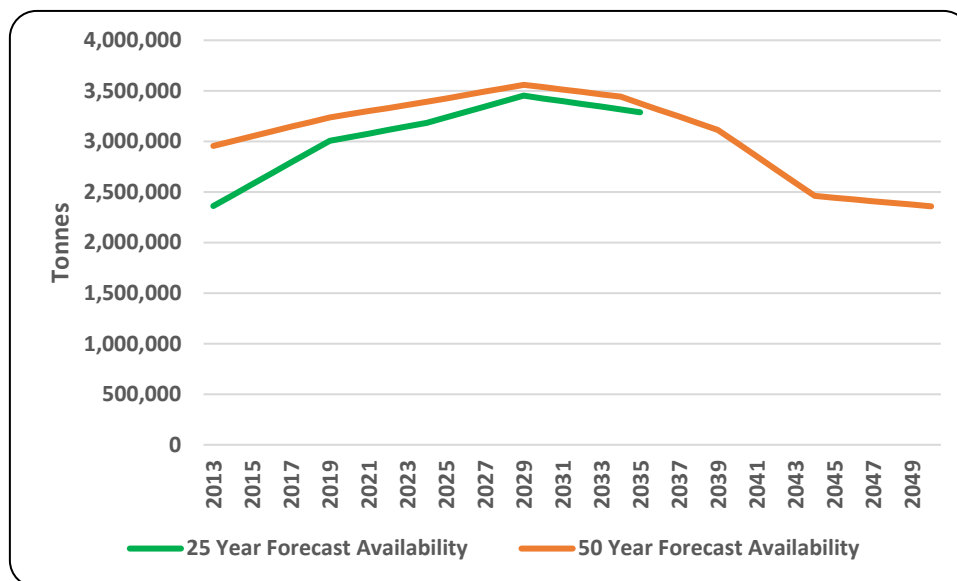


Footnote: Present and forecast uses includes exports

16.10. The chart shows that forecast potential availability for coniferous roundwood has been, and still is in excess of potential demand and this situation is likely to continue for the next 20 years assuming present anticipated roundwood sourcing intentions of buyers outside the zone remain unchanged. This gap between potential coniferous roundwood availability and demand in the Central Scotland zone may reflect location, terrain and transport infrastructure challenges associated with accessing the coniferous roundwood in this zone, as much of it is located in the West of Scotland.

16.11. A 50-year coniferous roundwood availability forecast has been made by the Forestry Commission using slightly different assumptions to the 25-year forecast (see annex section 14). Both 25-year and 50-year coniferous roundwood availability forecasts are given in chart 16.5.

Chart 16.5: Central Scotland: Forestry Commission 25 Year and 50-year Forecasts of Potential Coniferous Roundwood Availability 2013 - 2050



Source: Forestry Commission, 2015

16.12. Both forecasts confirm a similar trend which is that the potential availability of coniferous roundwood will start to fall after 2029. The potential availability will still be significantly in excess of the requirements of companies presently operating in the zone and it should be able to continue to meet the forecast requirements of those outside the zone that draw logs from the zone for about another 30 years based on the 50-year availability forecast.

16.13. The forecast reduction of coniferous roundwood availability after about 2027 reflects a number of issues which include slightly different forecast assumptions, but more significantly reduced areas of new planting in the zone from the 1980s and changes in forestry practices such as leaving larger areas unplanted for landscape reasons.

SAWMILL PRODUCTS

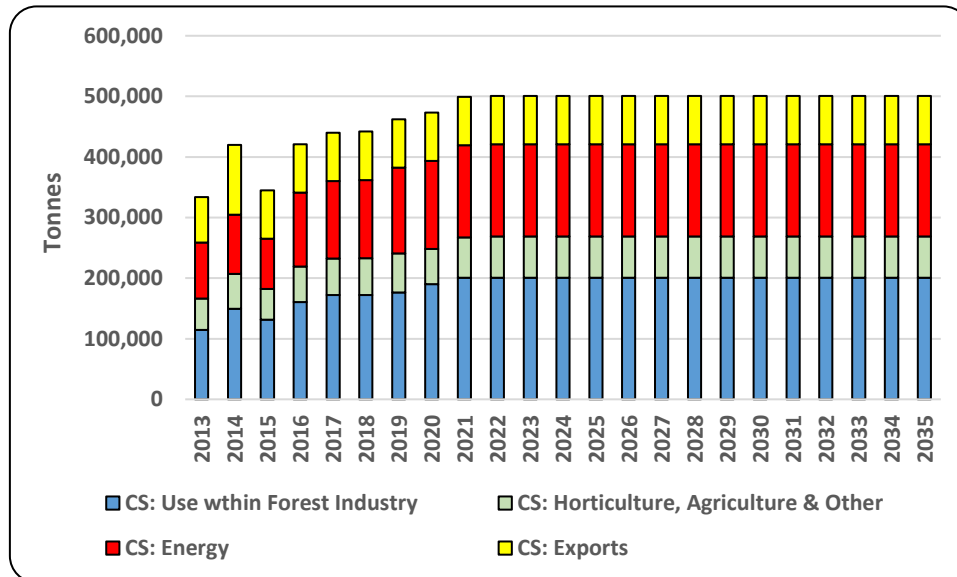
16.14. Coniferous sawmills produce sawn timber, wood chips, sawdust, pin chips, shavings, slab wood and bark. For the purposes of this report the term "coniferous sawmill products" or "sawmill products" relates to all the products *except* sawn timber.

16.15. The existing supply of sawmill products (chips, sawdust, slab wood and bark) produced by sawmills located in the Central Scotland zone is sold into a variety of markets. The markets in the Central Scotland zone can be broadly categorised as the panelboard mills, export,

agriculture and horticultural markets with a number of other small miscellaneous ones. By far the largest market at present for sawmill products is the panelboard industry.

16.16. The past and forecast future uses of sawmill products in the Central Scotland zone, based on information provided by sawmills in the Central Scotland zone, are shown in chart 16.6.

Chart 16.6: Past & Forecast Future Production & Use of Sawmill Products Originating within the Central Scotland Zone 2013 – 2035



16.17. The chart shows that exports and energy production make up almost half the end uses of sawmill products in the Central Scotland zone. The quantity of wood chips and sawdust exported is the largest of any zone, but it is still relatively small.

Zonal Roundwood Transfers

16.18. It is not possible to present any accurate data on sawmill product flows because many sawmills are uncertain for what purpose some of their sawmill products eventually get used. This is because the purchase and sale, and the logistics of moving most larger quantities of sawmill products between producers and purchasers is undertaken by a small number of specialist companies. These companies would consider providing detailed information on their sawmill product movements as being commercially confidential.

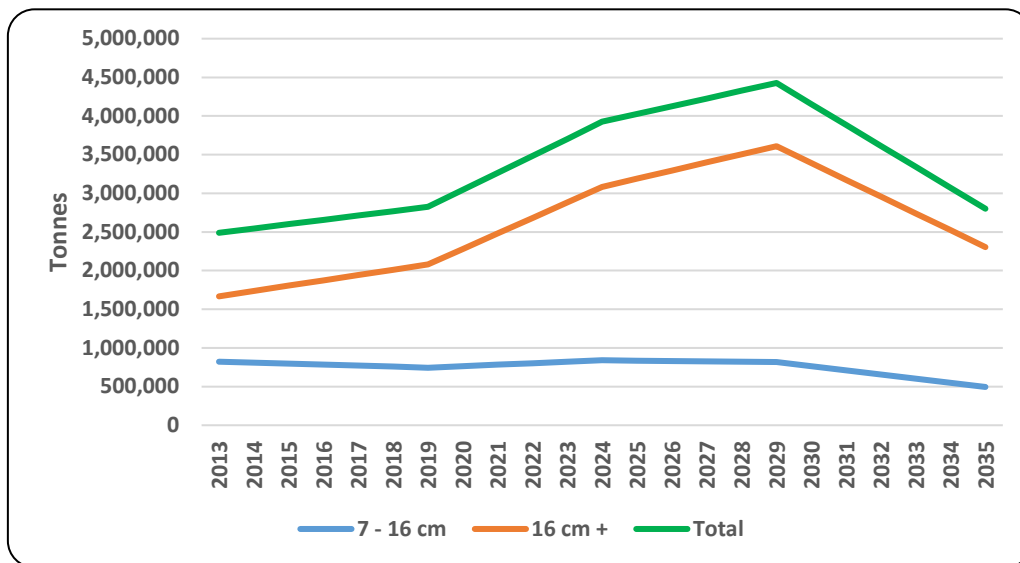
17. SOUTH SCOTLAND ZONE: CONIFEROUS ROUNDWOOD & SAWMILL PRODUCTS FORECAST AVAILABILITY & DEMAND

17.1. The information given in this section is for the area defined as the South Scotland zone (see map 13.1). This section of the report has been divided into two parts. The first part presents the situation for coniferous roundwood and the second part presents the results for coniferous sawmill products.

CONIFEROUS ROUNDWOOD

17.2. The forecast potential annual availability of coniferous roundwood from the woods in the South Scotland zone over the next 20 years is shown in chart 17.1 for logs in the 7-16 cm and 16 cm + t.e.d size categories along with their combined total.

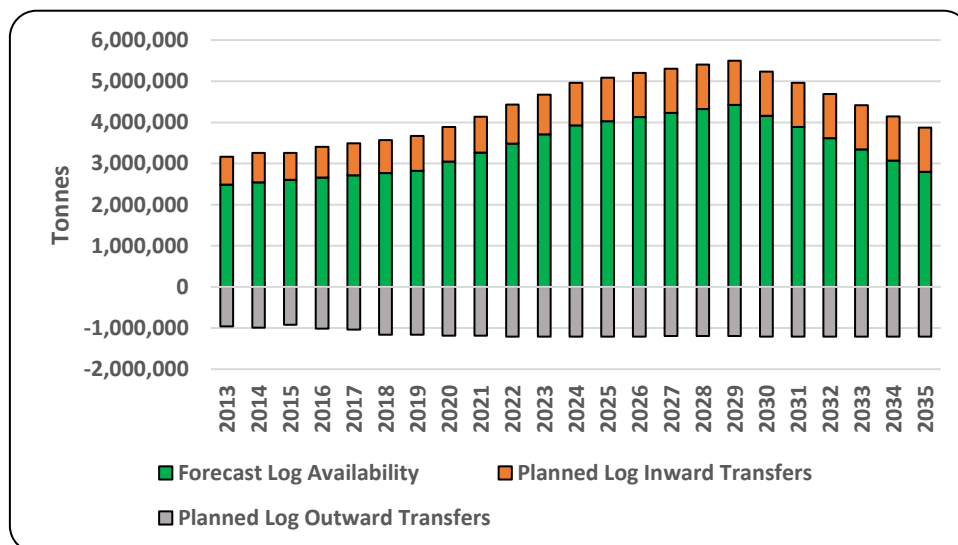
Chart 17.1: South Scotland Zone: Forecast Potential Coniferous Roundwood Availability 2013 – 2035



17.3. The chart shows that the potential availability of coniferous roundwood from woods in the South Scotland zone is forecast to rise by around 75% over the next 15 years with most of this increased potential availability coming from privately owned woods. Potential availability will then fall sharply back to almost present levels – a drop from the peak of 38%. All the increase in potential coniferous roundwood availability in the next 15 years is forecast to be as logs of 16cm or more t.e.d. After that the potential availability of coniferous sawlogs is forecast to reduce very significantly as will the quantity of logs of less than 16 cm t.e.d, but less markedly.

17.4. The potential availability of coniferous roundwood for wood users in the Southern Scotland zone is not just the forecast potential availability of coniferous roundwood from woods in the zone, but also needs to take account of the planned movement of coniferous roundwood into and out of the zone. These anticipated movements of coniferous roundwood are shown in chart 17.2.

Chart 17.2: Forecast Potential Coniferous Roundwood Availability in the South Scotland Zone with Expected Zonal Log Movements 2013 - 2035

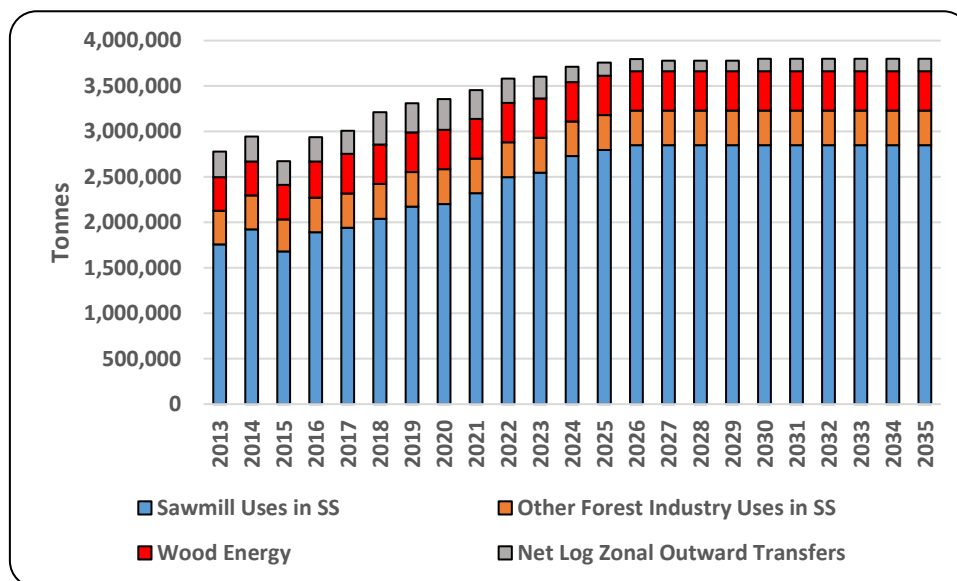


Source: FC, 2015 & Survey Data

17.5. This zone has more users of coniferous roundwood than either of the other two zones in Scotland. The movement of about 1 million tonnes per annum of coniferous roundwood both in and out of the zone partly reflects the fact that there are a number of major roundwood users located in the North of England relatively close to the Border and also the potential availability of coniferous roundwood in the Central Scotland zone.

17.6. The forecast use by the forest industry and by energy users in the South Scotland zone of the coniferous roundwood grown in woods in the zone is shown in chart 17.3.

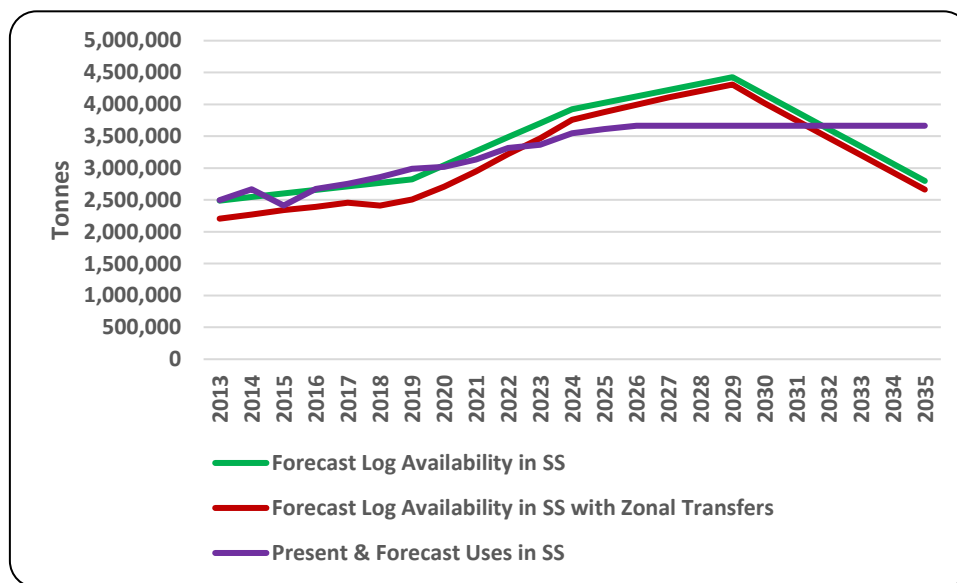
**Chart 17.3: South Scotland: Planned Uses of GB Grown Coniferous Roundwood
2013 – 2035**



17.7. The chart shows that anticipated use by sawmills and other forest industry wood users in this zone is expected to rise over the next 10 years, but then remain fairly steady. The amount of coniferous roundwood used for the larger scale energy generation is expected to increase slightly over the next two to three years and then to remain fairly constant under present energy policies. No exports of coniferous roundwood are planned and the net quantity of coniferous roundwood moving in and out of the South Scotland zone is expected to be fairly constant.

17.8. Chart 17.4 shows the potential availability of coniferous roundwood along with all the expected future uses for it in the South Scotland zone.

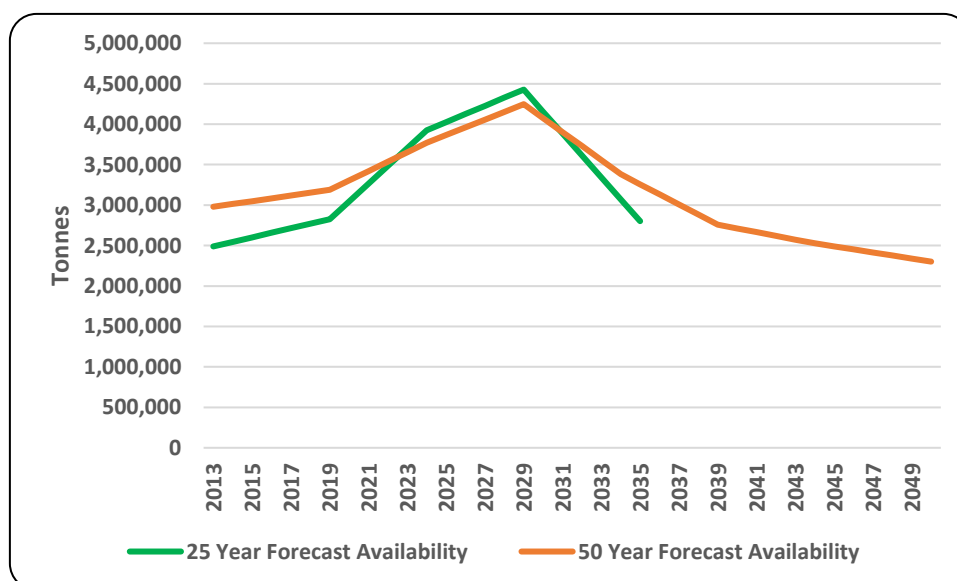
Chart 17.4: South Scotland: Comparison of Coniferous Roundwood Potential Availability & Demand 2013 - 2035



17.9. The chart shows that the potential availability and anticipated demand for coniferous roundwood is already very finely balanced in South Scotland and this situation is expected to continue for the next 5 to 10 years assuming present anticipated roundwood sourcing intentions of buyers inside and outside the zone remain unchanged. After that the potential availability is forecast to exceed demand for about 5 years until about 2030. After 2030 the potential availability of coniferous roundwood is forecast to start dropping sharply and by about 2033 anticipated demand will be in excess of potential coniferous roundwood availability.

17.10. A 50-year coniferous roundwood availability forecast has been made by the Forestry Commission using slightly different assumptions to the 25-year forecast (see annex section 14). Both the 25-year and 50-year coniferous roundwood availability forecasts are given in chart 17.5 and confirm a similar trend.

Chart 17.5: South Scotland: Forestry Commission 25 Year and 50-year Forecasts of Potential Coniferous Roundwood Availability 2013 - 2050



Source: Forestry Commission, 2015

17.11. The chart shows that the reduction in potential availability of coniferous roundwood

indicated by the 50-year forecast is slightly less steep than indicated by the 25-year forecast but it will start to fall after 2029. By about 2033 anticipated demand will exceed forecast potential roundwood availability in South Scotland and the gap will then continue to widen.

17.12. This forecast reduction of coniferous roundwood availability after about 2029 reflects a number of issues which include slightly different forecast assumptions, but more significantly reduced areas of new planting in the zone from the 1980s and changes in forestry practices such the planting of more broadleaved trees and leaving larger areas unplanted for landscape reasons.

SAWMILL PRODUCTS

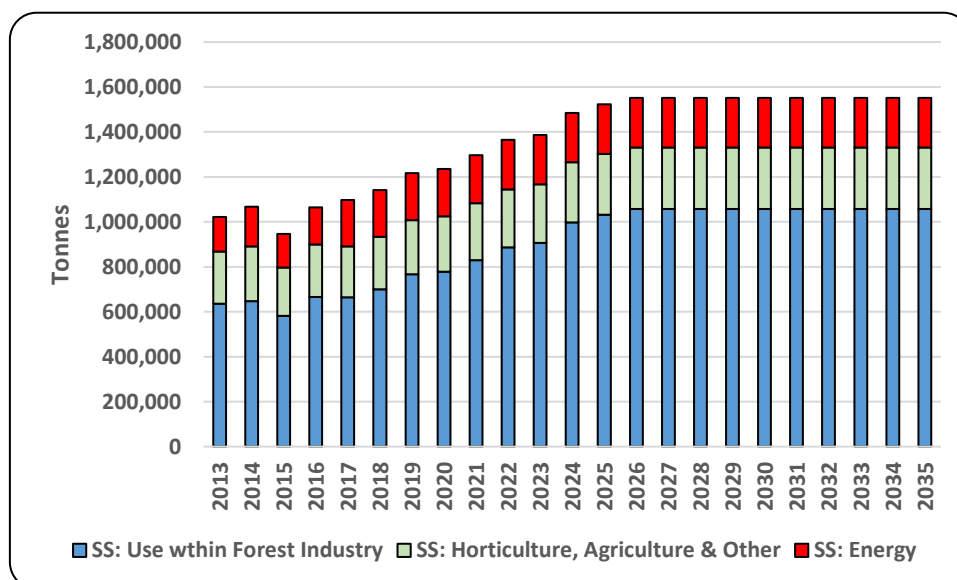
17.13. Coniferous sawmills produce sawn timber, wood chips, sawdust, pin chips, shavings, slab wood and bark. For the purposes of this report the term “coniferous sawmill products” or “sawmill products” relates to all the products *except* sawn timber.

Uses

17.14. The existing supply of sawmill products (chips, sawdust, slab wood and bark) produced by sawmills located in the South Scotland zone is sold into a variety of markets. The markets in the South Scotland zone can be broadly categorised as the panelboard mills, export, agriculture and horticultural markets with a number of other small miscellaneous ones. By far the largest market overall in Britain at present for sawmill products is the panelboard industry.

17.15. The past and forecast future uses of sawmill products in the South Scotland zone, based on information provided by sawmills in the South Scotland zone, are shown in chart 17.6.

Chart 17.6: Past & Forecast Future Production & Use of Sawmill Products Originating within the South Scotland Zone 2013 – 2035



17.16. The chart indicates the significant size and relative importance of the different markets for sawmill products produced within the South Scotland zone. Here the primary end use of sawmill products originating in the zone is with other parts of the forest industry itself.

Zonal Roundwood Transfers

17.17. It is not possible to present any accurate data on sawmill product flows because many sawmills are uncertain for what purpose some of their sawmill products eventually get used. This is because the purchase and sale, and the logistics of moving most larger quantities of sawmill products between producers and purchasers is undertaken by a small number of specialist companies. These companies would consider providing detailed information on their sawmill product movements as being commercially confidential.

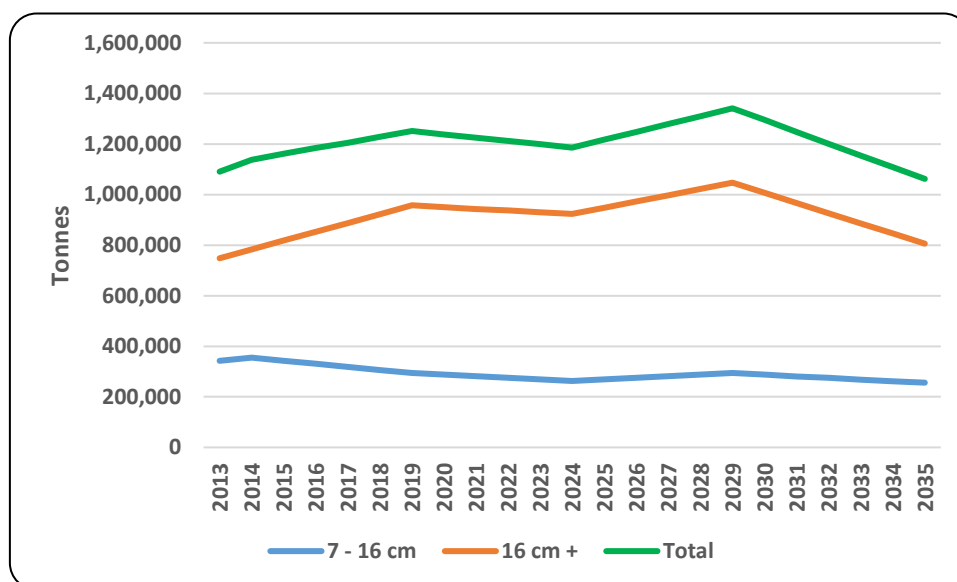
18. NORTHERN ENGLAND ZONE: CONIFEROUS ROUNDWOOD & SAWMILL PRODUCTS FORECAST AVAILABILITY & DEMAND

18.1. The information given in this section is for the area defined as the Northern England zone (see map 13.1). This section of the report has been divided into two parts. The first part presents the situation for coniferous roundwood and the second part presents the results for coniferous sawmill products.

CONIFEROUS ROUNDWOOD

18.2. The forecast potential annual availability of coniferous roundwood from the woods in the Northern England zone over the next 20 years is shown in chart 18.1 for logs in the 7-16 cm and 16 cm + t.e.d size categories along with their combined total.

Chart 18.1: Northern England Zone: Forecast Potential Coniferous Roundwood Availability 2013 – 2035

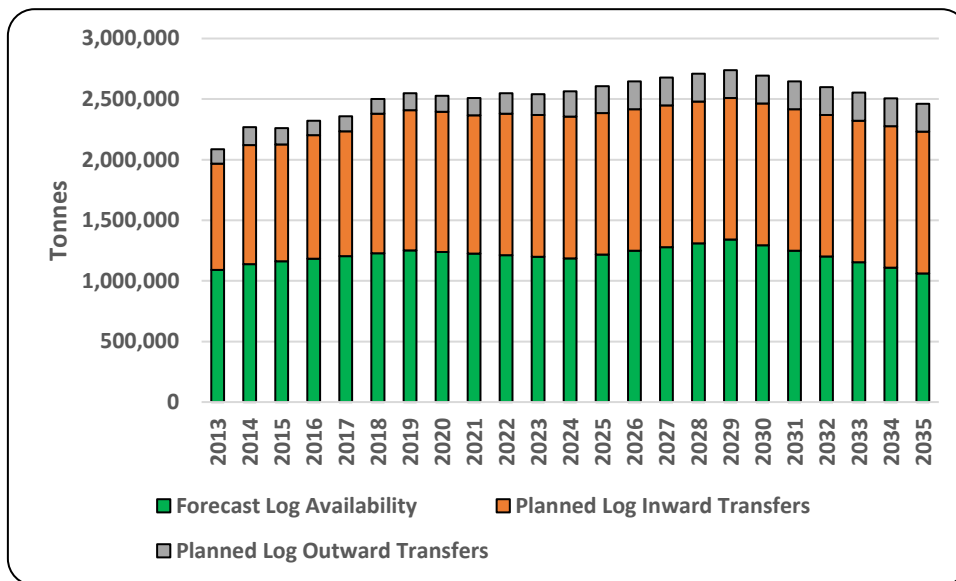


18.3. The chart shows that the potential availability of coniferous roundwood from woods in the Northern England zone is forecast to stay fairly steady over the next 10 years and then there is a small rise before it begins to start falling after 2030. The quantity of logs under 16cm t.e.d is forecast to decline gently and so a slight increase in potential availability of logs over 16 cm t.e.d can be expected.

18.4. The potential availability of coniferous roundwood for wood users in the Northern England zone is not just the forecast potential availability of coniferous roundwood from woods

in the zone, but also the planned movement of coniferous roundwood into and out of the zone. These anticipated movements of coniferous roundwood are shown in chart 18.2.

Chart 18.2: Forecast Potential Coniferous Roundwood Availability in the Northern England Zone with Expected Zonal Log Movements 2013 - 2035

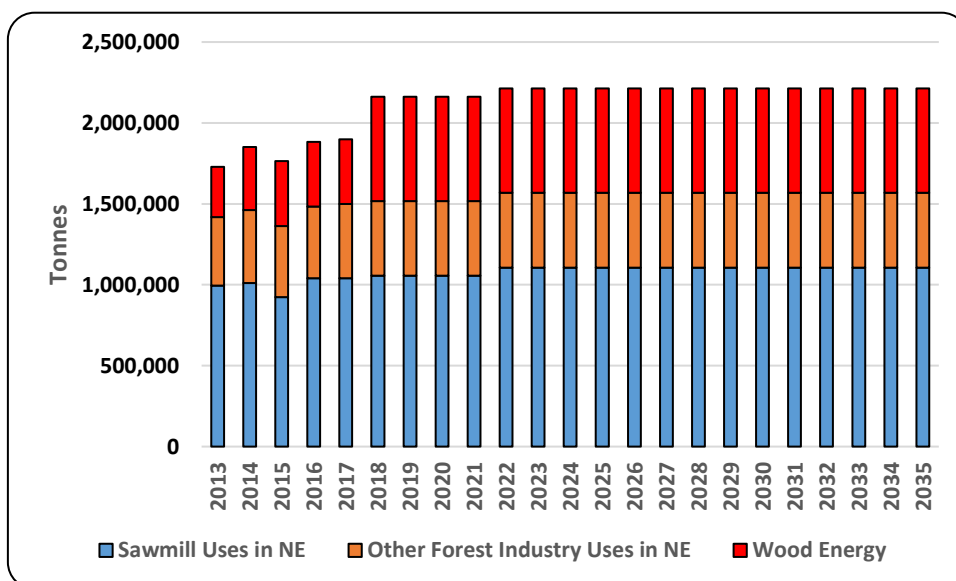


Source: FC, 2015 & Survey Data

18.5. The chart shows that the zone draws in a significant quantity of coniferous roundwood and it is expected that the quantity will increase slightly in the future. This can be partly explained by the location of some users being close to the Scottish border and it is therefore logical to draw their supplies from South Scotland. The quantity of roundwood transferred into the zone almost equates to the forecast potential annual availability of coniferous roundwood from woods located in the Northern England zone.

18.6. The forecast use by the forest industry and by energy users in the Northern England zone of the coniferous roundwood grown in woods in the zone is shown in chart 18.3.

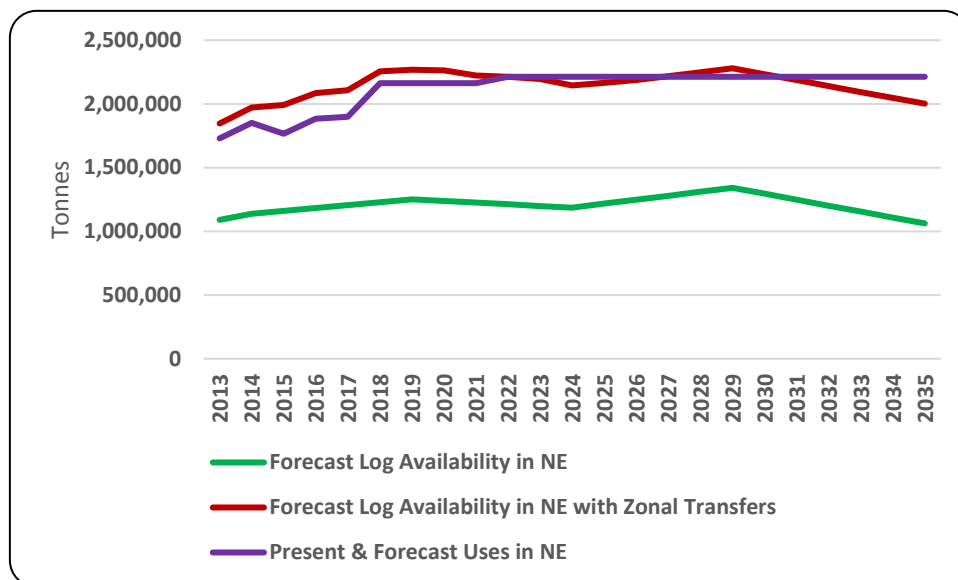
Chart 18.3: Northern England: Planned Uses of GB Grown Coniferous Roundwood 2013 – 2035



18.7. The chart shows that some increase in the use of coniferous roundwood forecast will occur based on the assumption that a new energy plant being planned comes into operation. Otherwise the anticipated use of coniferous roundwood by sawmills and other forest industry wood users is expected to remain fairly even over the next 20 years.

18.8. Chart 18.4 shows the potential availability of coniferous roundwood along with all the expected future uses for it in the Northern England zone.

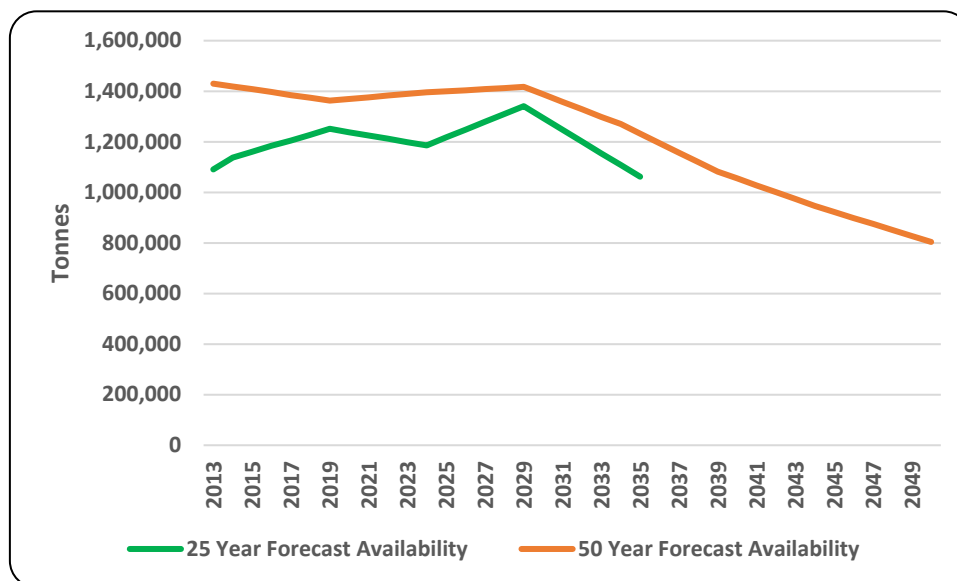
Chart 18.4: Northern England: Comparison of Coniferous Roundwood Potential Availability & Demand 2013 – 2035



18.9. The chart shows that the present and expected uses of coniferous roundwood significantly exceed the forecast potential availability of coniferous roundwood from the woods within the Northern England zone. The requirements of wood users are therefore met through transporting coniferous roundwood in from other zones. This situation is expected to remain for the foreseeable future assuming present anticipated roundwood sourcing intentions of buyers within and outside the zone remain unchanged.

18.10. A 50-year coniferous roundwood availability forecast has been made by the Forestry Commission using slightly different assumptions to the 25-year forecast (see annex section 14). Both the 25 year and 50-year coniferous roundwood availability forecasts are given in chart 18.5 and confirm a similar trend.

Chart 18.5: Northern England: Forestry Commission 25-year and 50-year Forecasts of Potential Coniferous Roundwood Availability



Source: Forestry Commission, 2015

18.11. The 50-year forecast indicates that there may be slightly more potential availability of coniferous roundwood in Northern England in the next 10 years, but after that both forecasts expect potential availability of coniferous roundwood to start falling quite steeply.

18.12. This forecast reduction of coniferous roundwood availability after about 2029 reflects a number of issues which include slightly different forecast assumptions, but more significantly reduced areas of new planting in the zone from the 1980s and changes in forestry practices such as planting more broadleaved trees and leaving larger areas unplanted for landscape reasons.

SAWMILL PRODUCTS

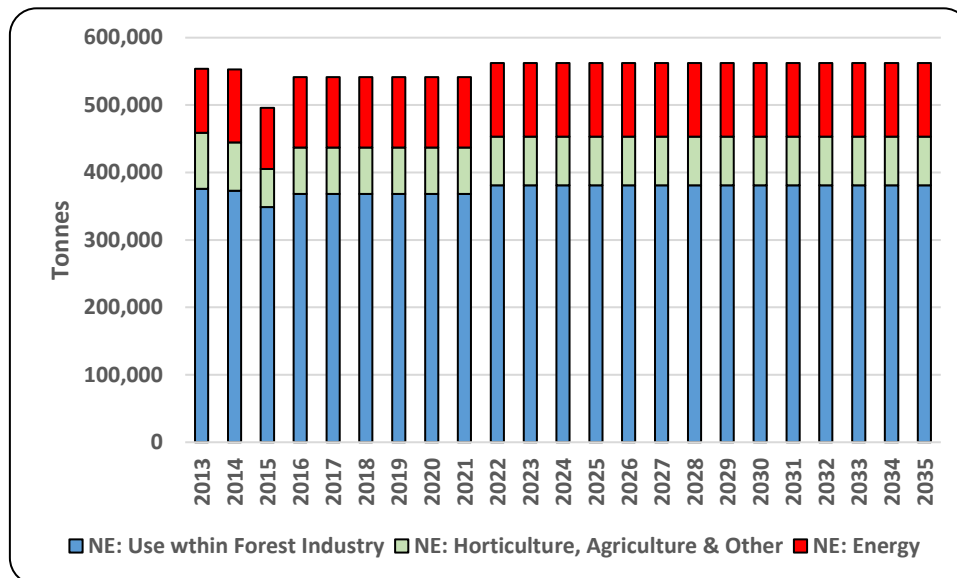
18.13. Coniferous sawmills produce sawn timber, wood chips, sawdust, pin chips, shavings, slab wood and bark. For the purposes of this report the term "coniferous sawmill products" or "sawmill products" relates to all the products *except* sawn timber.

Uses

18.14. The existing supply of sawmill products (chips, sawdust, slab wood and bark) produced by sawmills located in the Northern England zone is sold into a variety of markets. The markets in the Northern England zone can be broadly categorised as the panelboard mills, export, agriculture and horticultural markets with a number of other small miscellaneous ones. By far the largest market overall in GB at present for sawmill products is the panelboard industry.

18.15. The past and forecast future uses of sawmill products in the Northern England zone, based on information provided by sawmills in the Northern England zone, are shown in chart 18.6.

Chart 18.6: Past & Forecast Future Production & Use of Sawmill Products Produced within the Northern England Zone 2013 – 2035



18.16. The chart indicates the significant size and relative importance of the different markets for sawmill products produced within the Northern England zone. As in South Scotland the sawmill products originating in the zone are primarily used within the forest sector by the panelboard and pulp and paperboard sector.

Zonal Roundwood Transfers

18.17. It is not possible to present any accurate data on sawmill product flows because many sawmills are uncertain for what purpose some of their sawmill products eventually get used. This is because the purchase and sale, and the logistics of moving most larger quantities of sawmill products between producers and purchasers is undertaken by a small number of specialist companies. These companies would consider providing detailed information on their sawmill product movements as being commercially confidential.

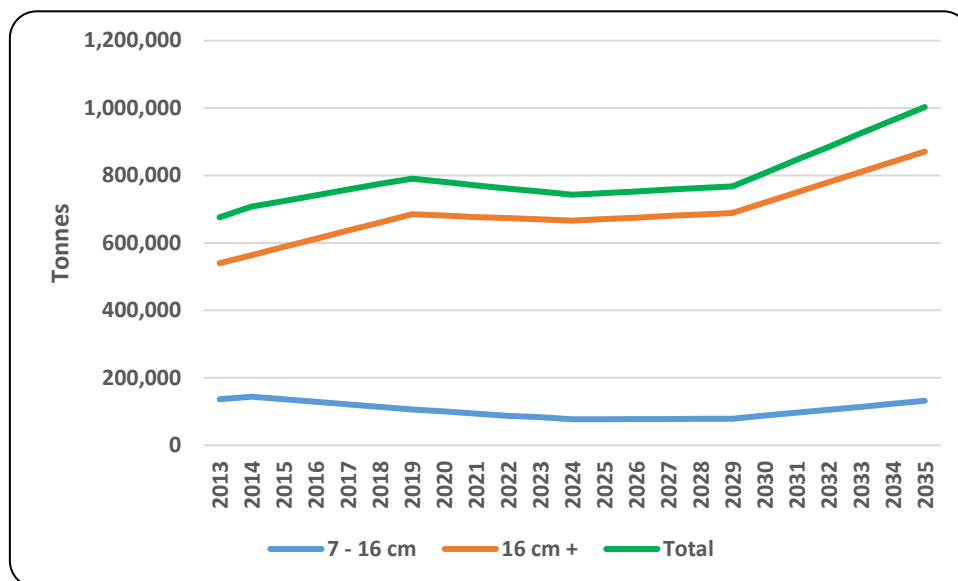
19. CENTRAL ENGLAND ZONE: CONIFEROUS ROUNDWOOD & SAWMILL PRODUCTS FORECAST AVAILABILITY & DEMAND

19.1. The information given in this section is for the area defined as the Central England zone (see map 13.1). This section of the report has been divided into two parts. The first part presents the situation for coniferous roundwood and the second part presents the results for coniferous sawmill products.

CONIFEROUS ROUNDWOOD

19.2. The forecast potential annual availability of coniferous roundwood from the woods in the Central England zone over the next 20 years is shown in chart 19.1 for logs in the 7-16 cm and 16 cm + t.e.d size categories along with their combined total.

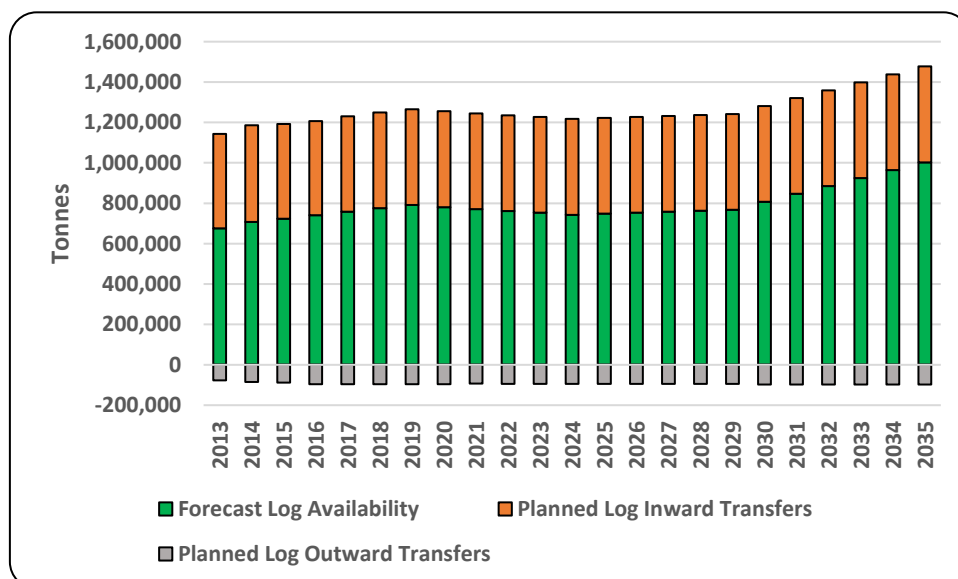
Chart 19.1: Central England: Forecast Potential Coniferous Roundwood Availability 2013 – 2035



19.3. The chart shows that the potential availability of coniferous roundwood from woods in the Central England zone is forecast to rise slightly in the next three years or so, but will then drop back very slightly before remaining fairly steady for 10 years until it starts rising in 2030 by about 20% up to 2035. Most of the forecast increase is expected to come from privately owned woods. All the increase in potential coniferous roundwood availability in the next 15 years is forecast to be as logs of 16 cm or more t.e.d. After that, logs under and over 16 cm t.e.d will both rise with the larger size category logs increasing much more sharply.

19.4. The potential availability of coniferous roundwood for wood users in the Central England zone is not just the forecast potential availability of coniferous roundwood from woods in the zone, but also needs to take account of the planned movement of coniferous roundwood into and out of the zone. These anticipated movements of coniferous roundwood are shown in chart 19.2.

Chart 19.2: Forecast Potential Coniferous Roundwood Availability in the Central England Zone with Expected Zonal Log Movements 2013 - 2035

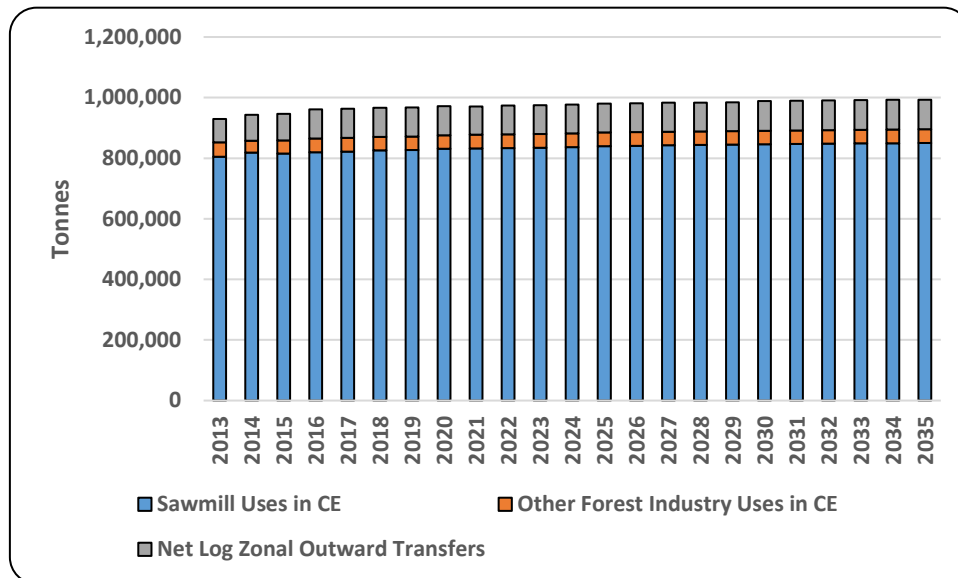


Source: FC, 2015 & Survey Data

19.5. This chart shows that coniferous roundwood movements in and out of the Central England zone are expected to remain largely unchanged over the next 20 years. Forecast coniferous roundwood availability for wood users in Central England will therefore remain largely unchanged over the next 15 years until 2030 when the forecast roundwood availability from the woods in Central England is forecast to rise. This increase is expected to come from privately owned woods in the West Midland and East England regions.

19.6. The forecast use by the forest industry and by energy users in the Central England zone of the coniferous roundwood grown in woods in the zone is shown in chart 19.3.

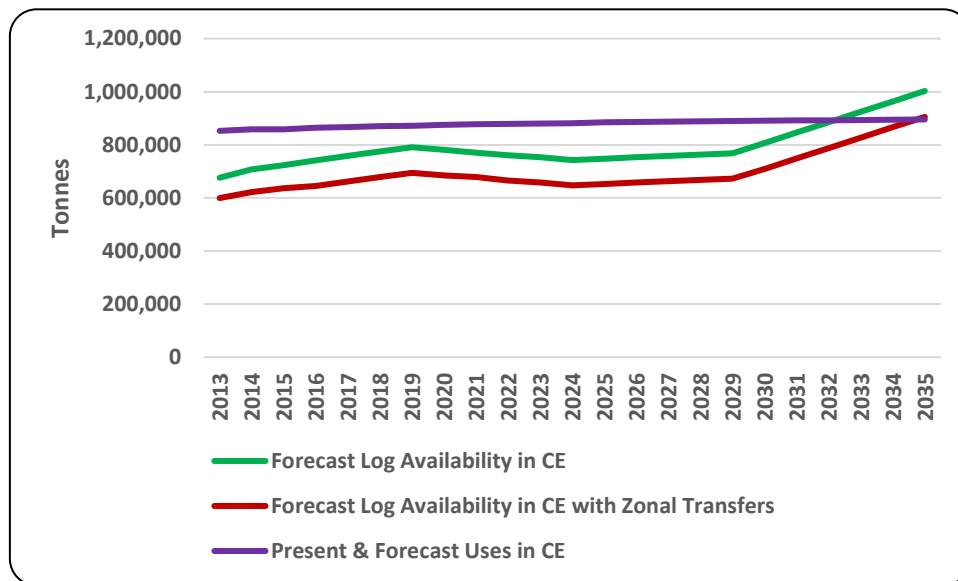
Chart 19.3: Central England: Planned Uses of GB Grown Coniferous Roundwood 2013 – 2035



19.7. The chart shows that the planned uses of coniferous roundwood in Central England are expected to remain largely unchanged over the next 20 years.

19.8. Chart 19.4 shows the potential availability of coniferous roundwood along with all the expected future uses for it in the Central England zone.

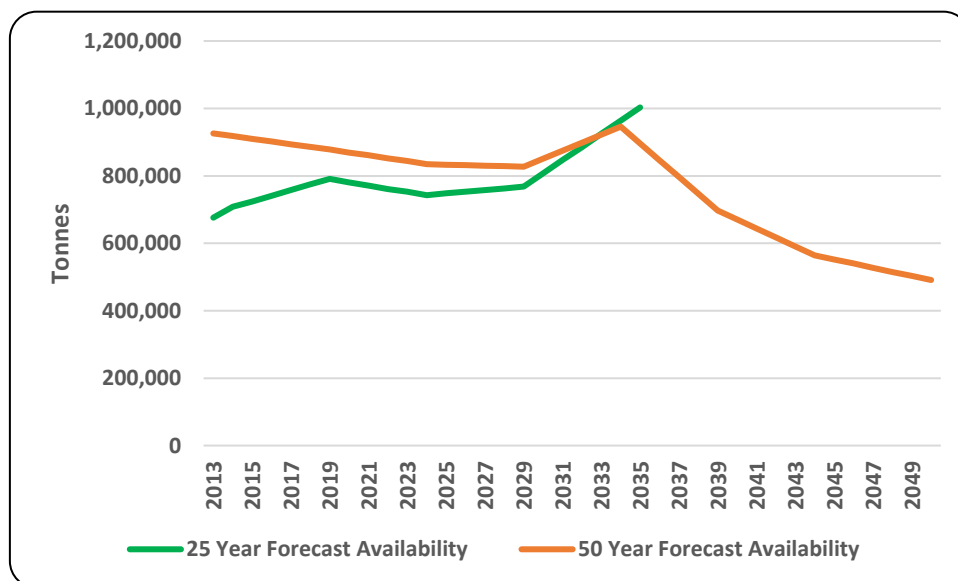
Chart 19.4: Central England: Comparison of Coniferous Roundwood Potential Availability & Demand 2013 - 2035



19.9. The chart shows that the anticipated demand for coniferous roundwood exceeds potential availability in Central England. This situation is forecast to continue until about 2030 when forecast availability from coniferous roundwood from woods in the zone is expected to increase.

19.10. A 50-year coniferous roundwood availability forecast has been made by the Forestry Commission using slightly different assumptions to the 25-year forecast (see annex section 14). Both the 25-year and 50-year coniferous roundwood availability forecasts are given in chart 19.5.

Chart 19.5: Central England: Forestry Commission 25-year and 50-year Forecasts of Potential Coniferous Roundwood Availability 2013 - 2050



Source: Forestry Commission, 2015

19.11. The chart shows that the 50-year forecast of potential availability of coniferous roundwood is slightly higher over the next 15 years than indicated by the 15 year forecast. Part of the explanation could be the existence of more conifer trees being retained for longer

than in upland areas before being harvested. After 2035 potential roundwood availability is expected to fall quite sharply.

19.12. This forecast reduction of coniferous roundwood availability after about 2033 reflects a number of issues which include slightly different forecast assumptions, but more significantly reduced areas of new planting in the zone from the 1980s and changes in forestry practices such as planting more broadleaved trees and leaving larger areas unplanted and using more broadleaves for landscape reasons.

SAWMILL PRODUCTS

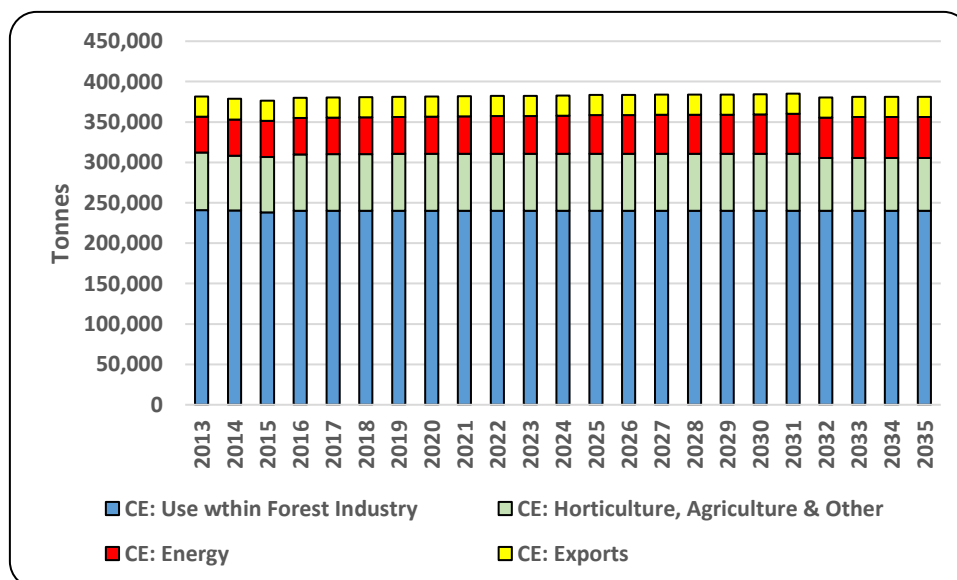
19.13. Coniferous sawmills produce sawn timber, wood chips, sawdust, pin chips, shavings, slab wood and bark. For the purposes of this report the term "coniferous sawmill products" or "sawmill products" relates to all the products *except* sawn timber.

Uses

19.14. The existing supply of sawmill products (chips, sawdust, slab wood and bark) produced by sawmills located in the Central England zone is sold into a variety of markets. The markets in the Central England zone can be broadly categorised as the panelboard mills, export, agriculture and horticultural markets with a number of other small miscellaneous ones. The quantity of chips that exported annually is very small. By far the largest market overall in GB at present for sawmill products is the panelboard industry.

19.15. The past and forecast future uses of sawmill products in the Central England zone, based on information provided by sawmills in the Central England zone, are shown in chart 19.6.

Chart 19.6: Past & Forecast Future Production & Use of Sawmill Products Originating within the Central England Zone 2013 – 2035



19.16. The chart shows that the production is forecast to be relatively steady and the forest industry is still the most important end use for sawmill products, but the use of them for horticulture, agricultural and other uses is the next most important end use within the Central England zone.

Zonal Roundwood Transfers

19.17. It is not possible to present any accurate data on sawmill product flows because many

sawmills are uncertain for what purpose some of their sawmill products eventually get used. This is because the purchase and sale, and the logistics of moving most larger quantities of sawmill products between producers and purchasers is undertaken by a small number of specialist companies. These companies would consider providing detailed information on their sawmill product movements as being commercially confidential.

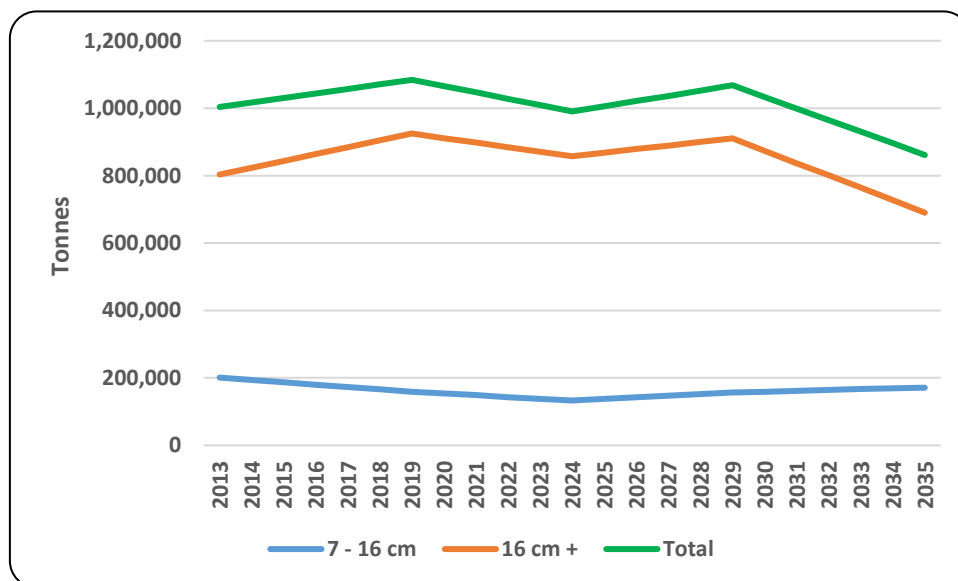
20. SOUTH ENGLAND ZONE: CONIFEROUS ROUNDWOOD & SAWMILL PRODUCTS FORECAST AVAILABILITY & DEMAND

20.1. The information given in this section is for the area defined as the South England zone (see map 13.1). This section of the report has been divided into two parts. The first part presents the situation for coniferous roundwood and the second part presents the results for coniferous sawmill products.

CONIFEROUS ROUNDWOOD

20.2. The forecast potential annual availability of coniferous roundwood from the woods in the South England zone over the next 20 years is shown in chart 20.1 for logs in the 7-16 cm and 16 cm + t.e.d size categories along with their combined total.

Chart 20.1: South England: Forecast Potential Coniferous Roundwood Availability 2013 – 2035

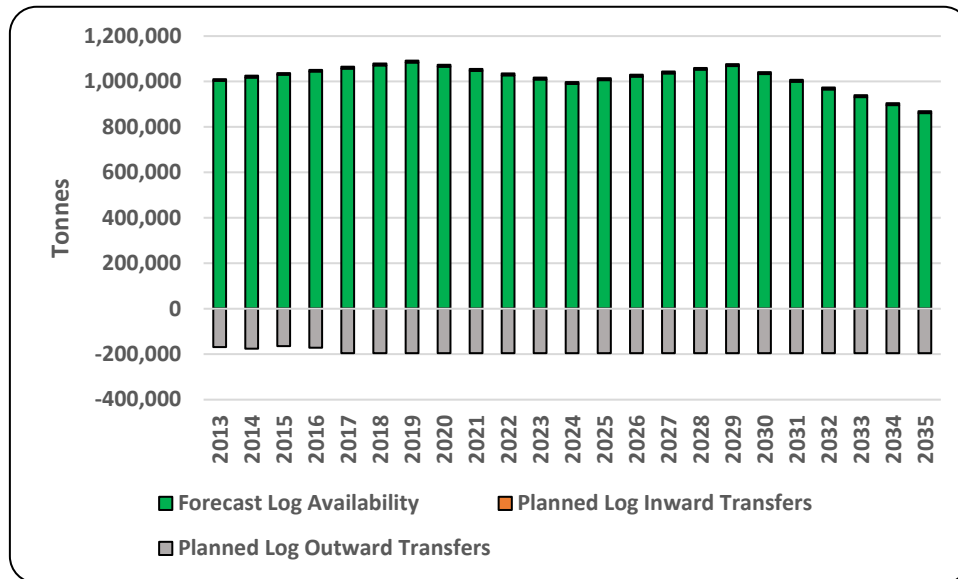


20.3. The chart shows that the potential availability of coniferous roundwood from woods in the South England zone is forecast to rise slightly in the next three years or so, but will then drop back very slightly before rising again in about 10 years' time. In about 15 years' time the potential availability of coniferous roundwood in the South England zone is forecast to start falling quite steeply. This fall is expected to occur almost entirely in logs with a diameter of 16 cm or more t.e.d.

20.4. The potential availability of coniferous roundwood for wood users in the Southern England zone is not just the forecast potential availability of coniferous roundwood from woods in the zone, but also needs to take account of the planned movement of coniferous roundwood into and out of the zone. These anticipated movements of coniferous roundwood are shown

in chart 20.2.

Chart 20.2: Forecast Potential Coniferous Roundwood Availability in the South England Zone with Expected Zonal Log Transfers 2013 - 2035

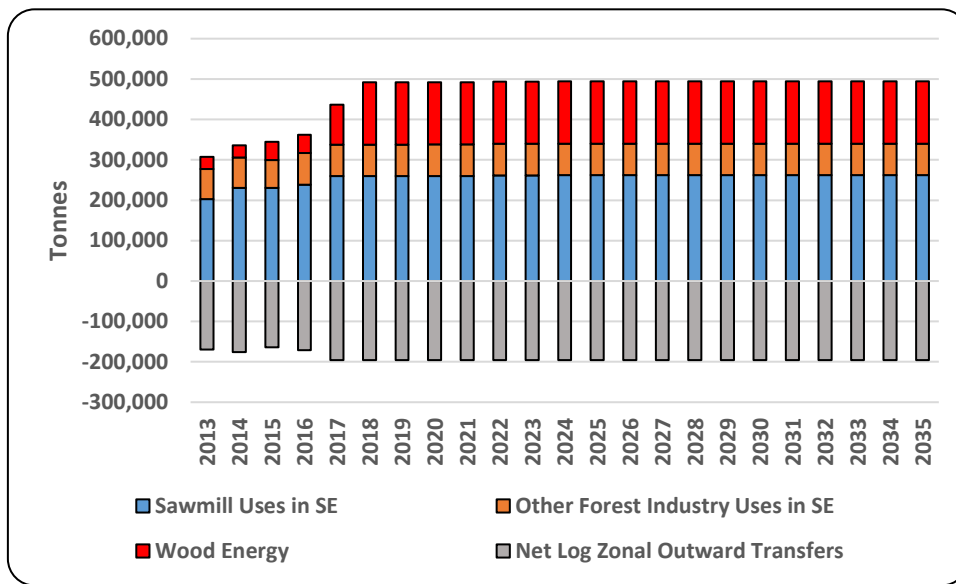


Source: FC, 2015 & Survey Data

20.5. This chart shows that coniferous roundwood movements in and out of the South England zone are expected to remain largely unchanged over the next 20 years provided the present sourcing intentions of buyers outside the zone remain unchanged. Forecast coniferous roundwood availability for wood users in the South England zone will fluctuate slightly but will remain largely unchanged over the next 15 years until 2030 when forecast roundwood availability from the woods in the South England zone is forecast to start falling quite significantly.

20.6. The forecast use by the forest industry and by energy users in the South England zone of the coniferous roundwood grown in woods in the zone is shown in chart 20.3.

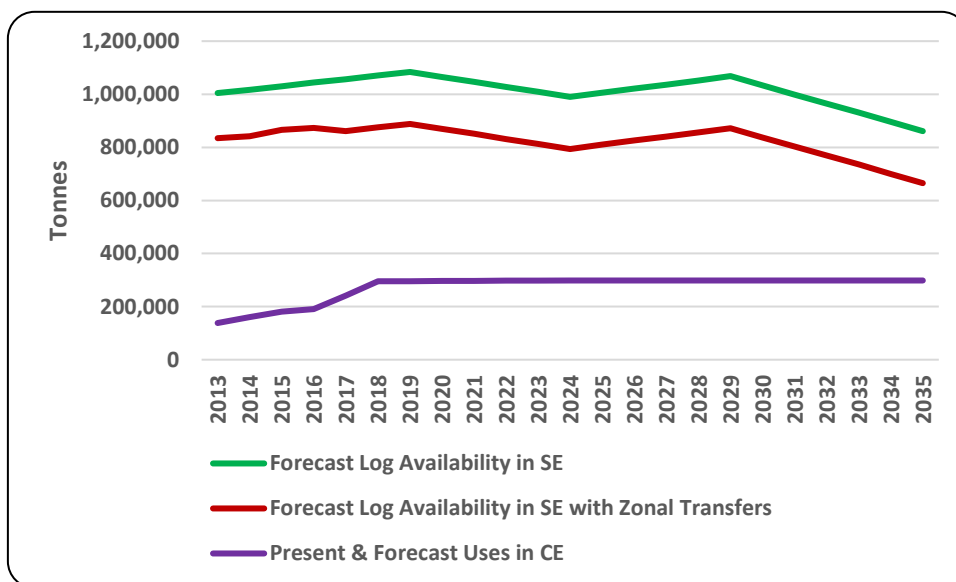
Chart 20.3: South England: Planned Uses of GB Grown Coniferous Roundwood 2013 – 2035



20.7. The chart shows that the planned uses of coniferous roundwood in the South England zone are expected to increase relatively significantly if three planned biomass wood energy projects begin operating.

20.8. Chart 20.4 shows the potential availability of coniferous roundwood along with all the expected future uses for it in the Central England zone.

Chart 20.4: South England: Comparison of Coniferous Roundwood Potential Availability & Demand 2013 - 2035

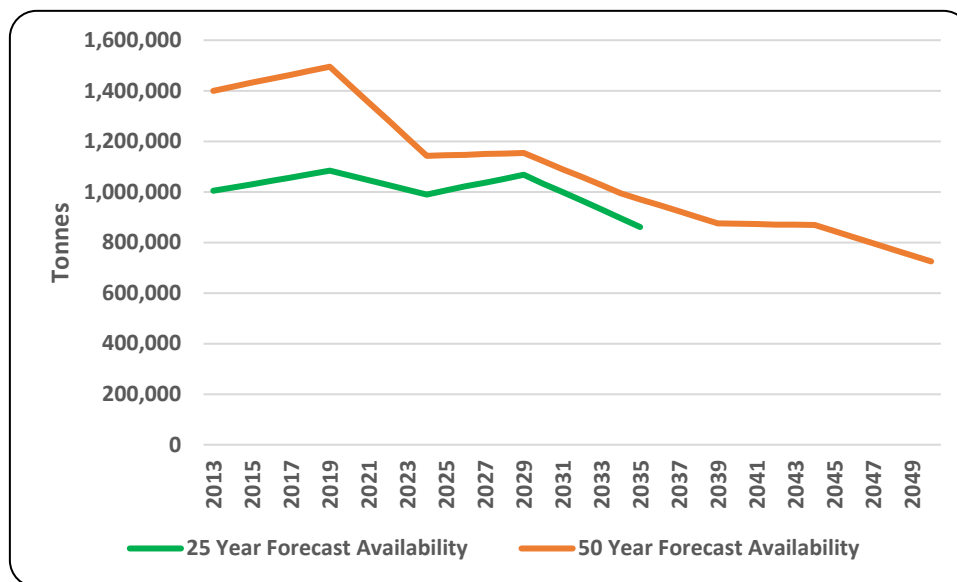


20.9. The chart shows that the potential availability of coniferous roundwood comfortably exceeds the anticipated demand for coniferous roundwood in Central England even after assuming that the anticipated roundwood sourcing intentions of buyers outside the zone remain unchanged. This surplus is expected to continue for the 20 years. Part of the reason for this big difference could be that much of the annual potential availability of coniferous roundwood is forecast to come from small woods that are owned by people with a wide variety of objectives in owning them other than commercial timber production. This may involve

retaining them beyond the felling age used in the production forecasting models for landscaping reasons.

20.10. A 50-year coniferous roundwood availability forecast has been made by the Forestry Commission using slightly different assumptions to the 25-year forecast (see annex section 14). Both the 25-year and 50-year coniferous roundwood availability forecasts are given in chart 20.5 and confirm a similar trend.

Chart 20.5: South England: Forestry Commission 25-year and 50-year Forecasts of Potential Coniferous Roundwood Availability 2013 - 2050



Source: Forestry Commission, 2015

20.11. The chart shows that the 50-year forecast of potential availability of coniferous roundwood is higher over the next 3 to 4 years than the 25 coniferous roundwood availability forecast, but then starts to fall with both forecasts turning down in about 15 years' time in 2030. The 50-year forecast then continues to fall sharply over the next 35 years.

20.12. This forecast reduction of coniferous roundwood availability after about 2033 reflects a number of issues which include slightly different forecast assumptions, but more significantly reduced areas of new planting in the zone from the 1980s and changes in forestry practices such as leaving larger areas unplanted and using more broadleaves for landscape reasons.

SAWMILL PRODUCTS

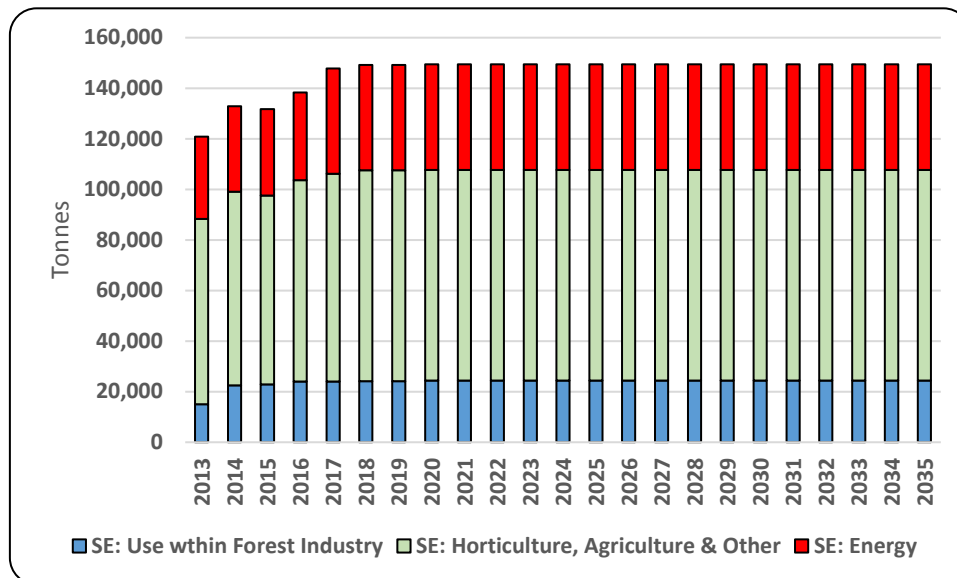
20.13. Coniferous sawmills produce sawn timber, wood chips, sawdust, pin chips, shavings, slab wood and bark. For the purposes of this report the term "coniferous sawmill products" or "sawmill products" relates to all the products *except* sawn timber.

Uses

20.14. The existing supply of sawmill products (chips, sawdust, slab wood and bark) produced by sawmills located in the South England zone is sold into a variety of markets. The markets in the South England zone can be broadly categorised as the panelboard mills, export, agriculture and horticultural markets with a number of other small miscellaneous ones.

20.15. The past and forecast future uses of sawmill products in the South England zone, based on information provided by sawmills in the South England zone, are shown in chart 20.6.

Chart 20.6: Past & Forecast Future Production & Use of Sawmill Products Originating within the South England Zone 2013 – 2035



20.16. The chart shows that the total quantity of sawmill products produced in the South England zone is relatively small compared with other zones and that a large proportion of them are used in the agricultural and horticultural sectors, including equestrian activities. Only a small percentage gets used within the forest industry.

Zonal Roundwood Transfers

20.17. It is not possible to present any accurate data on sawmill product flows because many sawmills are uncertain for what purpose some of their sawmill products eventually get used. This is because the purchase and sale, and the logistics of moving most larger quantities of sawmill products between producers and purchasers is undertaken by a small number of specialist companies. These companies would consider providing detailed information on their sawmill product movements as being commercially confidential.

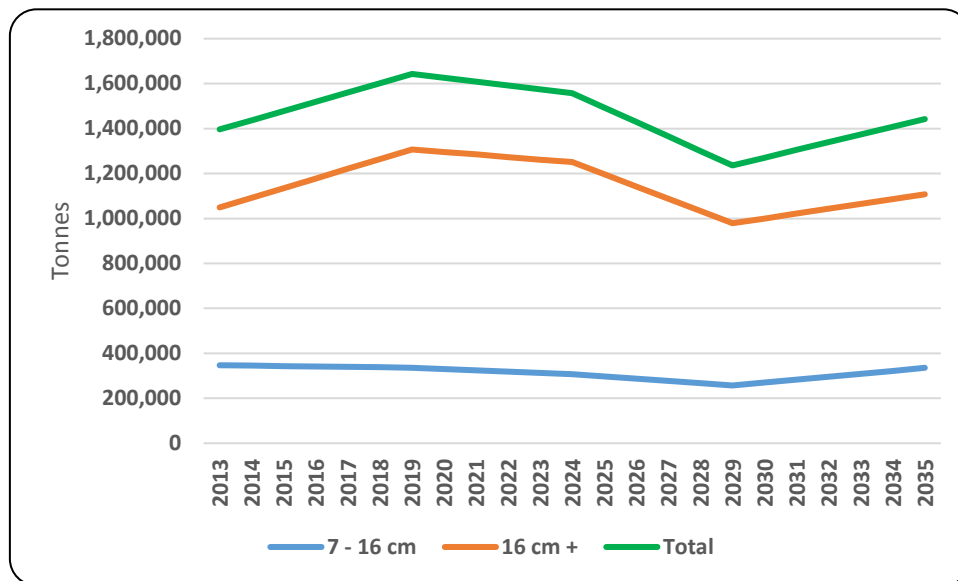
21. WALES: CONIFEROUS ROUNDWOOD & SAWMILL PRODUCTS FORECAST AVAILABILITY & DEMAND

21.1. The information given in this section is for Wales (see map 13.1). This section of the report has been divided into two parts. The first part presents the situation for coniferous roundwood and the second part presents the results for coniferous sawmill products. The coniferous roundwood availability forecast is a new one based on more up-to-date inventory data (Forestry Commission, 2016).

CONIFEROUS ROUNDWOOD

21.2. The forecast potential annual availability of coniferous roundwood from the woods in the Wales over the next 20 years is shown in chart 21.1 for logs in the 7-16 cm and 16 cm + t.e.d size categories along with their combined total.

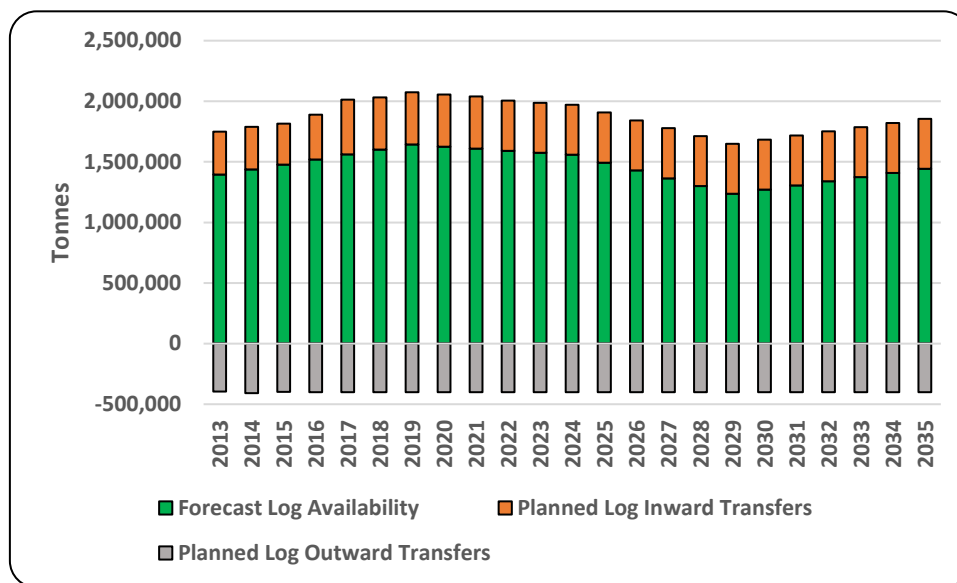
**Chart 21.1: Wales: Forecast Potential Coniferous Roundwood Availability
2013 – 2035**



21.3. The chart shows that the potential availability of coniferous roundwood from woods in Wales is forecast to rise in the next three years up to about 2019, but after that it is forecast to decline up to 2029. The decline is gradual up to about 2024 and then steeper until 2029. At that point potential coniferous roundwood availability is forecast to return to about its present potential availability. These major changes in potential availability are all forecast to occur in logs with a t.e.d of 16 cm or more, while the potential availability of logs with a ted of 16 cm or less is forecast to gradually decline over the next 15 years before rising slightly.

21.4. The potential availability of coniferous roundwood for wood users in Wales is not just the forecast potential availability of coniferous roundwood from woods in the zone, but also needs to take account of the planned movement of coniferous roundwood into and out of the zone. These anticipated movements of coniferous roundwood are shown in chart 21.2.

Chart 21.2: Forecast Potential Coniferous Roundwood Availability in Wales with Expected Zonal Log Movements 2013 - 2035

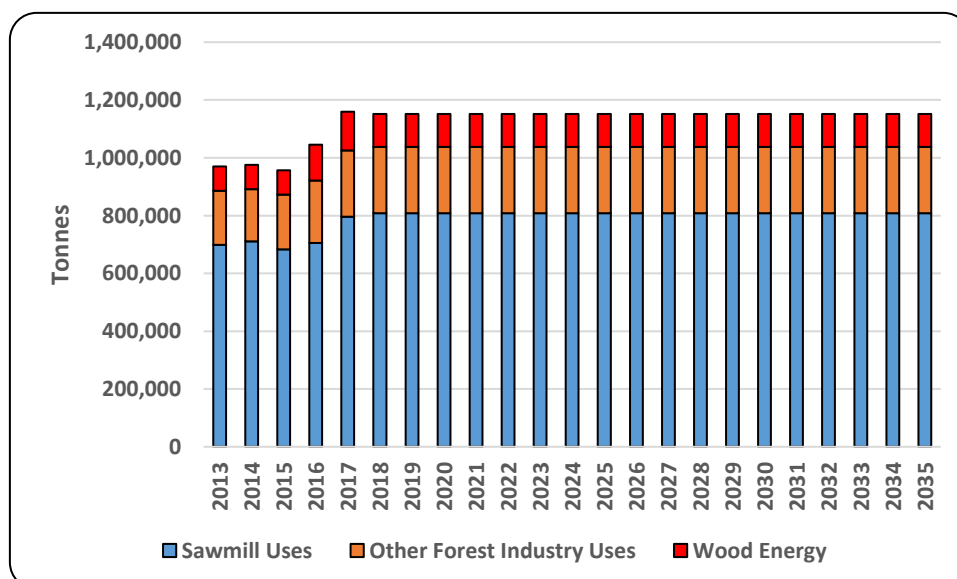


Source: FC, 2015 & Survey Data

21.5. This chart shows that coniferous roundwood movements out of Wales are expected to remain fairly steady at their present level, but inward movements will increase slightly in the next 2 to 3 years, but after that remain fairly constant provided the present sourcing intentions of buyers remain unchanged. The changes in overall potential roundwood availability will come about as a result of changes in potential roundwood availability from the coniferous woods in Wales.

21.6. The forecast use by the forest industry and by energy users in Wales of the coniferous roundwood grown in woods in the zone is shown in chart 21.3.

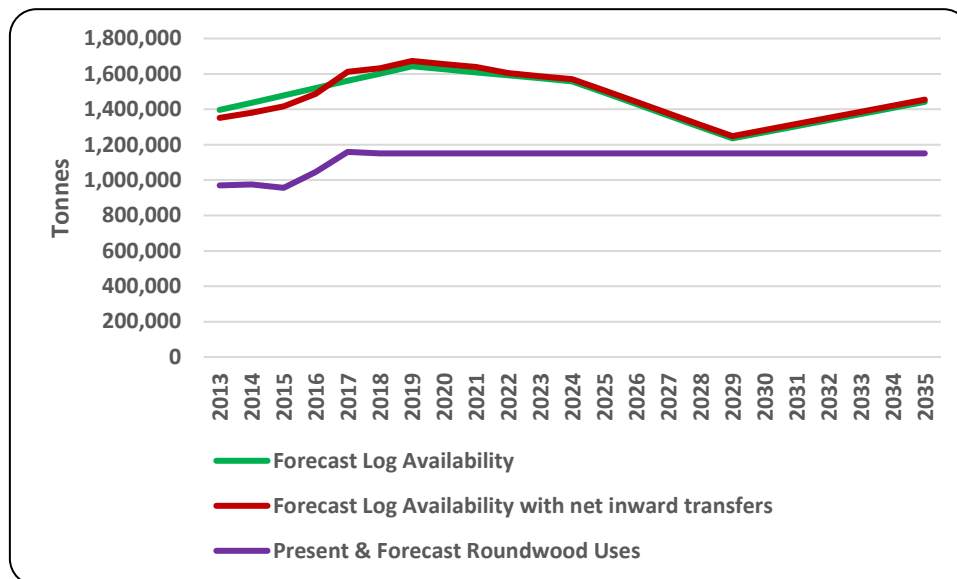
Chart 21.3: Wales: Planned Uses of GB Grown Coniferous Roundwood 2013 – 2035



21.7. The chart shows that increases in the use of coniferous roundwood by the sawmilling industry and for wood energy production are planned in the next three years. After that no further changes are foreseen at this stage.

21.8. Chart 21.4 shows the potential availability of coniferous roundwood along with all the expected future uses for it in Wales.

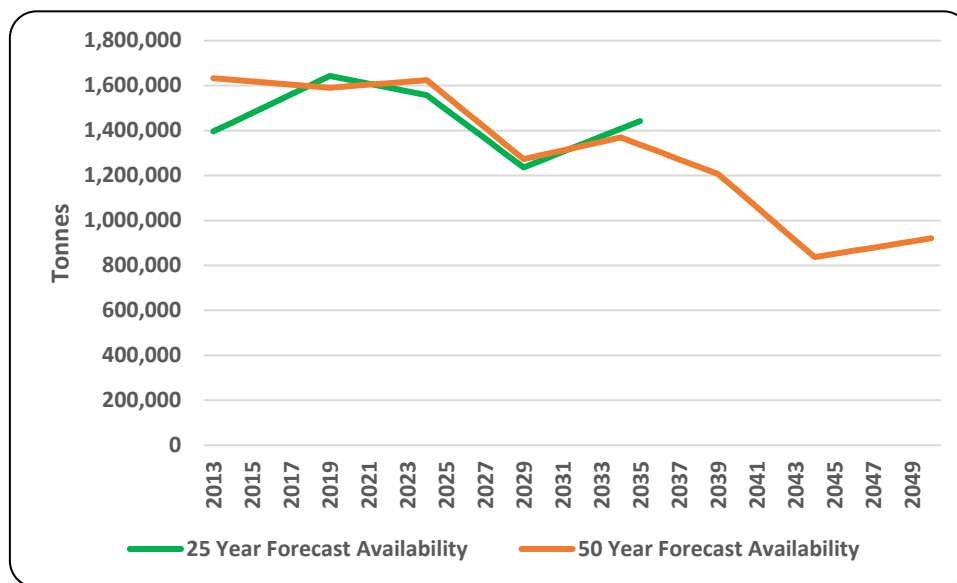
Chart 21.4: Wales: Comparison of Coniferous Roundwood Potential Availability & Demand 2013 - 2035



21.9. The chart shows that the potential availability of coniferous roundwood exceeds the anticipated demand for coniferous roundwood in Wales even after assuming that the anticipated roundwood sourcing intentions of buyers outside the zone remain unchanged. This surplus is expected to continue for the 20 years, although the potential roundwood availability and demand become very close in about 15 years' time in about 2030. Part of the reason that potential availability is forecast to remain above present and forecast users' requirements in Wales could be that some of the roundwood is forecast to come from small woods and owners have other priorities than timber production; there are difficulties in transporting it on rural roads and landscaping issues are given priority.

21.10. The most recent 50-year coniferous roundwood availability forecast has been made by the Forestry Commission using slightly different assumptions to the most recent 25-year forecast (see annex section 14). Both the 25-year and 50-year coniferous roundwood availability forecasts are given in chart 21.5 and confirm a similar trend.

Chart 21.5: Wales: Forestry Commission 25-year and 50-year Forecasts of Potential Coniferous Roundwood Availability 2013 - 2050



Source: Forestry Commission, 2015

21.11. The chart shows that the 50-year forecast of potential availability of coniferous roundwood has been higher than the 25-year coniferous roundwood availability forecast over the last 3 years, but then both forecasts follow the same pattern and potential roundwood availability falls until about 2030. Then potential availability will rise slightly for 5 years before falling below the requirements of present users in about 2040.

21.12. This forecast long term reduction of coniferous roundwood availability after about 2020 reflects a number of issues which include slightly different forecast assumptions, but more significantly reduced areas of new planting in Wales from the 1980s and changes in forestry practices such as leaving larger areas unplanted and using more broadleaves for landscape reasons.

SAWMILL PRODUCTS

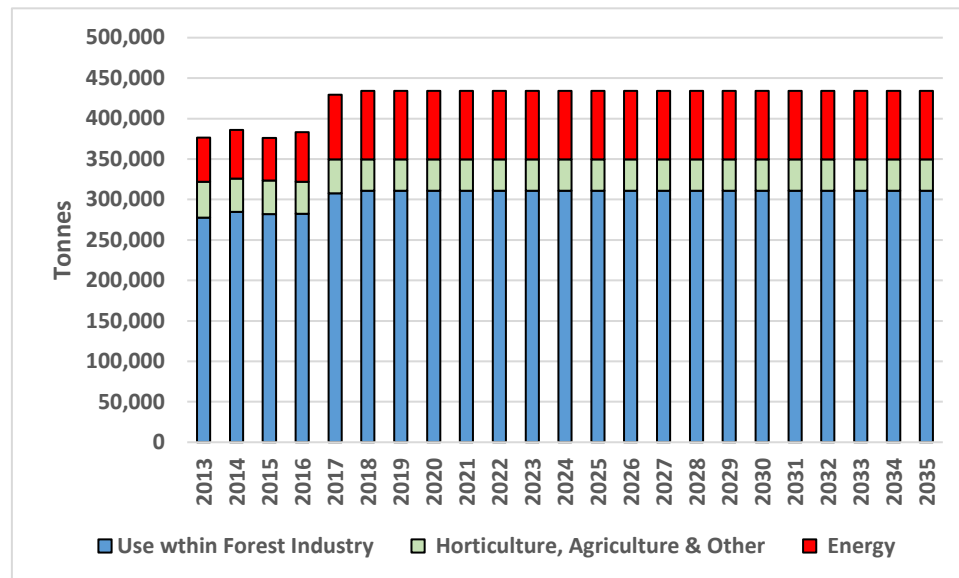
21.13. Coniferous sawmills produce sawn timber, wood chips, sawdust, pin chips, shavings, slab wood and bark. For the purposes of this report the term "coniferous sawmill products" or "sawmill products" relates to all the products *except* sawn timber.

Uses

21.14. The existing supply of sawmill products (chips, sawdust, slab wood and bark) produced by sawmills located in Wales zone is sold into a variety of markets. The markets in Wales can be broadly categorised as the panelboard mills, agriculture and horticultural markets with a number of other small miscellaneous ones. By far the largest market overall in Britain at present for sawmill products is the panelboard industry.

21.15. The past and forecast future uses of sawmill products in Wales, based on information provided by sawmills in Wales, are shown in chart 21.6.

Chart 21.6: Past & Forecast Future Production & Use of Sawmill Products Produced within Wales 2013 – 2035



21.16. The chart shows that the most important market for sawmill products in Wales is the forest industry.

Zonal Roundwood Transfers

21.17. It is not possible to present any accurate data on sawmill product flows because many sawmills are uncertain for what purpose some of their sawmill products eventually get used. This is because the purchase and sale, and the logistics of moving most larger quantities of sawmill products between producers and purchasers is undertaken by a small number of specialist companies. These companies would consider providing detailed information on their sawmill product movements as being commercially confidential.

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June 2016

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