

Appendix:

Scoping a Roadmap for Delivering Sustainability and Growth of Welsh Woodlands

For: Wales Forest Business Partnership

Authors: Gary Newman, Graham Hilton,
Geraint Williams – Resource Efficiency Services

Reviewers: Roger Cooper, Dr David Robson

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1 Woodland area

Wales has a current recorded woodland cover of 306,000 hectares, or 14.8% of its available land. This is broadly in line with other parts of the UK (England 10% Scotland 18.2% NI 8.2%) but well below the EU average of 34% (excl. Russia. 45% incl. Russia). and a World average of 31%. (Forestry Commission - Forestry Statistics 2014, UN FAO – Global Forestry Resources Estimate 2010).

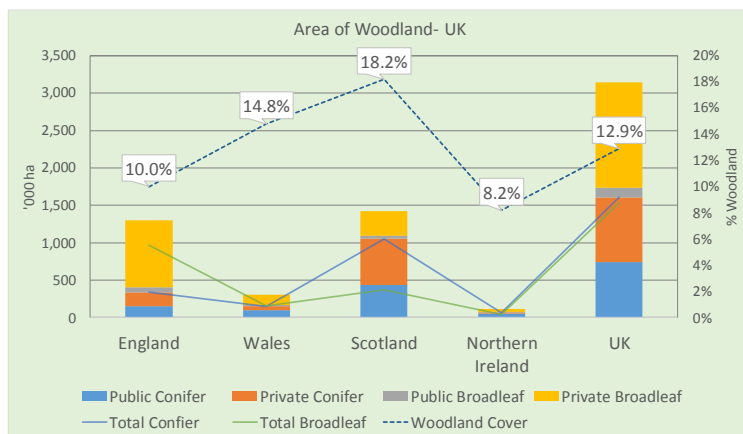


Chart A1: Forest cover across the UK

Wales Only Data			
Total		Cover	
306		14.8%	
WGWE		Other	
117		189	
Broad	Conifer	Broad	Conifer
19	98	136	53

WGWE - Welsh Government Woodland Estate (Public Forest)

Fig. A1: Forest cover breakdown - Wales

A quick scan of historic data, suggests that cover has grown significantly from the late 1990s, but the apparent increase, of some 20,000 hectares, is largely due to revised mapping and reporting procedures. The National Forest Inventory (NFI) was due to report comprehensive results of field surveys, as part of a wider UK programme in late 2014 to complement the existing 2011 satellite mapping data. At the time of writing, these findings are yet to be publicly released, but RES have begun a dialogue with NFI staff which suggests that comprehensive and detailed data will be

available for use in a full scale roadmap exercise, if commissioned.

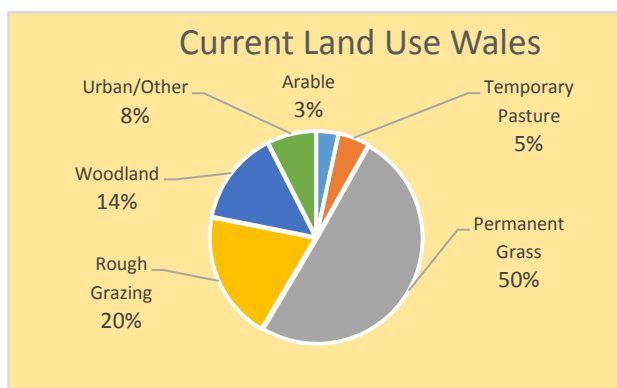


Chart A2: Breakdown of land use in Wales

- Numerous aspirations for increasing woodland cover have been expressed alongside evolving schemes to support both woodland evolution (including farm woodland and plantations on ancient woodland sites) and overall cover

- Under the Better Woodland for Wales Grant Scheme which ran 2006 to 2010 – only 380 hectares per year of new cover was established. This was mainly in small blocks and at low stocking density. At this rate, it

would take 55 yrs to add 1% cover, or over 800 years to double cover. This compares to Scottish aspirations to increase cover to 25% by 2050 (FC Scotland 2006)

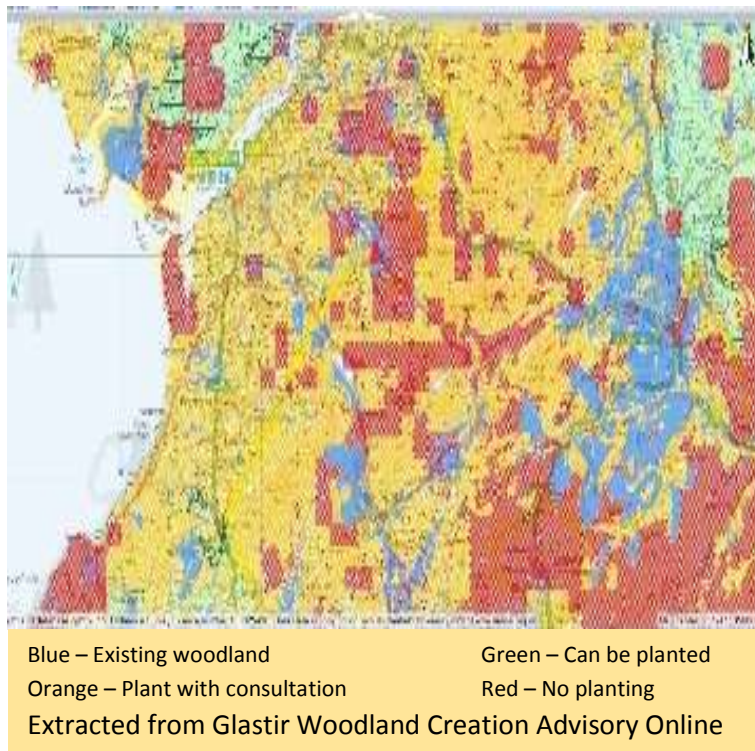


Fig. A2: Planting area map - Glastir Woodland Creation

- The Glastir programme¹, which started in 2010, references the creation of 100,000 ha of additional woodland cover, and there is evidence from the Welsh Woodland Indicators report (2013) that net planting may now be as high as 900 hectares (see below)
- This additional 100,000 ha is also referenced in the Welsh Government Land Use Climate Change report (ADAS, 2014) with an aspiration to achieve it by 2030
- If the Welsh Government target of 100,000 ha new woodland by 2030 is achieved, an additional 5,800 ha of woodland would need to be planted annually (WFBP/Confor, 2013)
- The intended split of these plantings, between 50% native broadleaves and 50% mixed

woodland does raise some issues around the avowed intention to also maintain production

- Natural Resources Wales (NRW) has specific management of “120k ha” of Wales (WGWE) that is wooded, where it has highlighted value for amenity, biodiversity, fruit and fuel

Woodland creation is recognised as a very effective way of fighting climate change over the long term and represents 60% of the grant aid administered by the Forestry Commission. But to realise the potential for 2050 there will need to be a big increase in woodland creation.

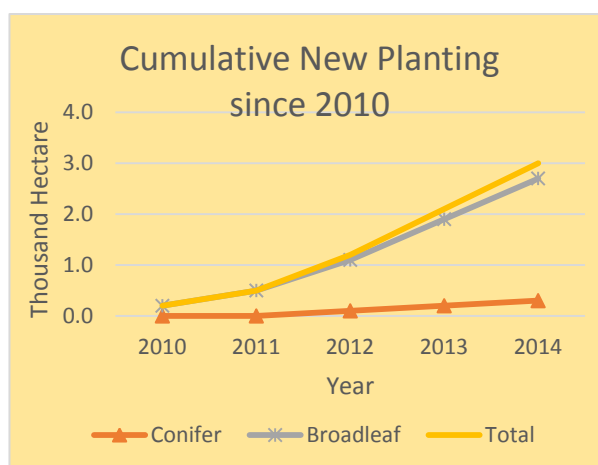


Chart A3: Cumulative new planting in Wales

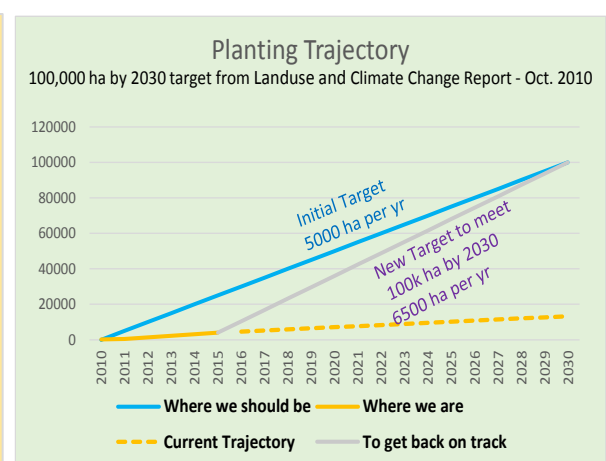


Chart A4: Planting trajectory vs. target

¹ A new map (ph4) replacing the one shown opposite has been produced but not yet released by WG. The new map is a more positive proactive approach to afforestation as opposed to the original map shown which is purely a constraint based approach. (Contact Alex.harris@wales.gsi.gov.uk)

The charts above show the recent increase in area of woodland in Wales. This increase, 3,100 ha since 2010, improves on the Better Woodland for Wales position but is substantially below (only 16% of) the 20,000 ha target originally required by 2014. This results in a required new planting rate of round 6500 ha/yr to meet the original Land Use and Climate Change Group (LUCCG) report target. The afforestation of 3,100 ha can be broken down into coniferous forest (300 ha) and broadleaved forest (2700 ha). Rates of coniferous tree afforestation have remained constant for the last three years, whilst the rate of broadleaved forest creation was eight times faster but remained constant for the last two years. The expansion of woodland within Wales has been triggered mainly by Glastir woodland creation grants, but has also recently been encouraged by the potential benefits of afforestation to prevent flooding.

In the UN published outlook document for European forestry (UN, 2011) under the reference scenario (business as usual) the total forest area is assumed to increase at the rate of 600,000 ha/year (out of 205 million ha) which is equivalent to 0.3% per year and follows a linear progression from the known rate of increase between 2005 and 2010. If we assume productive area of Welsh woodland to be 150,000 ha and an equivalent rate of area increase of 0.3% this would yield an additional 450 ha/year – or 9000 ha over 20 years. This is broadly in line with the rate of increase generated under the BWW scheme. This would indicate that in terms of the business as usual models put forward by the UN, Wales would need radical policy change if an afforestation target of 100,000 ha is to be adopted and achieved.

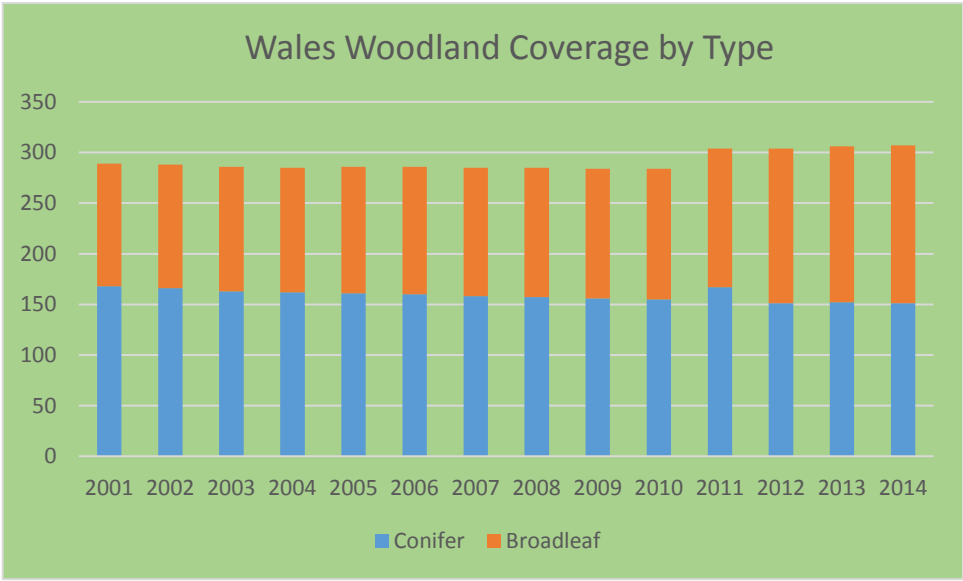
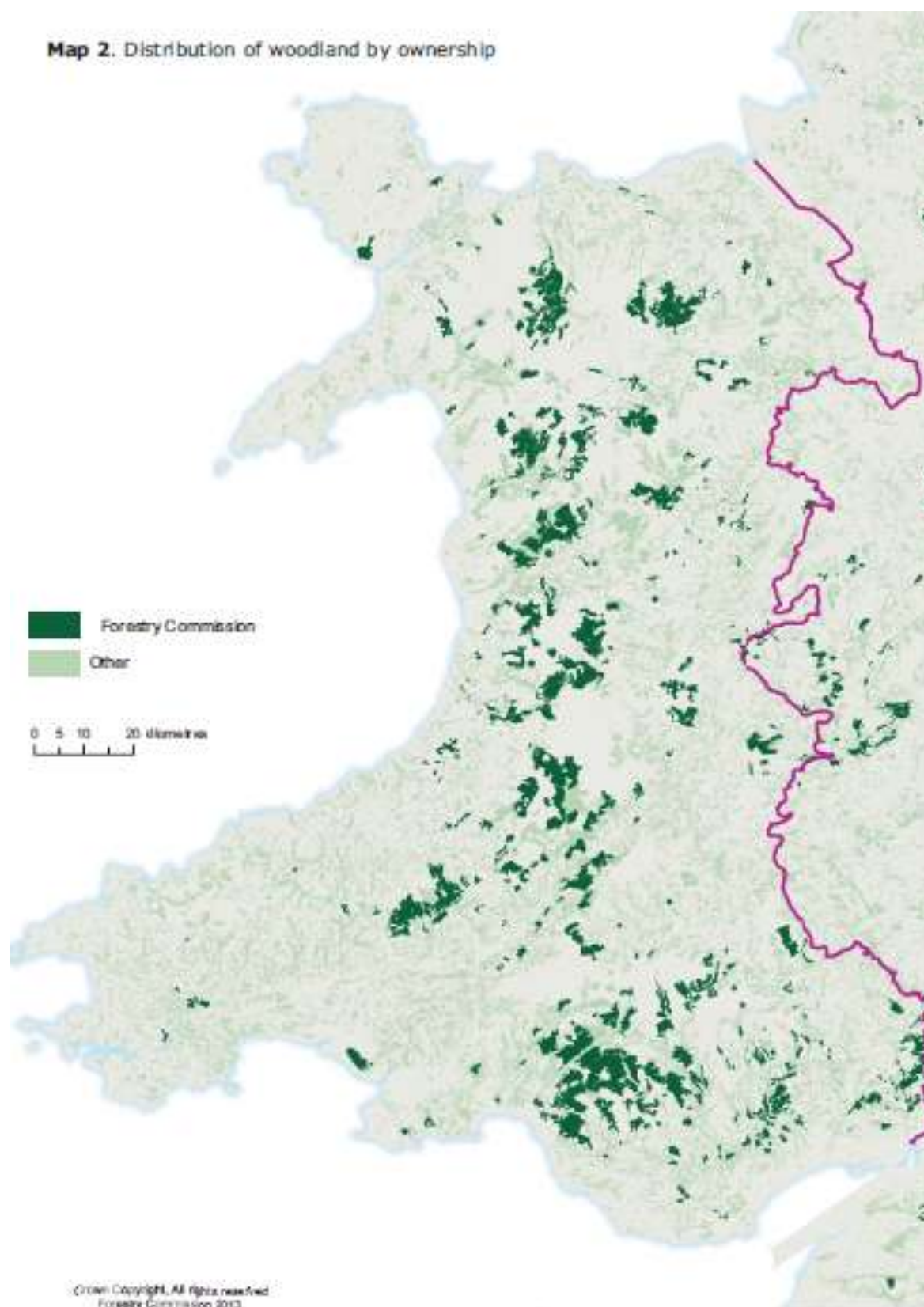


Chart A5: Wales' woodland coverage by type 2001-2014

The majority of conifers are managed by Natural Resources Wales and the majority of broadleaves are under private ownership. The ownership structure of Welsh woodland is shown in Fig. A3 below. Since 2001 the estimated area of conifer woodland has decreased by 16,000 ha, whilst the estimate area of broadleaf woodland has increased by 33,000 ha. Recent planting is shown in Chart A6 below.

Map 2. Distribution of woodland by ownership



10 NFI woodland map - Wales

Fig. A3: Ownership and distribution of Welsh woodland

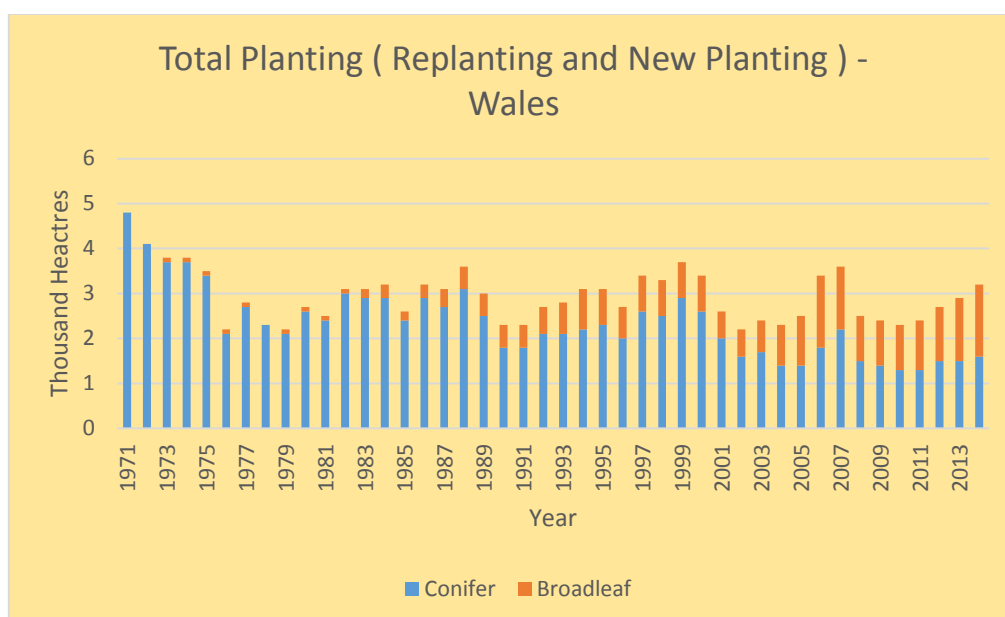


Chart A6: Total planting activity in Wales

The recent lack of planting of conifers is a concern to industry. All the industrial markets for timber are for conifers.

The nature, ownership and market conditions for softwoods and hardwoods suggest that radically different solutions are required to increase the productivity and value from the Welsh woodland resource. The roadmap should view the barriers to productivity and potential interventions separately.

	Woodland Type	2010 (000 ha)	2014 (000 ha)	% Change	<i>*Other – all other woodland. Includes woodland previously owned by Countryside Council for Wales and the Environment Agency Wales, other publicly owned woodland and privately owned woodland. ** Revised disparity between the FC estimates of the woodland area in Wales existed for the reference date of 31st March 2010. Forestry Statistics (2010) published 284 thousand hectares as the total woodland area, but the National Forest Inventory (NFI, 2010) published 303.5 thousand hectares at the same point. This disparity is believed to be due to methodological differences between the National Inventory of Woodland and Trees (NIWT) and NFI, and the classification of unmapped areas of woodland.</i>
NRW	Conifer	90	98	9	
	Broadleaf	15	19	27	
Other*	Conifer	65	53	-18	
	Broadleaf	114	137	20	
Total	Conifer	155	151	-3	
	Broadleaf	129	156	21	
Total		284	307	8	
Revised Total**		304	307	1	

Fig. A4: Increases in woodland ownership

2 Woodland ownership

Throughout the UK, a significant proportion of the productive woodland estate is in public hands.

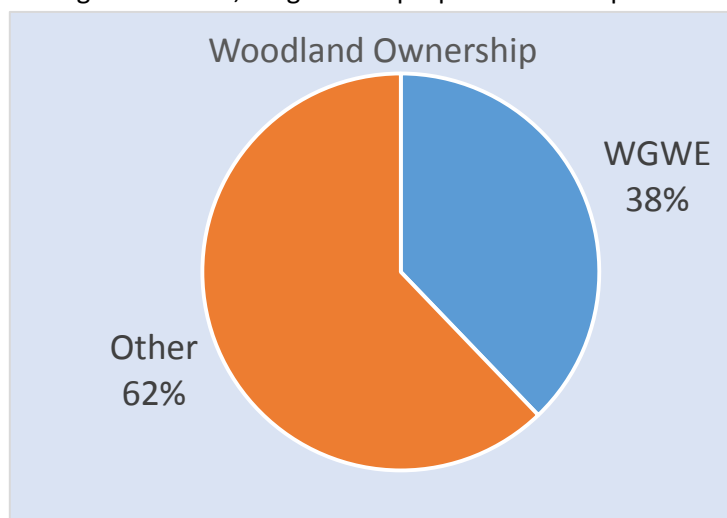


Chart A7: Woodland ownership in Wales

The Welsh Government Woodland Estate (WGWE) extends to 117,000 hectares, or 38%, but represents 58% of the area under active management.

Private woodland, covering a further 189,000 hectares has only between 85,000 and 105,000 ha in recognised management schemes. The majority of private sector conifer plantations (53,000 ha) are thought to be in management leaving only broadleaf

30-55,000 ha out of 136,000 ha of broadleaf in management.

Management however can refer to a multitude of activities and only around 6.5% of private sector broadleaf cover shows evidence of thinning. The drive to bring private woodland into management remains a major preoccupation for Natural Resources Wales and Welsh Government, as it is with forestry authorities across the UK.

Historically a major focus of management expansion has been within the farm woodland sector. This has seen some success with the area in recognised management schemes trebling in the first 13 years of the new millennium, to cover almost half of all “farm” woodlands. There is some evidence however (see below: 3. Woodland management) that the degree of management practised in these areas is typically very limited in its scope. The balance of Welsh woodland consists of linear features (hedges etc) and smaller, often community managed features such as community woodlands and parks.

This ownership structure, in Wales, in common with the balance of the UK differs from the European norm, not just in the relatively high proportion of managed woodland in state ownership, but also in the absence of integrated forestry and processing ownership. With the exception of small areas of woodland, supplying “craft” processes, sawmills and large scale wood processors in Wales do not own, or completely manage significant areas of forestry. In contrast, the large scale wood processing industries of Germany, Austria and Scandinavia show a high degree of integration, managing forestry for supply into their sawmills, biomass plants and into a growing number of value added processing operations for chemicals or engineered wood products. The balance of Europe is characterised by a large estate of private woodlands, ranging from large estates to small “retail” investment blocks, which supply the processing industries on long term or spot market contracts. In some cases these will include provision of forestry management on a “gain-share” basis.

Strangely, given the extensive research library for Welsh forestry, little if any investigation has been undertaken into this ownership situation. “Very little objective research has been undertaken to

compare the value of public benefits delivered by publicly and privately owned woodland” (Forestry Commission Wales, 2011). This comment prefaced the Assembly Government Woodland Estate (AGWE) research report, which made the following recommendations:

“Future management of the estate requires a clear strategic approach and the ability to respond to the most pressing public policy needs. An entirely static view would risk missing opportunities for greater public benefit.

Choosing a more dynamic approach to ownership and management of the AGWE, which would help to deliver the 50 year woodland strategy Woodlands for Wales, the Welsh Assembly Government asked Forestry Commission Wales to:

- Take forward plans for the mixed ownership option, starting by developing the tools for making case-by-case decisions on the future of individual AGWE holdings. This portfolio analysis will be used to characterise woodlands according to their existing delivery of ecosystem services and their capability to deliver future public benefits.
- Explore the feasibility of transferring AGWE land to the third sector. This will start with small-scale transfer cases arising from the portfolio analysis, testing the concept and exploring the potential for using it at a larger scale.
- Take a more pro-active and imaginative approach to commercial opportunities while continuing to manage the AGWE for the delivery of environmental, social and wider economic benefits. FCW is already engaged in commercial activities, including joint ventures on wind energy and recreation. Commercial expansion will be selective, bearing in mind that the AGWE also offers valuable opportunities to encourage Social and Community Enterprise.”

The Assembly Government Woodland Estate (AGWE) is synonymous with Welsh Government Woodland Estate (WGWE) following the change from Welsh Assembly Government to Welsh Government in 2011.

A different approach to ownership and management of the WGWE could help to create more dynamic and innovative industry. The most appropriate ownership and management approach could be considered on a case by case basis depending on site specific issues and opportunities.

As about 1/5 of Welsh woodland is on privately owned farms (equivalent to 60,800 ha), this sector is a key focus for strategies to increase future value. Under Woodlands for Wales the stated desired trends are increased area within a grant scheme and an increase in income generation from timber and other products and services. Considered within the context of a target to increase woodland cover by 100,000 ha by 2030, this sector should be a core focus for behaviour change. The level of farmers currently harvesting timber is very low. The following chart shows that currently, of the farmers surveyed, only 3% harvested products for sale. The reason for this low level of harvest should be investigated further.

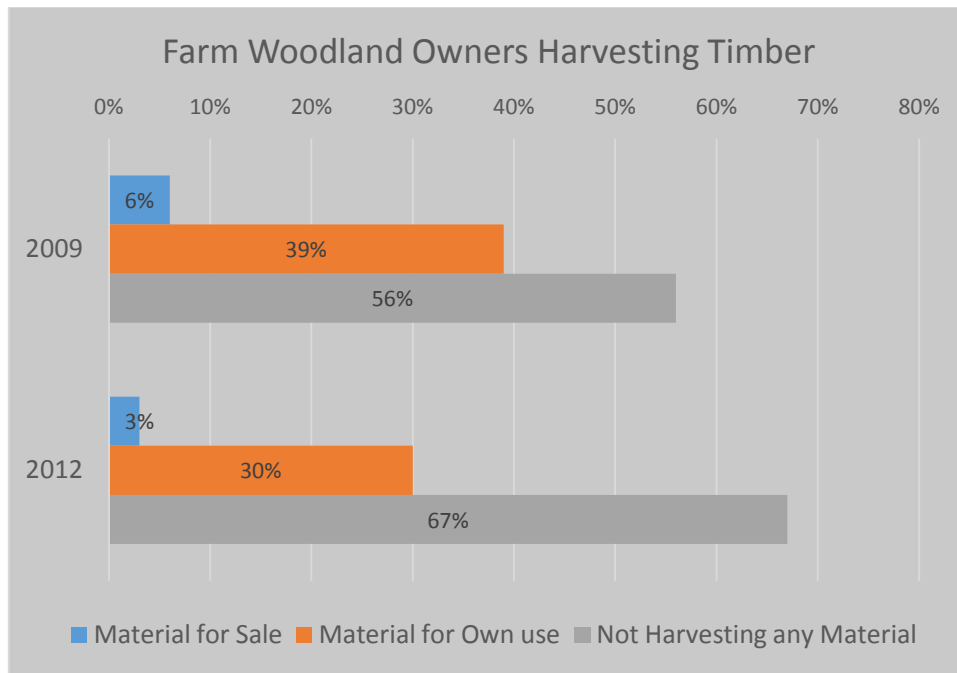


Chart A8: Farm woodland harvesting patterns

A Welsh forestry roadmapping exercise would provide the space for the necessary thinking required to find solutions for significant afforestation on privately owned farmland.

3 Woodland management

While public attitude surveys often display a presumption that “natural” or “native” woodlands represent the best forms of landscape or biodiversity protection, it is now widely accepted that managed woodland is better for all potential outcomes than unmanaged woodland. While this may cover a range of scale and nature of intervention, the improvement in outcomes supports the ongoing drive to bring existing woodland into management.

The recent trend for increased management (UK Forestry Standard) is shown in the following graph; the increase since 2006 is from the non-WGWE, with between 44% and 55% of privately owned woodland now managed to UKFS.

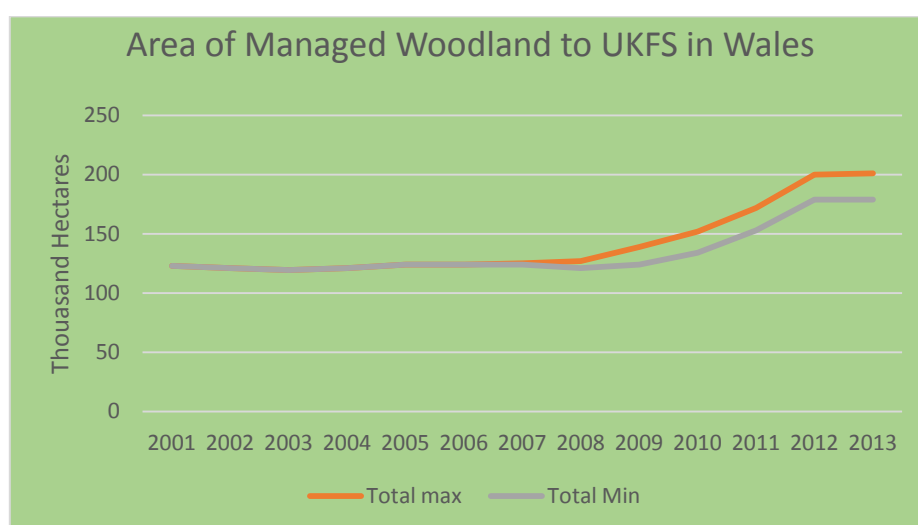


Chart A9: Area of managed woodland to UKFS

Further work appears necessary in this area, as this estimates the total area managed to UKFS, significantly in excess of other management scheme estimates, even allowing for 100% coverage of the public estate.

It is also clear that for many private sector forest owners there is considerable inertia, in engaging with comprehensive management, as their primary management objective for their woodland has not been income generation (due to low timber prices) and they are not dependent on forests for their livelihood. Basic business plan data for economically viable woodland establishment and management is not widely disseminated. While circumstances vary considerably a common basis for initial engagement is likely to require at least initial breakeven/payback analysis.

A second key outcome expressed in recent policy (WfW) is, in parallel with the increase in woodland under management, to decrease the amount of this woodland that is managed under a clear-fell regime.

While the WGWE has historically been managed on a mainly (66%) clear-fell basis originally instituted to create “structural diversity” – presumably of age classes across the estate. Recent policy direction has promoted a reduction in the prevalence of this system to improve “structural diversity” – presumably of age classes within individual stands. This is clearly a paradigm which needs to be

further understood and given further consideration over what scales the methods apply. The result is over 37,000 hectares of productive forest on the WGWE have been designated as non-clearfell through the FDP process. This has been done without publication of any significant effects on costs, yields and future productivity.

Different management systems can have a profound impact on quality and cost of timber. Recent trends are shown in the graph below.

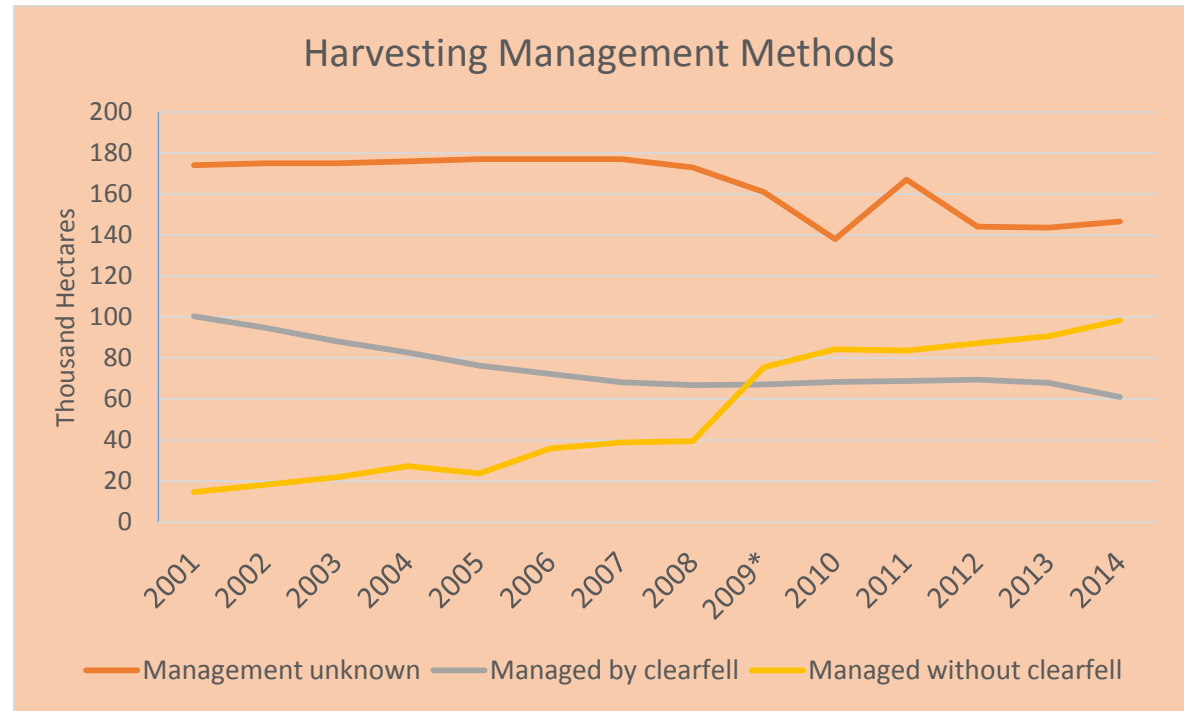


Chart A10: Management practices by area

There is a discrepancy between the area with known management practices (c 160,000 ha) in the above chart with the area being managed to UKFS (200,000 – 225,000 ha) in Chart A9 of between 40,000-65,000 ha suggesting that the management practice unknown could be split further into managed but practice unknown and not managed.

4 Species

Sitka spruce is the main conifer species and forms the basis for Wales' forest industry. The species mix for conifers and broadleaves is shown below (Forestry Commission, 2013):

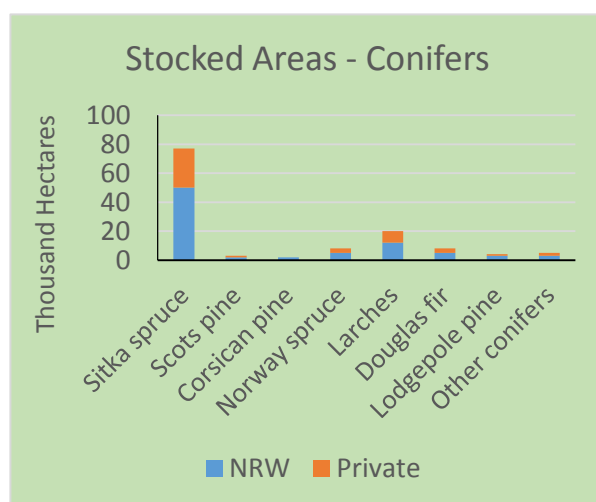


Chart A11: Conifer stocked areas by species and ownership

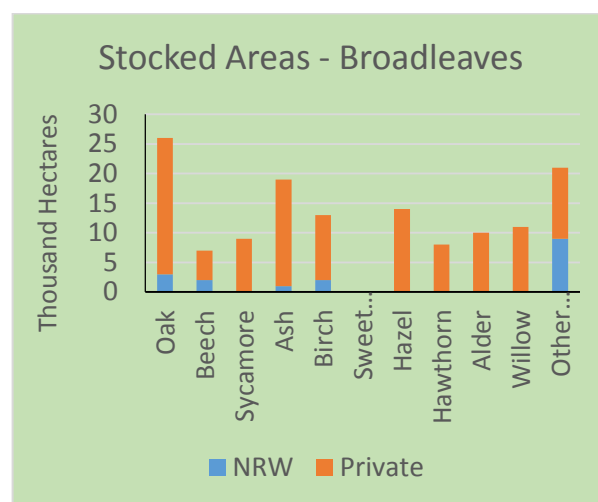


Chart A12: Broadleaf stocked areas by species and ownership

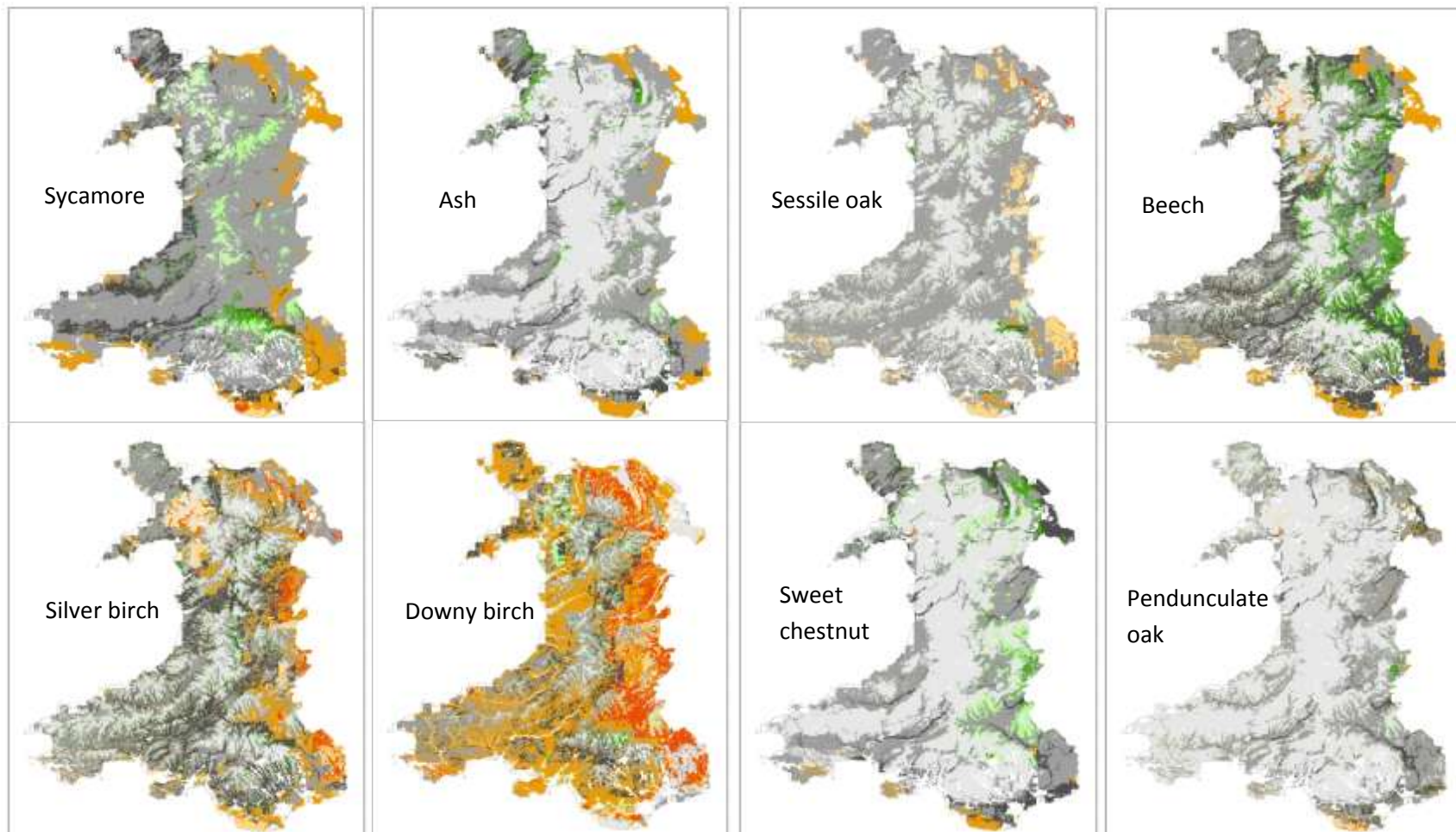
Concerns regarding biodiversity, disease, and climate change suggest that a wider range of conifer species should be planted.

"There are likely to be significant changes to the composition, structure and character of the ground flora and other species of priority for biodiversity and conservation, particularly under High emissions scenarios and over longer timeframes. Current species descriptions of native woodland communities are unlikely to remain valid, so the changing climate raises difficult questions for conservation of woodland biodiversity. In replanting the preference for use of native tree species and local provenances under all circumstances will need to be reconsidered" (The Read Report, 2009)

As the climate changes, different species will become more or less suitable for the prevailing conditions and planting decisions taken now must result in a robust forest in the future. Below, maps show how climate change will affect the suitability of a variety of conifers and broadleaves both in terms of their suitability now and their suitability under a high carbon climate change scenario.

The maps are based on a variety of factors including soil type, water availability, wind exposure, temperature and seasonal temperature differences.

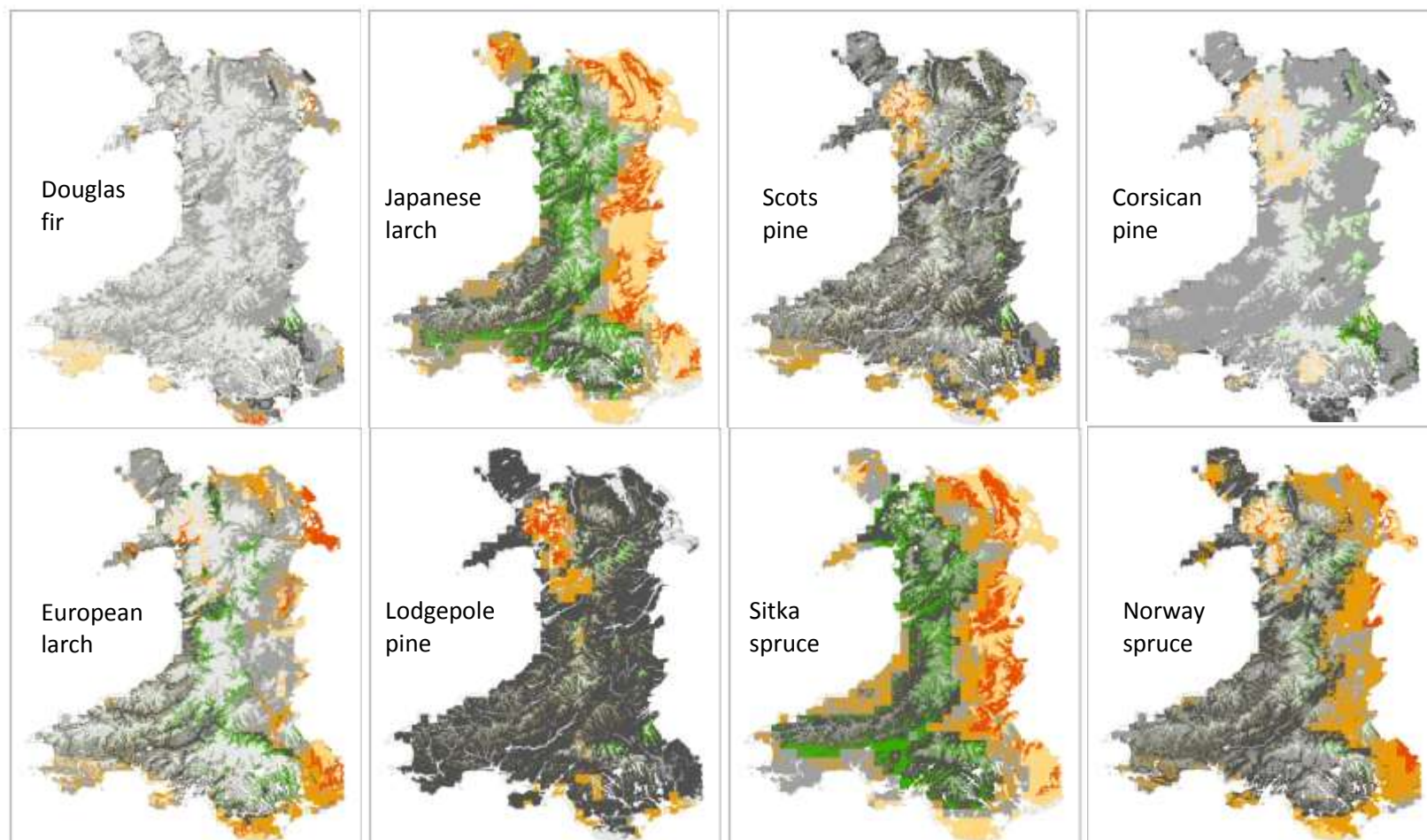
The maps by species show how the suitability of species changes over time. The maps are plotted on a 9 point colour scheme (Greys – no change, Reds/Oranges – Negative Change, Greens – Positive Change) showing all permutations from the current suitability expressed as "unsuitable", "suitable" and "very suitable" to the suitability in 2050 under a high carbon climate change scenario.



Selected broadleaf species suitability present vs. 2050 high carbon climate change scenario



Fig. A5: Change in broadleaf suitability now to 2050 (high carbon scenario)



Selected conifer species suitability present vs. 2050 high carbon climate change scenario

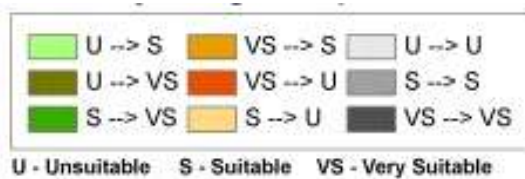


Fig. A6: Change in conifer suitability now to 2050 (high carbon scenario)

The desired trends according to WG (Welsh Government, 2014) are to:

- Increase diversity of woodland types at a catchment and woodland scale
- Increase the area of non-native woodlands with intimate mixtures
- Planting becoming less dominated by single species
- Planting of a wider genetic base

in response to:

- Disease – WWI reference key episodes as - *Phytophthora ramorum*, widespread in Japanese larch, particularly in South East Wales. *Chalara fraxinea* (ash die-back) across Wales, but with limited impact so far compared to South East England. Red band needle blight and bleeding canker are also present.
- To date the replanting of sites cleared of larch in response to *Phytophthora ramorum* have been replanted with 37 different species of tree (Natural Resources Wales, 2014), part of a 47% increase broadleaf and 10% reduction in conifer planting on WGWE.
- All the above trends have the potential to have a negative influence on the viability of Welsh processing industries in terms of cost and quality. On the WGWE, some conifer crops are currently being replaced with native broadleaf species as part of ongoing PAWS restoration work. It has been recognised that this could have an effect on the long-term softwood timber availability if this ‘trade-off’ is not managed.

5 Timber production

It is widely agreed that increased production of timber from Wales would be beneficial for economic, social and environmental sustainability. This production can be achieved through bringing existing woodland into management, increasing forest area, and increasing productivity.

Latest figures from the National Forest Inventory Woodland Area statistics indicate that 14.3 % of the

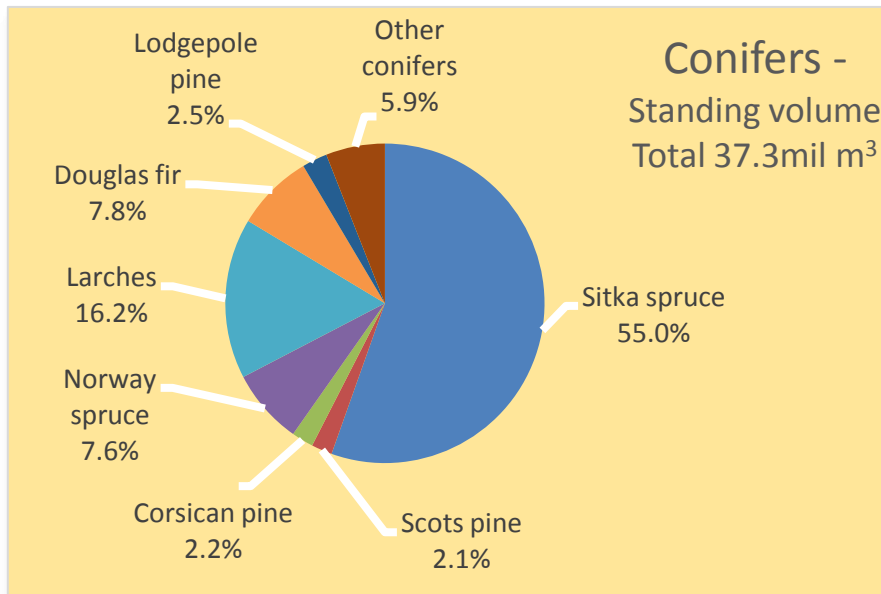


Chart A13: Conifer standing volume breakdown

total land area of Wales, 304,000 hectares, is under the cover of trees. This estimate, using more accurate monitoring techniques, is around 20,000 ha more than the previously published data for 2010.

Of this total growing resource, the net forest area of coniferous plantations (excludes enclosed open spaces within the

woodland, roads, fire breaks, etc.) is 131,000 ha of relatively recent planting with a rotation of 40-45 years and estimated to contain 37.3 million m³ (overbark standing) of wood. From this around 2 million m³ of timber is harvested per annum (50 year Softwood Forecast, Forestry Commission).

Broadleaf timber stocked areas account for 137,000 ha which is estimated to contain around 27.3 million m³ of wood. These are mostly privately owned, largely ancient and producing around 32,000 m³ (obs) of timber every year (50 year Hardwood Forecast).

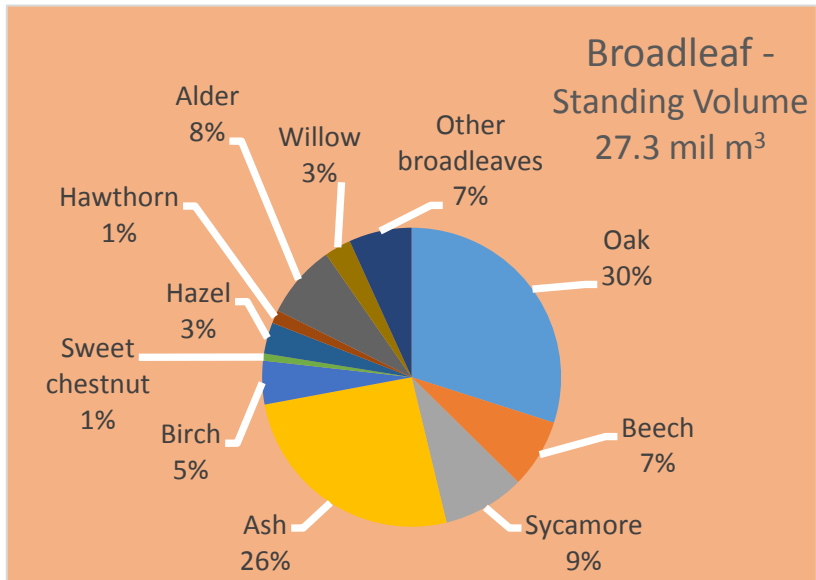
Two principal species, Sitka spruce and larches, account for nearly 75% of the standing conifer crop in Wales. Sitka spruce, a native of North America, is the most commonly planted timber tree in the UK. Planted from the end of World War II, it is the largest proportion by area and by volume (accounting for 70% of current sawmill production). Planted on wet infertile sites in Wales, it is fast growing, producing low density timber with heavy branching and large knots. It is very soft and difficult to finish, non-durable and resistant to timber treatments. It saws and nails well. Harvested at 40 to 50 years, it is used in construction as carcassing timber machine graded to C16, packaging and fencing. It is widely used in the paper and particle board industry but the use for paper processing in Wales has ended with the setting up of the UPM-Kymmene paper recycling plant at Shotton on Deeside. Industry figures reflect this decline.

Larch, planted on sheltered fertile sites, is usually felled when about 55 years old. However, with the invasion of the *Phytophthora* pathogen it is likely that a large proportion (estimated at 5m tonnes) will be prematurely available from sanitation felling. It is strong and straight-grained although

strength and durability is very variable. Resin seep is a problem with joinery timber. Seasoned larch is susceptible to furniture beetle which requires its treatment for use in permanent structures.

Douglas fir, other spruces and pines are present in smaller quantities than the two main species, and pine plantations are suffering badly from a complex of fungal diseases.

Of the broadleaves, oak and ash dominate with oak much more prevalent (43,000 ha as compared to



19,000 ha of ash). Oak is usually harvested between 80 and 140 years old. The timber has variable grain which is hard and strong. It is used for joinery, veneers (which timber is sent abroad), furniture, structural timber, flooring and fencing. Ash is straight-grained, hard and strong and is usually harvested between 35 and 80 years old. It works easily to a good finish, takes stains, glues and varnishes well. It has a variety of uses flooring. Beech and sycamore

Chart A14: Broadleaf standing volume breakdown by species

are common and species present in lesser quantities such as birch, alder and sweet chestnut, may become viable for use in new applications (for example, chestnut used for exterior cladding).

The Forestry Commission maintain periodic reviews of the availability of both softwoods and hardwoods in their 50 year availability forecasts.

5.1 Softwood

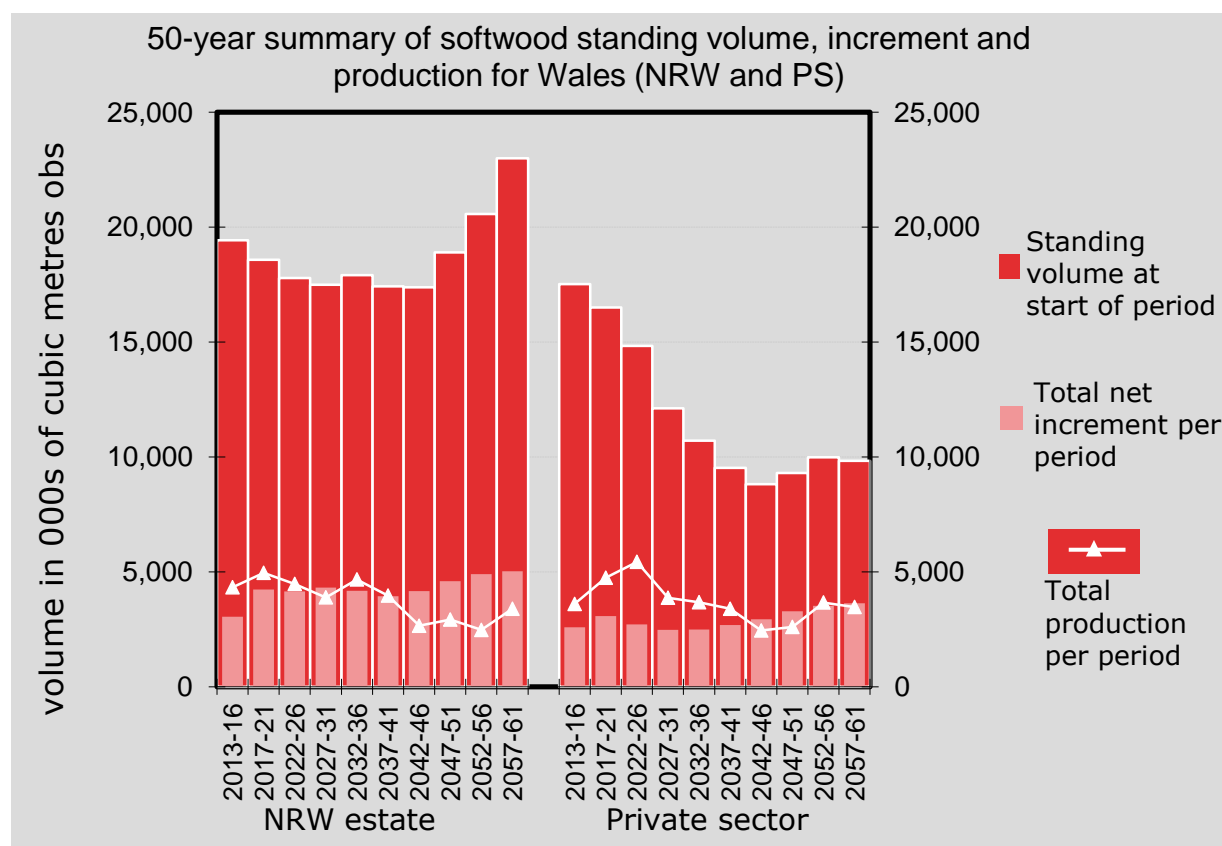


Chart A15: 50 year softwood forecast summary Wales

The softwood forecast summarised above, shows standing volumes, annual increment and the available production of softwood 2013 – 2061 from both the NRW estate and the private sector.

The private sector and NRW forecasts, whilst displaying the same output figures, are based on different sources of information.

For the private sector age class, yield and annual increment comes largely from the NFI survey data which takes actual samples from the woodland to complement satellite imagery to assess the current condition of trees in the forest. The “headline” harvesting plan is a scenario based on consultation with the industry and assumes:

“Private sector forests are managed under a regime designed to maximise productivity (biological potential), within which it is assumed that timber will be harvested in the year of maximum Mean Annual Increment (MAI). It also takes account of wind constraints. This scenario, selected after consultation with private sector woodland owners and timber processors, aims to maximise timber production in a way that involves relatively straightforward and transparent management prescriptions.”

Data for the NRW forecast is based on the sub compartment database (SCDB) maintained by NRW for all its own holdings.

A number of other scenarios are also considered within the forecast. The standing volume of timber remaining at the end of the forecast is less than current by around 4 million m³ (obs) the small (3.5 million m³) increase in NRW volume being balanced by a reduction in private sector volume of 7.5 million m³.

The forecast for available softwood drops sharply for Wales. The availability drops by roughly ¼ from current levels to around 1.5 million m³ for the period 2027 – 2041 before a further reduction to just over a million m³ (approx. 50% of current) for the period 2042-2046. This significant drop off in capacity over the same period is a UK wide phenomenon as total UK production

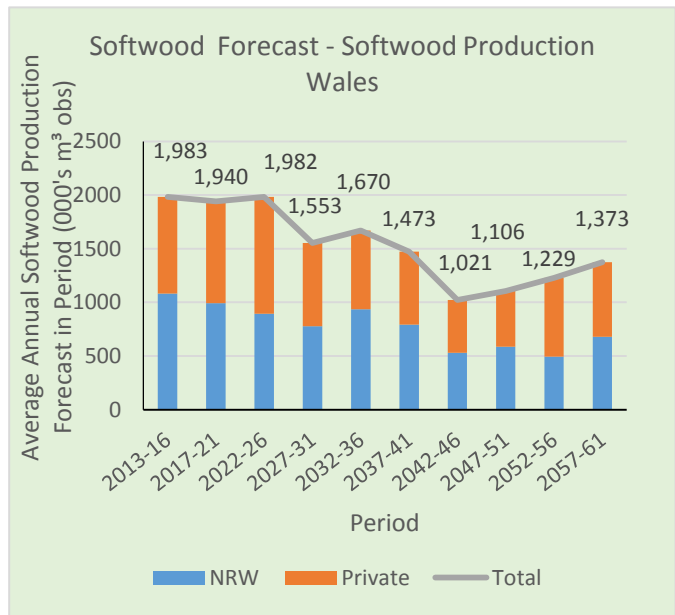


Chart A16: Softwood forecast detail - Wales

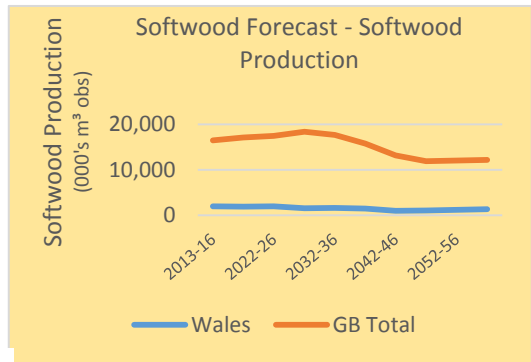


Chart A17: Softwood forecast UK

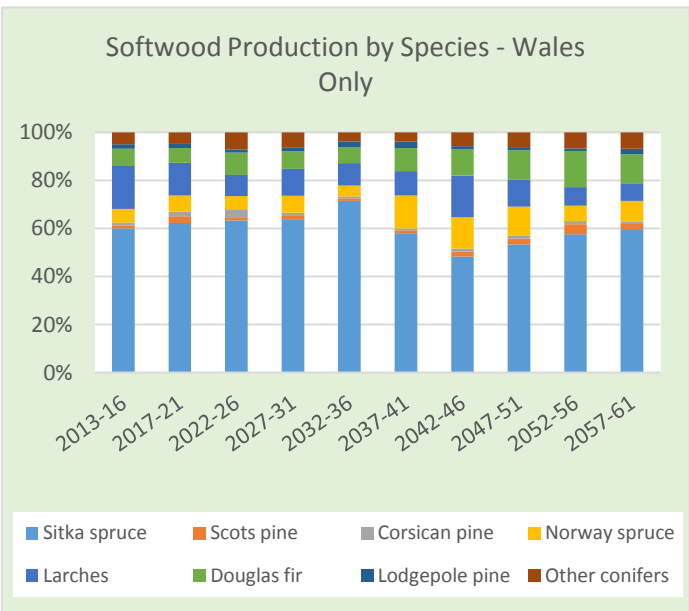


Chart A18: Softwood production forecast by species

period almost 1.3 million m³ lower than the scenario with no loss of conifer area. For Wales, whereas production continues to be dominated by Sitka spruce (50-70% through the period) and a high proportion of larches, the resulting proposed replanting regimes sees larches and Corsican pine disappearing after this current rotation is harvested mainly due to Dothistroma needle blight and

availability has also dropped by around ¼ from its projected peak of 18 million m³ pa in 2022-2026 to 12 million m³ in 2047-2051. This is a physical shortfall reflecting a lack of mature conifer tree volume through the period. Availability does improve after this period but only slowly.

The “headline” scenario is based on a 10% reduction in conifer per growing cycle with 5% of the reduction converted to open space and the 5% converted to broadleaf. Over the period (total to 2061) this results in a loss of around 12 million m³ of timber production across the whole of the UK and leaves the annual production figures for the 2061

Phytophthora ramorum risk and conifer stocked areas drop by 13,000 ha from 131,000 ha (43.1% of woodland area) to 128,000 ha (38.1% of woodland area).

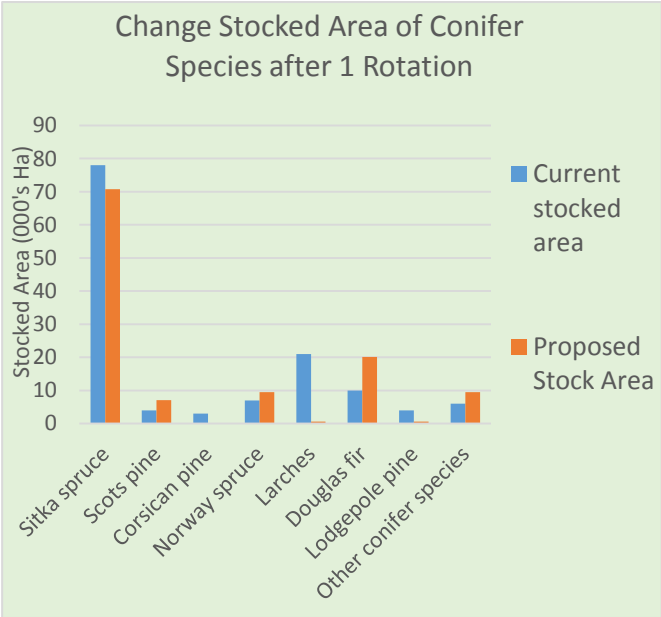


Chart A19: Change to stocked area species breakdown after 1 crop rotation

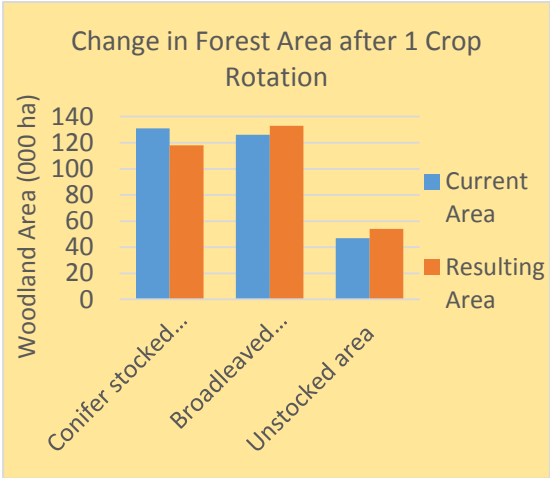


Chart A20: Change to forest area after 1 crop rotation

This is a big concern to industry as even planting extensive conifer plantations now, trees will not have reached maturity to cover the initial forecasted drop of 0.5 million but could help alleviate the subsequent drop. Purely in a Welsh context, a 500,000 m³ drop in softwood availability equates roughly to 250,000 m³ of sawlog; this is the entire capacity of its largest sawmill – BSW, Newbridge on Wye.

Proposals are being investigated to cover this initial drop of availability including:

- Delaying harvest of some timber during the period up to 2027.** This will undoubtedly put pressure on prices in the short term but potentially avoid bigger disturbances post 2027. This would involve clearing any backlog of overdue timber which is problematic as modern sawmills struggle to cope with oversized logs, much of which is in difficult to access sites.
- Harvesting some timber earlier coupled with a planting program to cover the generated shortfall.** Current planting regimes support broadleaf and mixed forestry as opposed to conifer plantations.
- Substituting demand where possible with hardwood** but processing capacity and harvest would be much lower and many uses are not possible.



Chart A21: Timber harvesting equipment requirement

The further drop into the 2040s can be covered with planting though will result in some trees being harvested prior to full maturity.

5.2 Hardwoods

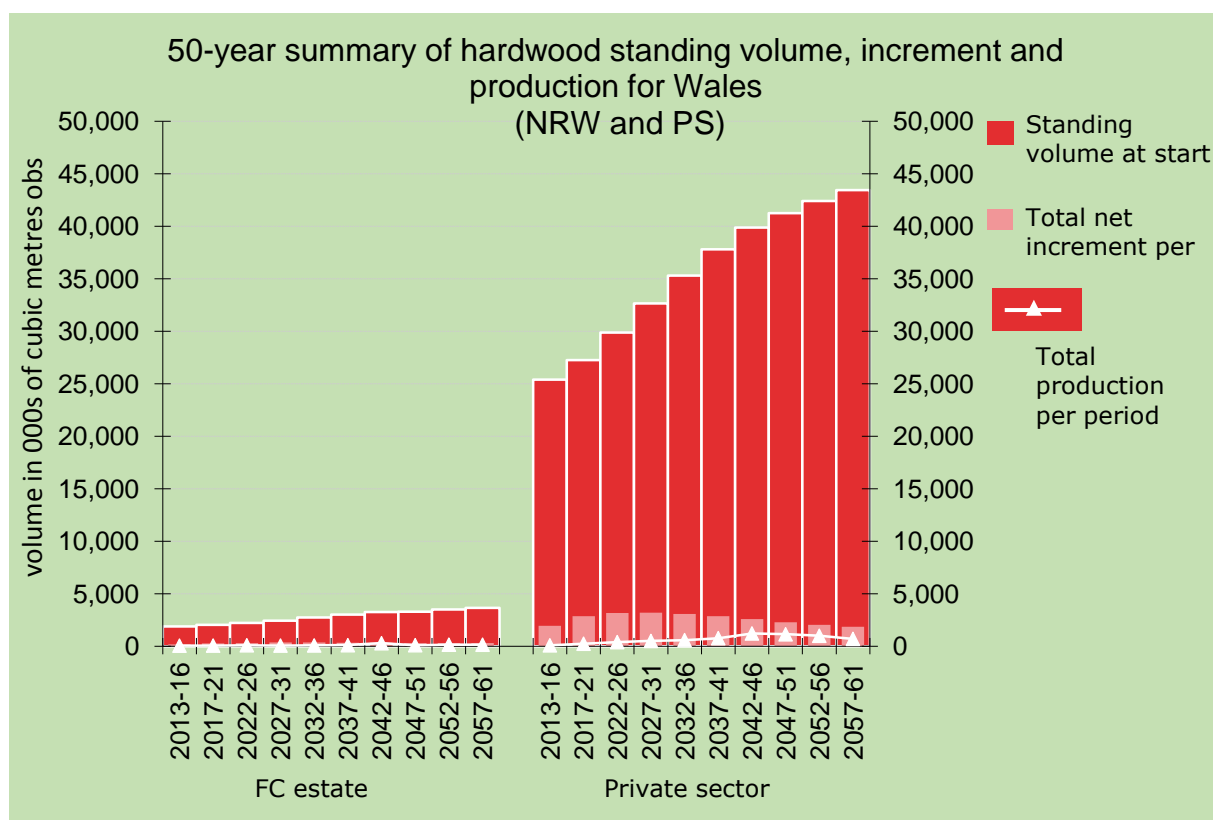


Chart A22: 50 year hardwood forecast summary

The hardwood forecast for Wales is less certain. The SCDB is again used for NRW data but as the contribution to the total is low, the harvesting scenarios are largely insignificant. The private sector assessment however is based on a key assumption of only including woodland areas currently showing harvesting and thinning activity. Stand management within this area assumes felling to year of maximum MAI and thinning of all stands to management table in all crops planted in areas with a DAMS score of less than 16, and felling at an assumed terminal height of 25 metres (if this is attained before year of maximum MAI) and no thinning for stands in areas with a DAMS score of 16 or more. This scenario has the effect of:

- Tying the scenario to current levels of activity.
- Tying potential timber availability to past levels of production.
- Making the scenario highly conservative in terms of potential availability.

The results of expanding the same management strategy across the entire private broadleaf estate (full biological potential) are also presented and show the full availability of hardwood for harvest.

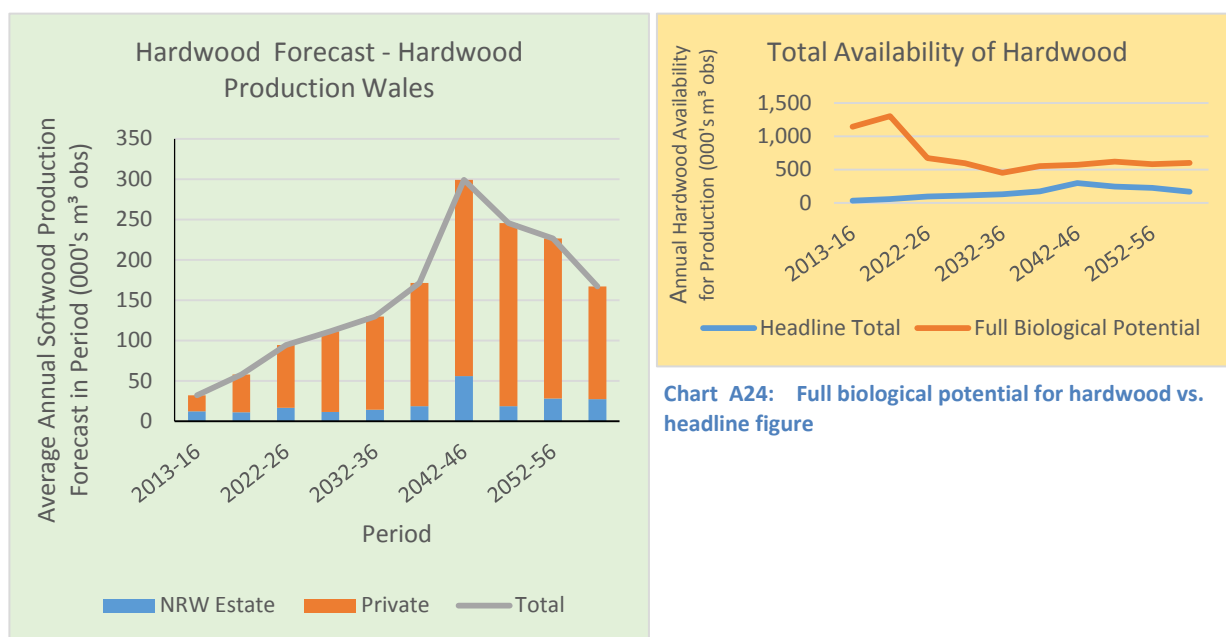


Chart A23: Hardwood headline forecast totals

The massive imbalance between the availability in stands currently managed and the full biological potential at the start of the forecast period reflects the substantial amount of overdue timber in stands which are not being managed for timber production.

This difference is highlighted in Fig. A7 opposite. The headline availability figures in

Chart A23 and the blue series in Chart A24 represents only a fraction of the available hardwood harvest coming from the area of broadleaf estate currently showing signs of harvesting or active thinning.

The whole broadleaf estate will currently contain significant quantities of harvestable timber. This is why the initial availability is so high compared to the headline figure during the early stages of Chart A24.

Fig. A7: Hardwood forecast scenario

The forecast figures, even the headline forecast, still only represent a theoretical availability. How much of the forecasted tenfold increase in available stocks will be harvested is yet to be seen and will depend strongly on mill capacity and the prevailing economic conditions at the time. Unless this market is stimulated, the increase in broadleaf cover from conversion of conifer plantations and any planting of new forest area with broadleaves stimulated by the current grant support can only result in increased biological potential in the future without increasing the actual available for production.

The split by species for the availability is shown below:

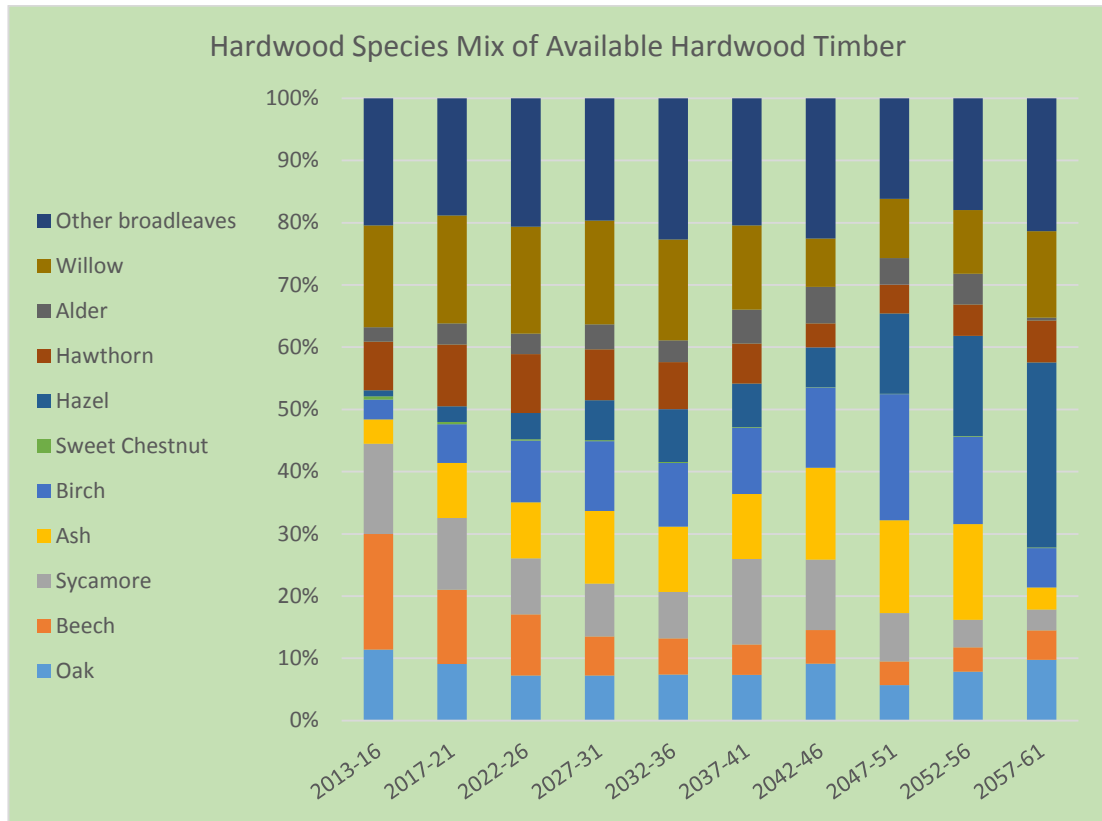


Chart A25: Species mix of available hardwoods

5.3 Increasing future production

In the ADAS review of land use and climate change it was concluded that an increase in forest area of 100,000 ha (which would increase Wales' forest cover from 14% to 20%) is both desirable (mostly in terms of carbon) and possible. This remains a low forest cover when compared to the European average forest cover of 37%.

The source of the current 100,000 hectare target was a 2010 recommendation from the Welsh Government's Land Use and Climate Change Group, chaired by Professor Gareth Wyn Jones. He gave the main opening address to the conference on 'Climate Change and the Rural Mindset (Institute of Welsh Affairs, 2012).

The potential planting could come from rough upland grazing land as shown in the following table:

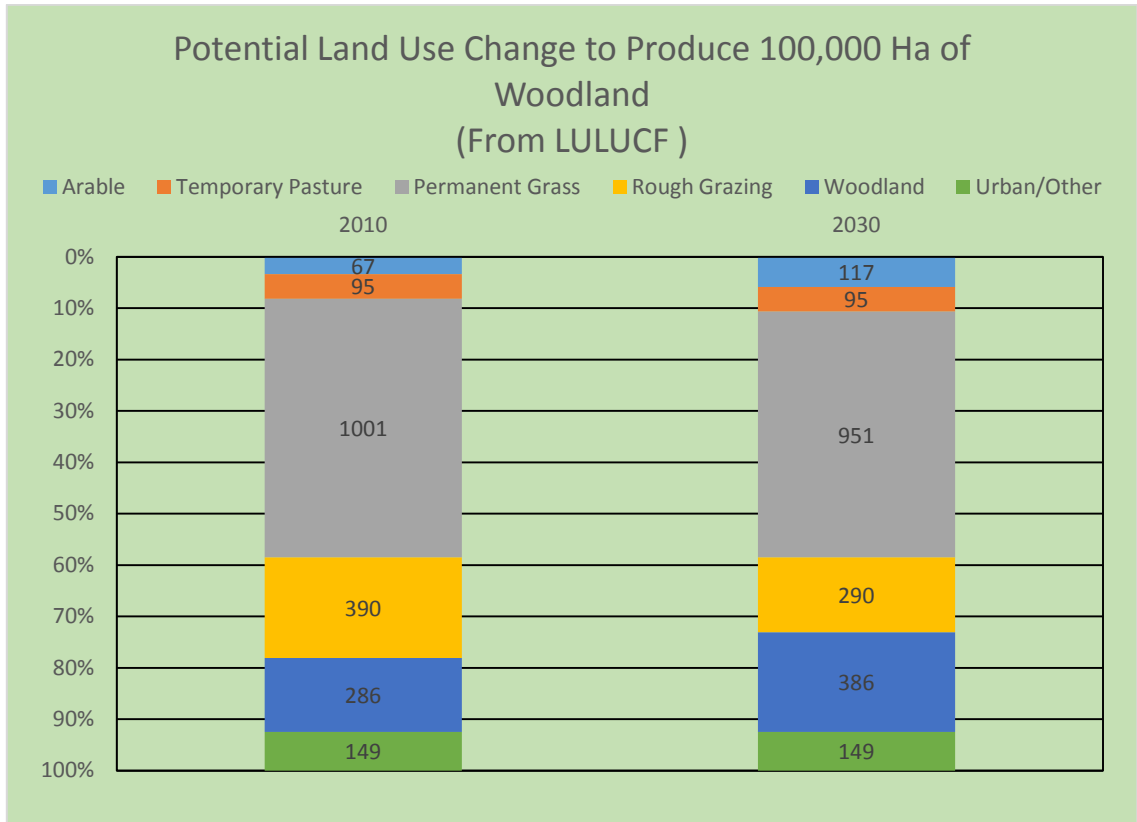


Chart A26: Potential land use change to give a further 100,000 ha of woodland

But he noted the inter-dependence between forestry and farming and said an opportunity was being missed in increasing grazed woodland in Wales. He agreed with Celia Thomas of National Parks Wales who, as quoted in the IWA’s *Growing Our Woodlands in Wales* report, said:

“Rather than thinking of large areas of new densely planted trees we should be looking for ways of getting trees into our countryside that deliver multiple benefits. So a menu of small firewood copses, a good lot of hedgerow trees, shelter woods, parkland or scattered wood pasture trees, or trees planted to limit erosion or flooding would be a better than losing six acres of productive land on your 100 acre holding.”

Even though the focus of this apparent policy drive is mainly upon planting area and management, it is worth reiterating that a significant part of the forestry and processing industry is more interested in productivity (yield per unit of cost) than it is in areas under management or new planting per se. The ability of new woodlands to support viable ongoing management, by contribution to its host farming activity or the generation of new wood supply chains is central to its long term sustainability.

This ongoing viability of change is crucial irrespective of whether desired outcomes are largely environmental, economic, or, more likely a combination of both, as policy has too often failed to progress beyond aspiration to deployment, or from initial deployment to full scale behaviour change, management and robust increase in viable forest cover or output.

It is also necessary to build upon the work conducted by ADAS in Wales, and Forestry Commission in Scotland, to understand the competing impacts of displaced activities such as hill farming.

6 Employment

There are between 8,500 and 11,300 people employed (either full-time or part time) in the forest sector in Wales (Welsh Government, 2014). Approximately 10% are directly employed in forestry and logging. Employment in the forest sector and processing sectors is particularly important to rural communities.

Expanding employment opportunities in rural Wales is a high priority for policy makers. Additionally expanding employment in forestry and associated industries is creating 'green jobs'. Increasing forest productivity through increasing forest cover and increasing productive forest management would provide much needed rural employment in management, harvesting and primary processing. Additionally the multiplier impacts of increased productivity to the Welsh economy are significant. The table below shows the employment multiplier impact of increasing productivity from Welsh sawmills by £1m (Welsh Economy Research Unit, 1999). Although this report is 15 years old, it is expected that the relationship between productivity and employment remains valid.

Forest Sector	Output Effects (£m) of £1m of output	Output Multiplier	Employment effects (FTEs*) per 1m of direct output	Employment multiplier
Private estates	1.77	1.77	59.01	1.34
Harvesting/allied contracting	1.51	1.51	28.94	1.49
Sawmills	1.94	1.94	31.23	2.65
Panelboard and paper	1.25	1.25	7.48	2.29
Haulage	1.48	1.48	31.53	1.37

Fig. A8: Table of economic outputs from forest sectors

It is interesting to note that:

- the multiplier impacts varied considerably between forest sectors. The higher multiplier impacts, in sawmilling for example, are explained as being as a consequence of the high degree of Welsh purchasing per unit of output.
- the employment effect from £1m increase in sector demand is particularly high in the private forest sector (incl. large and small estates) and particularly low in the capital intensive panelboard sector.

The employment opportunity from developing the Welsh forest sector has been considered in a report commissioned by the Wales Forest Business Partnership and Confor, 2013. The report concluded that expanding management to all woodland in Wales would create 627 new jobs, and a plan to meet the target of 100,000 ha by 2030 would create 145 new jobs. A further 443 could be created in wood fuel and a further 400 in primary processing.

7 Timber price and the value of Welsh forestry

7.1 Gross value added

Based on Standard Industry Classification (SIC) codes, the total GVA of the Welsh forest sector has grown to £455.7 million, approximately 1% of Wales' GDP, of which £20 million is in forestry and logging (SIC02), with manufacture of wood products another £147.7 million (SIC16) and manufacture of paper and paper products £288.1 million (SIC17).

However, these figures relate to the forestry sector as a whole and are not a true reflection of the value added from the processing of Welsh grown timber. Specifically the figures for wood products include all activity based on imported timber as well as Welsh grown timber and as the paper and paper products industries no longer use Welsh timber these estimates do not relate to Welsh forests. By contrast no estimates are made for the added value of energy (heat and electricity) produced from Welsh timber.

This indicates that basing the analysis of the health or otherwise of the Welsh forest sector on GVA derived from SIC code information is misleading. A more accurate estimate of the value Welsh timber adds to Wales' GDP is required if we are to use GVA as a meaningful measurement of performance.

There is also some economic contribution from the craft, small scale and firewood sectors, but the value is difficult to estimate. In the past efforts to engage with those involved have had mixed results. Many who are active in the sector are 'life stylers' (often people who have left conventional employment) who do some coppicing, firewood, training courses and attend agricultural or County shows. Where there has been investment in equipment, such as mobile sawmills, this is often underutilised and many users lack operator expertise. These hobbyists do not want to become industrialists and are unlikely to engage in formal initiatives or marketing pushes, so their output cannot easily be changed. They are not (and probably will not) be captured by economic statistics for the same reasons. The major local development in this sector has been in firewood production. In a recent Welsh study, only 46% of households that heat with solid wood (typically between 2.5m³/year and 12m³/year) actually purchase that wood (Wong & Walmsley, 2012). Whilst individually these sectors may make a minor contribution, collectively they may be more significant and could be used to raise public awareness of using Welsh-grown wood.

The woodland economy also contributes to a wide range of smaller enterprises and to the major economic impacts achieved through tourism (see below). Based upon work conducted in England, the rapid changes in exchange rate driven utilisation of domestic production, together with historic focus on low value raw material transactional levels, suggests that there is a significant under-reporting of the true value of UK forestry. Current developments in biomass, added value wood products and sustainable building product demand also make correlations between historic value and future opportunity particularly unreliable.

It is widely understood that forests and the wood processing industries create wealth and provide employment and livelihoods. However, perhaps as a consequence of the timber industry being widely considered as making only a minor contribution to international GDP (<1% in Europe, (UN Economic Commission for Europe, 2013)), in recent years there has been greater policy focus on non-

monetary services provided by forests (biodiversity, amenity) than upon policies that target growth in the sector.

The timber industries' contribution to GDP has always been understated through consideration of forestry and primary processing only, whereas the majority of GVA is from secondary processing. Additionally, many of the goods and services provided by forests are not marketed or assigned monetary value leading to an underestimate of the contribution of forestry, and creating economic challenges for forest owners.

Tourism and recreation make a considerable contribution to the economy of Wales (£3.2bn in 2007, 6% of total Full Time Equivalent workforce in 2003) yet little is known about actual GVA or employment figures for those businesses engaged in specifically woodland related tourism and recreation provision, although a 2003 study estimated that day visits to forests contributed £51 million to the Welsh economy.

The current assessed value of the Welsh Government woodland estate is £595 million (Natural Resources Wales, 2014) although this estate has a net cost to the tax payer of circa £3.5 million (2012/13 figures, below, under the previous reporting regime, prior to the establishment of NRW):

		2012/13
Harvesting & haulage	Expenditure	9.9
Recreation, etc.	Expenditure	4.0
Other	Expenditure	12.1
Timber	Income	-13.5
Recreation, etc.	Income	-0.9
Other	Income	-8.1
NET EXPENDITURE		3.5

Fig. A9: Table from final FCW accounts before NRW took responsibility

The timber income for 2013/14 accounting period is similar, at £13 million. Expenditure declared includes timber harvesting, marketing and re-stocking - £6.8 million and forest roads – £2.8 million. The management cost is not declared separately.

It is clear that significant additional work is required in this area to accurately capture the value of Welsh forestry. Additional work in this area should address the widespread view that productivity on private estates significantly exceeds the public sector on an area basis and with significantly lower staffing and other costs.

7.2 Timber price

The value of standing timber is shown in the graph below. The big drop occurred between 1990 to 2000 after which the price has levelled off. Since 2010 the price is beginning to rise but in real terms remain well below those of the 1980s. The key influences on timber price are exchange rates, UK demand and overseas supply. Global economic trends would indicate that the cost of timber, in line with other commodities, is likely to continue to rise over the coming decades. However, how this rise will affect the value of forestry relative to farming (important for afforestation) or the competitiveness of timber relative to other materials is unclear.

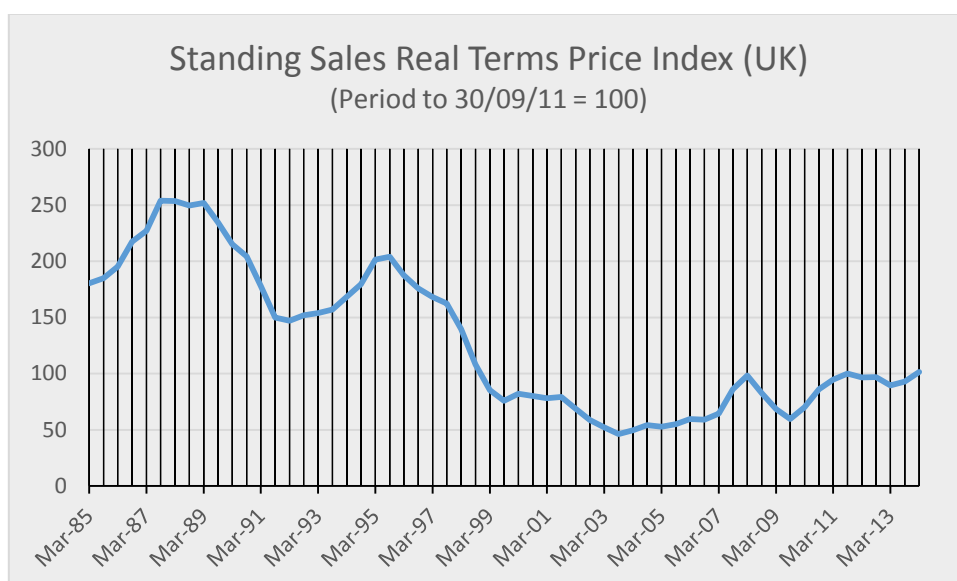


Chart A27: Standing sales Real Terms Price Index (UK)

A key challenge will be to ensure that any benefits from rising timber prices are matched with increased income to growers and help to incentivise planting and management.

The role of Natural Resources Wales (NRW), and its influence on timber price should also be analysed. As NRW supply timber on the basis of volume (against a production forecast) and not against economic conditions, there can be a distorting impact on prices.

The price premium for FSC certified timber is reported in Forestry and Timber News as being typically between £3 to £5 per tonne (Combe, 2015).

It is worth noting that investing in forestry is producing very high returns at present, with the IPD forestry index showing a 34.8% return in 2011, a 20 year high. However, this increase does not seem to follow the sales price of wood (Forestry Commission, 2012).

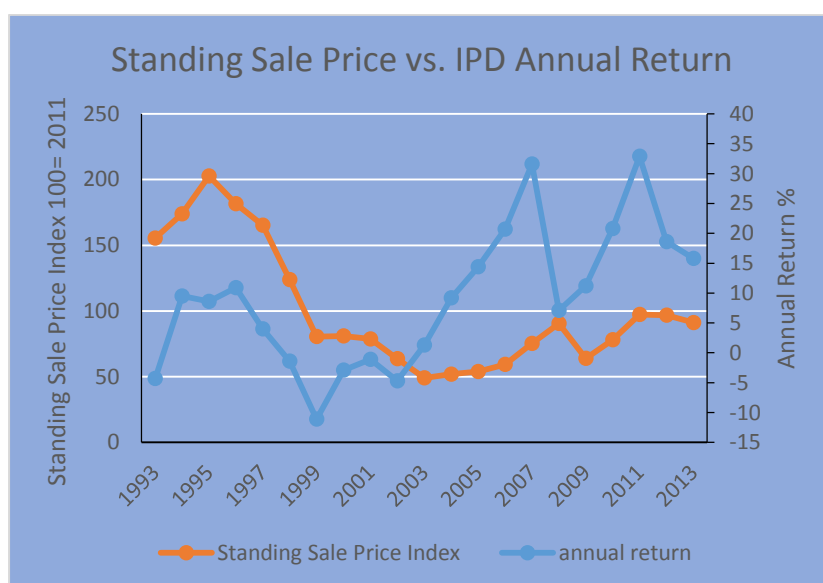


Chart A28: A comparison of indexed standing sales prices and % annual return on forestry investment

The above chart indicates that the relationship between timber price and the attractiveness of forestry as an investment is unclear.

Surprisingly, for such a seemingly important issue to the future of forestry, there is little analyses of timber value available in the published literature. What, for example, is the reason for the timber sales price in Scotland exceeding equivalents in Wales by circa £10/tonne at the time of writing? This price differential may be due to the larger Scottish market and greater competition or perhaps due to decisions made by the dominant supplier (NRW).

Of course, the price of wood is not the only determinant of value. The chart below, prepared by RES for a previous unpublished study on English forestry, compares the total economic values in the two studies of the current English forest estate (Snowdon & Willis, 2005; Tinch, et al., 2010), adjusting the Snowdon and Willis values, which are for the whole of the UK, to the area of English forestry and using the actual UK deflators to adjust all values to 2012 (HM Treasury, 2013).

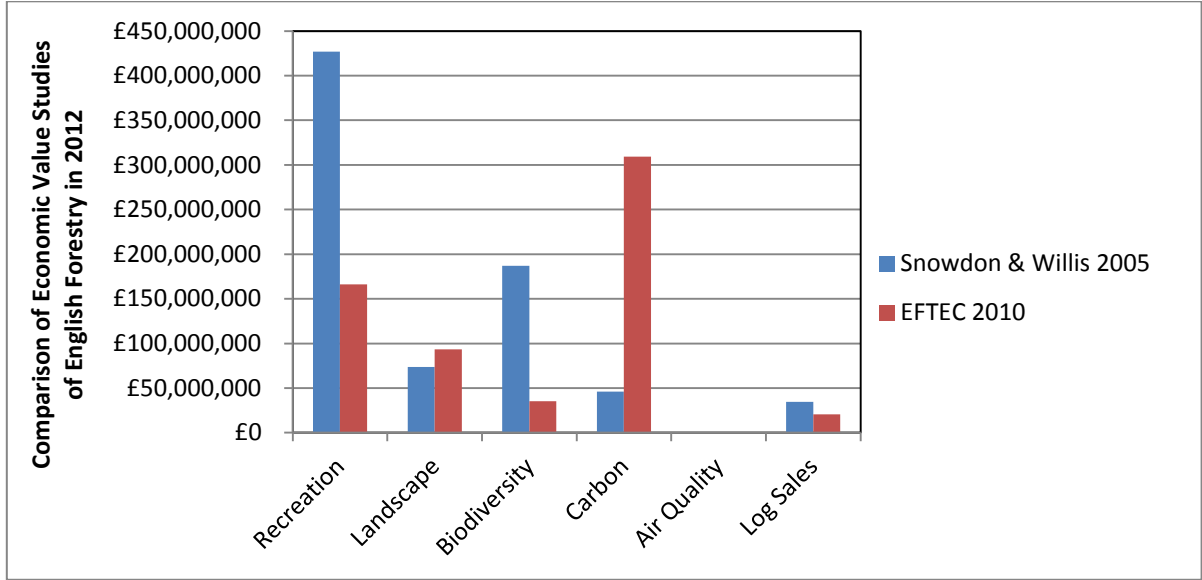


Chart A29: Economic values (2010) from English forestry activities

In both studies the economic value of wood products, as measured by log sales, ranks lowest in the evaluation of economic values, compared to all of the non-wood benefits. However, if the estimated turnover from English primary processing² of forest products³ is added to the log sales value (total ‘forest products’ value) and compared with non-wood benefits, between 60% and 70% of the total economic value of all benefits comes from forest products (see Chart A30). It should also be noted that flood defence could also be included as a non-wood value of forestry, also that currently much of the non-wood value does not currently flow back to the forest owner.

² We have used primary processing values only (rather than the larger value of primary and secondary processing) because this figure is for processing home produced logs.

³ There are no national statistics for the proportion of primary processing in England. It is also difficult to estimate this proportion. While ONS statistics show that over 60% of forestry turnover and secondary processing turnover is in England, only 40% of the UK’s total forest and woodland area and 20% of the UK’s conifer plantations are in England (also from the Phase 1 report). As an initial estimate, a central estimate of 40% of the UK primary processing turnover (Forestry Commission, 2012) has been used in these calculations (£1,256 million at 2012 values). A low estimate could be 20% of the UK primary processing turnover (£628 million at 2012 values) and a high estimate 60% (£1,884 million at 2012 values).

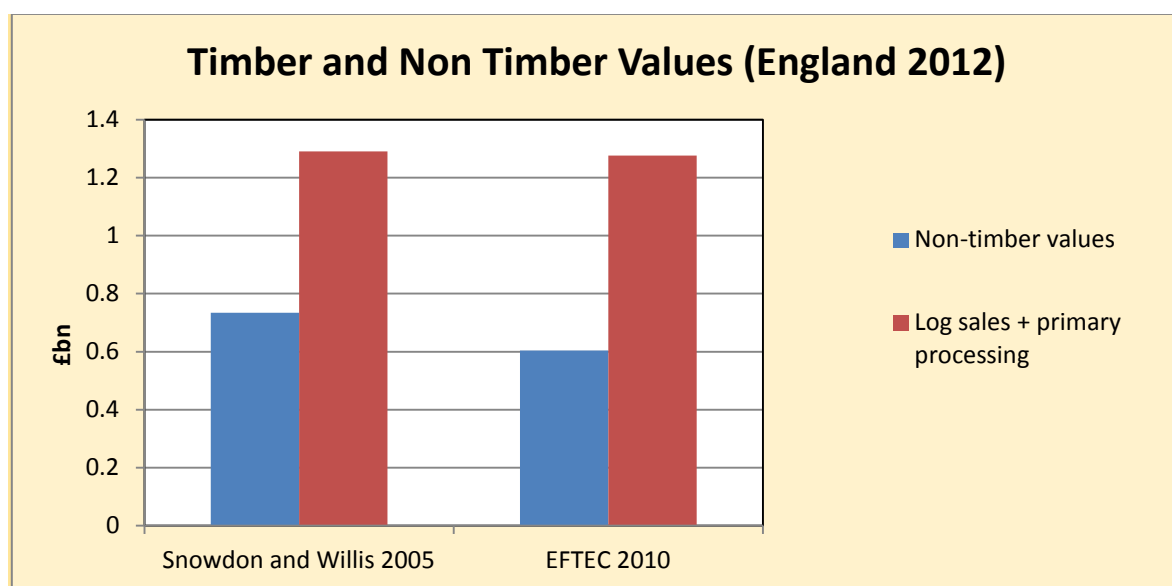


Chart A30: Comparison of estimated timber and non-timber values for England in 2012 based on two approaches of valuing the value of forestry

These figures suggest that by including the economic value of primary processing of forest products, the economic value balance of English forestry is changed. This approach of expanding the sector appears justified: it is home grown timber; while the values are captured outside the forest gate, the same is true for many of the non-wood values (e.g. biodiversity, recreation distances travelled and the cost of travelling to look at landscapes).

Perhaps as a consequence of forestry being considered to contribute little to the GDP of Wales, the sector has not been seen as a priority for transformational policy intervention. Now, with the ever-growing threat from climate change and emphasis on Green Growth, the forest sector is beginning to be viewed as one that offers significant potential for development. The development of the roadmap will provide a format to capture the true economic value of forestry, and to review all options to ensure that this potential will be realised.

8 Supply and demand

The demand side of the wood products market is subject to a wide range of factors, most notably the health of the construction market (which is subject to large cyclical fluctuations) and exchange rates which alter the balance of competition from imports.

Longer term, the carbon sequestration and renewable resource, implicit in wood as a building material, are expected to drive growing demand for wood. With considerable scope to expand the percentage of timber frame (and in many cases offsite constructed) housing within Wales, as has already happened in Scotland, there are obvious opportunities for increasing the use of wood, including a percentage of home grown material. This opportunity is further bolstered by the European trend to engineer wood products such as I-joists and more recently cross laminated timber (CLT) which may also allow the use of a wider range of locally grown species. These developments do face a conservative industry and slow changing regulation in expanding to wider market acceptance.

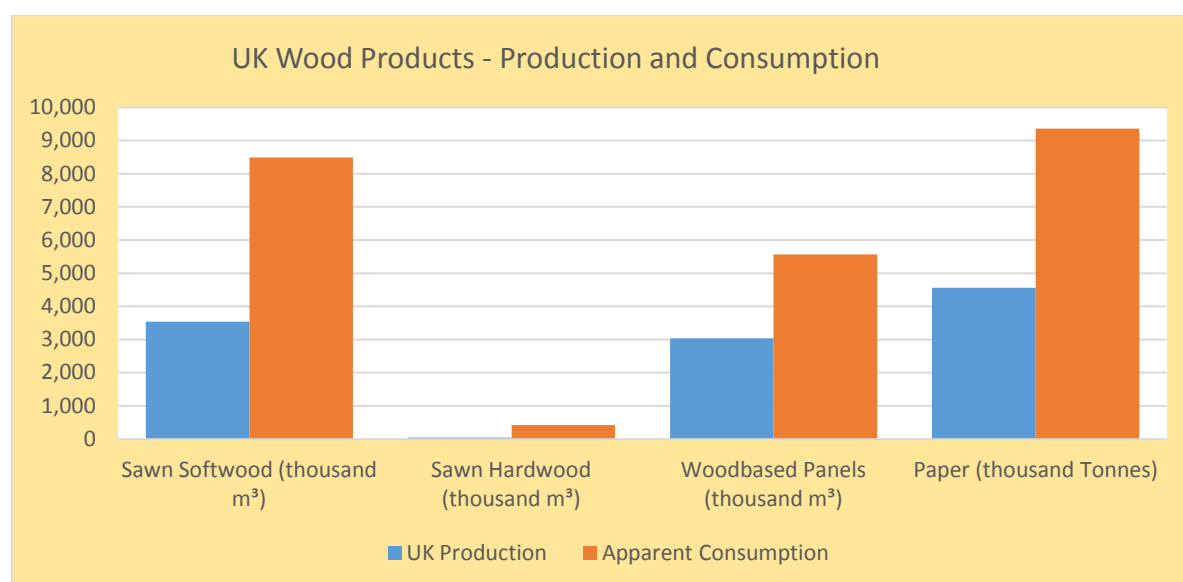


Chart A31: Wood products - apparent consumption and production (UK)

UK softwood deliveries into the main UK markets are shown below (Forestry Commission, 2014). Sawn softwood production has seen recent growth. There has also been a growth in the wood fuel market. In contrast the market in wood pulp and paper, fence posts and wood based panels has seen no growth.

Sawn softwood remains the main market for UK grown timber. In 2013 sawn softwood output was approximately 3.5 million m³ and hardwood output was 50,000m³.

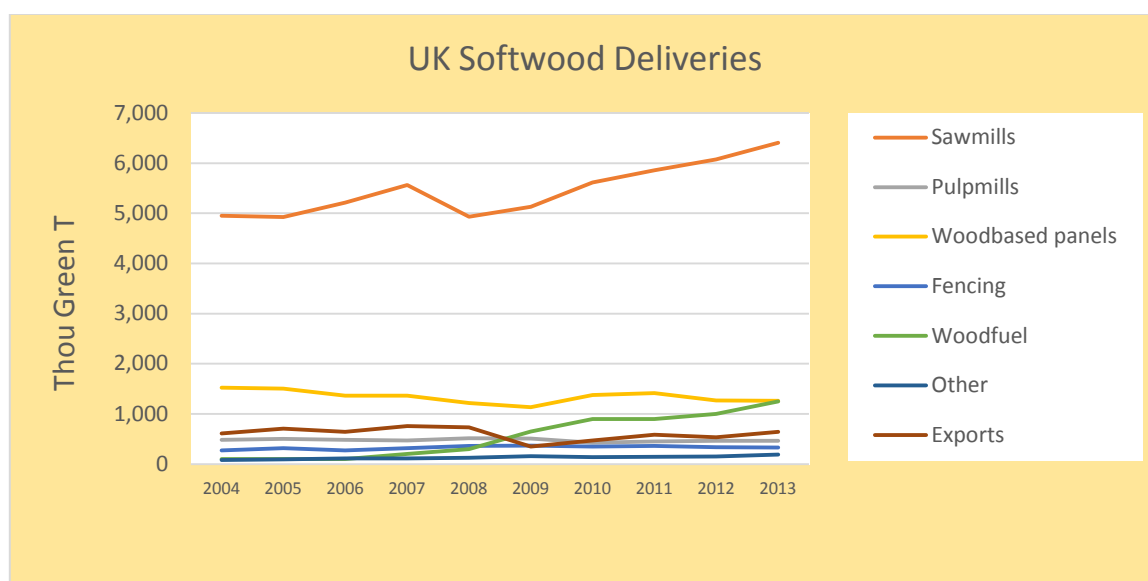


Chart A32: Deliveries of UK softwood by process unit type

The UK sawnwood market is shown below (Forestry Commission, 2014). The UK sawnwood data comes from sawmill output figures and the import data comes from trade statistics. The figures indicate that approximately 1/3 of UK sawnwood demand is derived from UK production. By way of contrast Ireland is a net exporter of sawnwood and in 2012 supplied 6.5% of the UK sawnwood market (Irish Forestry and Forest Products Association, 2013).

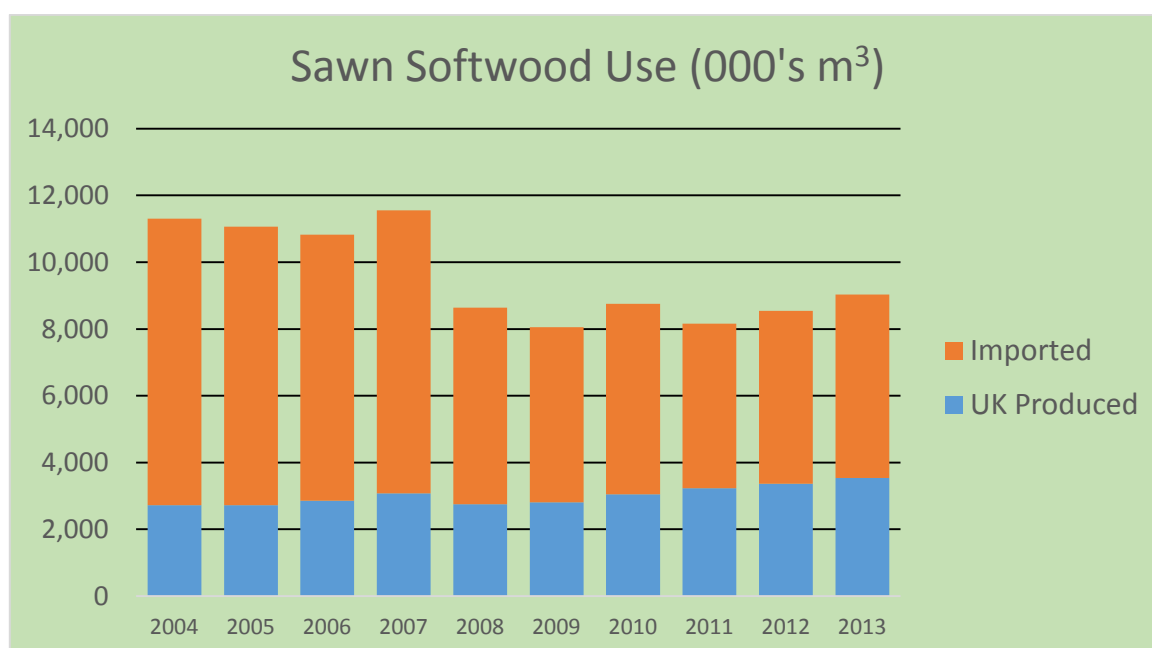


Chart A33: Use of sawn softwood by source (UK or import)

The sawn softwood market is dominated by the demand in construction. The following figure indicates that construction accounted for 62% of sawn softwood consumption in the UK in 2011. In 2011 the sawn softwood market was valued at £1.5 billion (Moore, 2012).

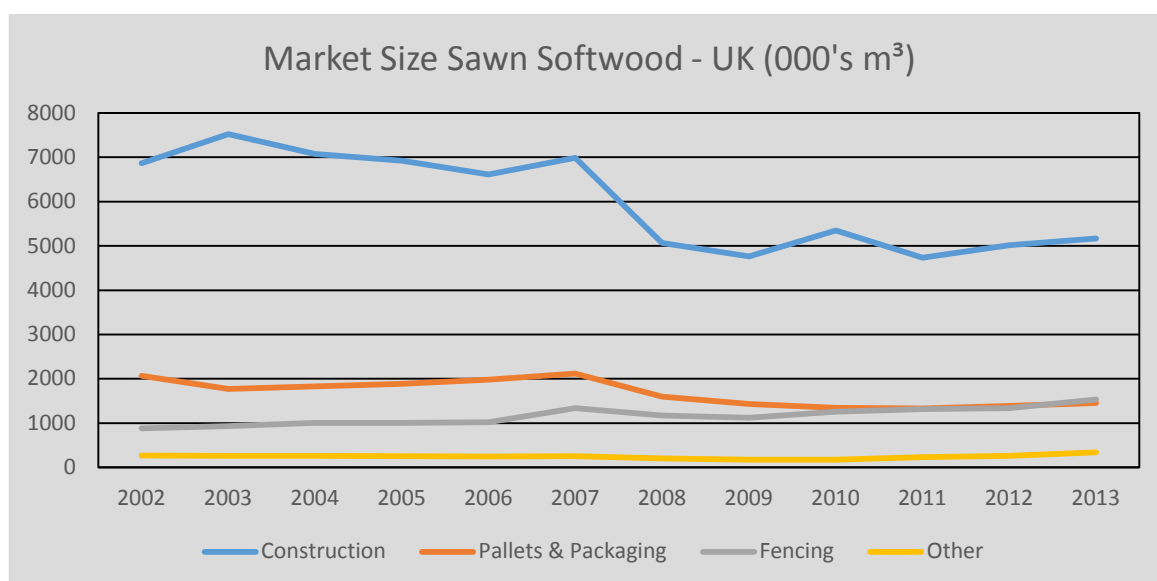


Chart A34: Consumption of softwood sawnwood in the UK by market

The following graph shows the trend in softwood utilisation in the main UK markets from 2009 up to 2013 (Moore, 2014). Surprisingly the use of sawn softwood in construction appears to have been in decline throughout the early 2000s even before the 28% drop in 2008. One explanation for the reduction in use of sawnwood could be the use of alternative products. These alternatives could include wood based products such as MDF joinery (skirting boards etc) and engineered wood (I-joists).

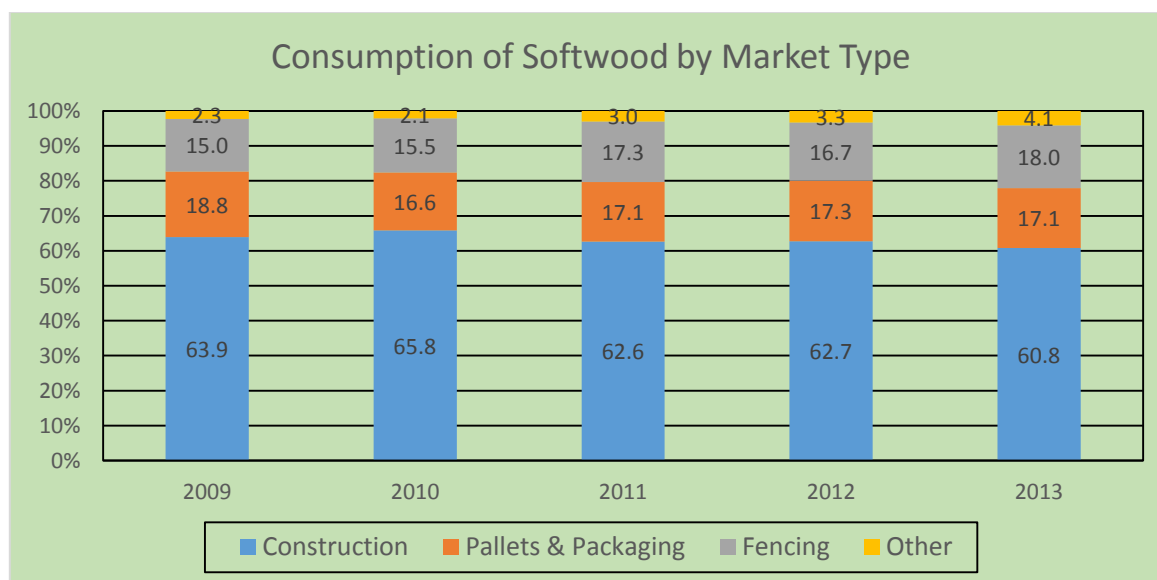


Chart A35: Market share by market - UK sawn softwood

Data: Timber Trends (Moore, 2014)

The use of UK grown sawn softwood in construction was 889,000m³ in 2010. Whilst the volume of UK grown sawn softwood has remained fairly consistent, the decline in the total market has resulted in a growth of market share from 12% 2002 up to 17% in 2010. The figure below indicates that consumption of domestic sawn softwood appears to have been resistant to the construction

downturn in 2008/09 which is widely believed to be due to a change in exchange rates. This growth in the relative importance of UK produced sawn softwood in construction is matched in the other major markets of fencing and pallets.

Sawmills are the main customer for softwood in the UK, currently 6 times greater than in wood based panels which is deriving an ever increasing proportion of its timber needs from recycled sources. However, much of the residue from sawmills (up to 50%) continues to go into panel production.

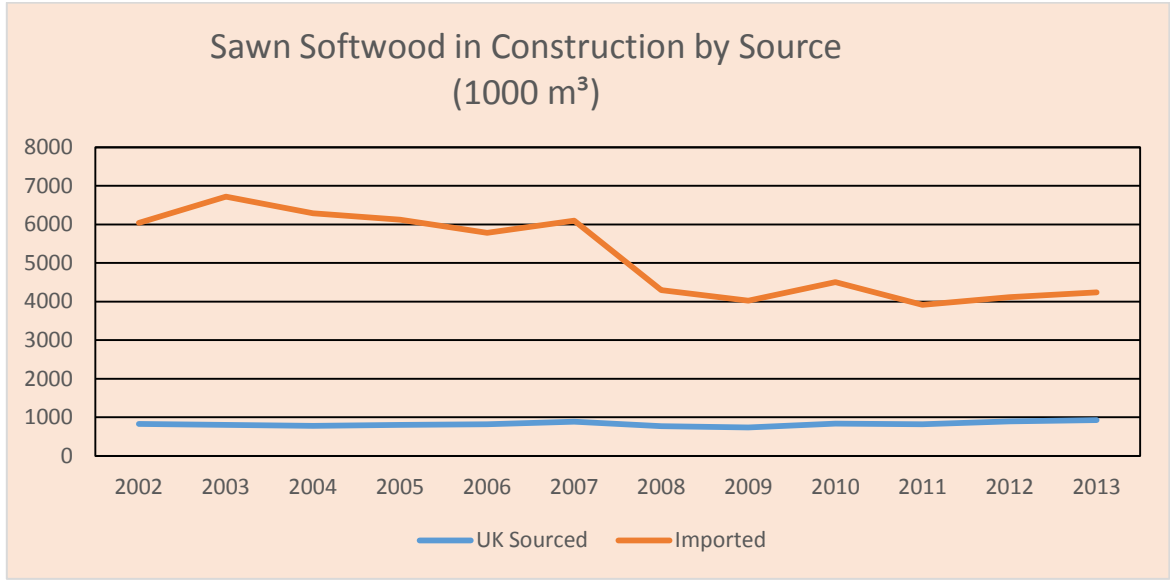


Chart A36: Sawn softwood in construction by source

Data: Timber Trends (Moore, 2014)

The construction market can be segmented into new housing and all other construction (which includes repair, maintenance and improvement). According to Timber Trends, new housing accounts for only 6-10% of total sawn softwood entering construction. The relative insignificance of the new build housing market for UK sawn softwood helps to explain why the market was little affected by the downturn in 2007/08.

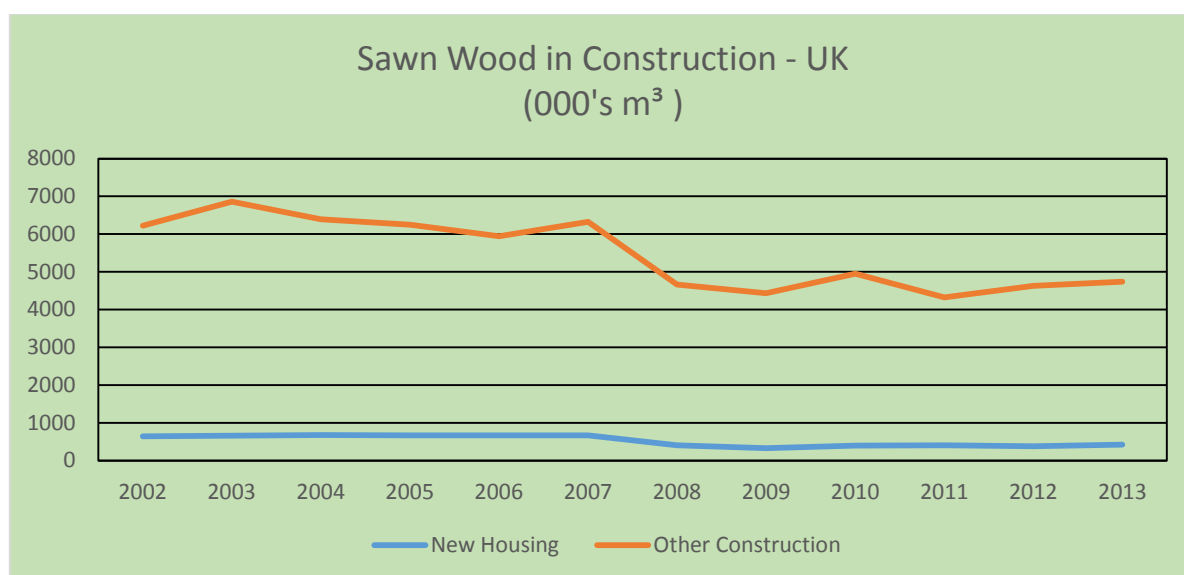


Chart A37: Sawn softwood in construction by construction type

Data: Timber Trends (Moore, 2014)

The market data would appear to suggest that a strategy to increase the volume of Welsh produced sawn softwood in construction should be one focused on general construction (repair, maintenance and improvement) rather than new build housing. However, the Timber Trends report provides insufficient detail to enable firm conclusions to be drawn. Surprisingly there is little available data on the market applications for sawn softwood in construction. This information gap needs addressing.

9 Commercial structure

The sawmilling sector in Wales is dominated by two key players that can be said to have modern large scale high productivity lines able to supply construction grade timber - BSW in Newbridge (with a stated capacity of 140,000m³) and Pontrilas in Herefordshire on the Welsh border (with a stated capacity of 150,000m³). These companies are differentiated from the other mills not just through scale, but also through the added value processes of kilning and stress grading (to C16) giving them the ability to supply construction grade timber.

BSW have a total production capacity of 930,000m³ of sawn timber spread across their 7 UK production centres and supply 14% of the total UK softwood market which represents 1/3 of all UK produced sawnwood. The Newbridge plant represents 15% of BSW's capacity. The markets supplied by BSW are shown in the following chart.

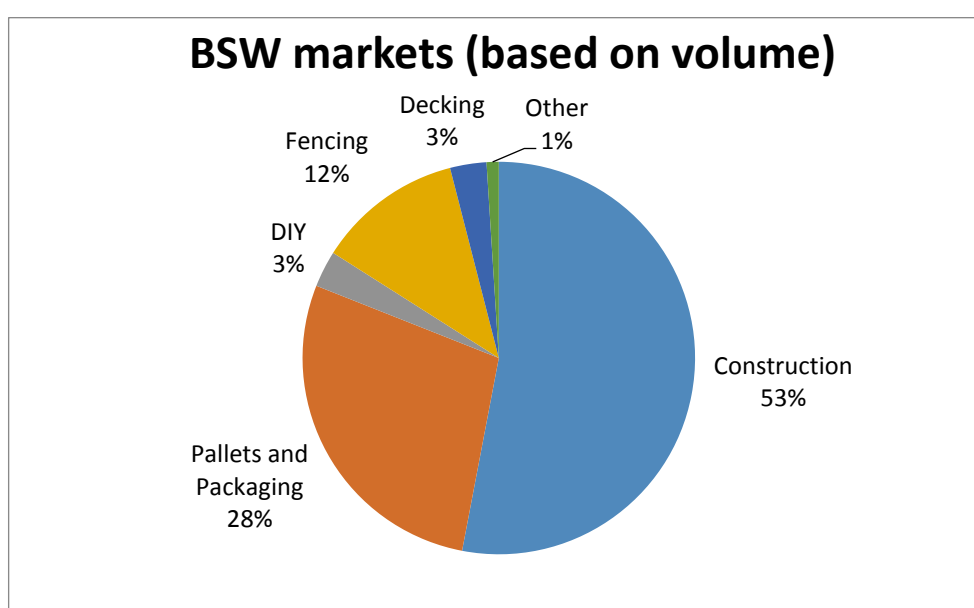


Chart A38: BSW market breakdown

BSW have recently signed a contract with Natural Resources Wales to process 600,000m³ of larch which is being felled to slow down the spread of *Phytophthora ramorum*.

Other smaller mills in Wales and the borders include Charles Ransford and Son, ETC Sawmills, James Davies Ltd and Clifford Jones Ltd. These companies tend to supply the fencing, pallet wood and, more recently, biomass markets in common with BSW and Pontrilas, but for practical commercial reasons their focus is not upon the commodity sawn-wood construction market. Adding value activities tend to be upon biomass such as pellets, fencing (treatment) and timber products.

Kronospan based in Chirk employs 600 people with an output of 600,000m³ of wood-based panels. Output also includes 500,000 worktops, 18 million m² of laminate flooring and turns over around £200 million (<http://www.wbpionline.com/features/investing-for-the-future-at-kronospans-uk-plant/>). Also on the site is a sawmill that consumes 240,000 tonnes/year. The post-consumer waste consumption is 300,000 tonnes for the chipboard line.

Hardwood sawmills remain very small in comparison to the softwood sector. This reflects the decline in markets for hardwood. This is also reflected in the Welsh context by the closure of the St Regis

board mill in 2007 which removed the market for much of the lower value co-products, which had previously helped to underpin activity in this area. This market has latterly seen a recovery in demand through the emerging biomass market, underpinned by capital grants and more recently the Renewable Heat Incentive (RHI).

The Welsh forestry sector is currently dominated by three major softwood customers (BSW, Pontrilas and Kronospan) and one dominant softwood supplier (Welsh Government). The roadmap should consider how best to nurture a competitive and dynamic sector given the relatively small forest resource and the limited number of market participants.

10 Biomass

The EU target is for 20% of its energy to come from renewable sources by 2020, with the UK required to achieve 15% average, across electricity, heat and transport. In the EU woody biomass accounts for about 50% of the total renewable energy supply (UN, 2011). Uncertainties include the lack of information about the resource and the informal nature of some of the transactions and policy concerns surround the impact of biomass policy on other aspects of the sector. Key policy challenges include:

- Mobilising enough wood on a sustainable basis
- Finding the most effective climate change mitigation strategy
- Maintaining sustainability in other parts of the forest sector
- Ensuring that wood for energy is sustainably produced

To achieve renewable energy targets would require increased use of stemwood, forest residues (including stump extraction), post-consumer waste and imports, biomass on marginal agricultural land (such as short rotation coppice). There is evidence that supply is arising from all of these sectors, but in many cases this is neither sufficient to create reliable fuel supply chains, nor of sufficient value to stimulate management of woods or subsequent processing, where this does not currently exist.

The biomass energy opportunities are extensive but fall into a number of categories.

Opportunity	Wood Type	Fuel Source & Type	Opportunities for Wales
Wood Type : Can be used in most situations, Can be used in some situations without technological changes, Can be used in some situations with technological changes, Not suitable			
Utility scale power generation-100% Biomass (e.g. 299MW _e Lateral Eco Park development, Holyhead)	Hardwood	Imported wood pellet + other clean biomass	Direct and indirect downstream employment from CHP opportunities
	Softwood	Unlikely to use much Welsh wood	No forestry jobs and not in forest and wood products SIC codes
Utility scale power generation – Co-firing	Hardwood	Mixture of clean waste wood, forest residues, small roundwood,	Significant direct and indirect upstream employment from forestry

Opportunity	Wood Type	Fuel Source & Type	Opportunities for Wales
Wood Type : Can be used in most situations, Can be used in some situations without technological changes, Can be used in some situations with technological changes, Not suitable			
with fossil fuels (e.g. Aberthaw power station 1.5GW _e)	Softwood	processing residues and other biomass Some local, but a competitive commodity market covering not only timber but other tree derived products eg. Empty Fruit Bunches (EFB) and Palm Kernel Shells (PKS) from Palm Oil Production and Olive Cake from Olive Oil Production	/ haulage requirements Adds value to low value timber streams and supports sawlog harvest
Distributed scale power generation (e.g. Western Wood Biomass, Port Talbot 14MW _e)	Hardwood	Small diameter roundwood, forest residues, clean wood chip	Significant direct and indirect upstream employment from forestry / haulage requirements
	Softwood	Mainly sourced from Wales	Adds value to low value timber streams and supports sawlog harvest
Industrial scale CHP, heat and power generation (e.g. BSW Newbridge 300MW _{th} biomass boiler for kiln drying)	Hardwood	Small diameter roundwood, forest residues, processing residues	Significant direct and indirect upstream employment from forestry / haulage requirements
	Softwood	Mainly locally sourced (Wales and borders) or, in the case of BSW, is own residue	Adds value to low value timber streams and supports sawlog harvest
Wood fuel production facilities possibly with integrated biomass CHP or biomass drying	Hardwood Chips only. Pellets – not used	Small diameter roundwood, forest residues and clean wood chip. Some whole tree but limited to disease control	Significant direct and indirect upstream employment from forestry / haulage and downstream

Opportunity	Wood Type	Fuel Source & Type	Opportunities for Wales
Wood Type : Can be used in most situations, Can be used in some situations without technological changes, Can be used in some situations with technological changes, Not suitable			
(e.g. Proposed NET energy project in Tredegar, CJT Ruthin)	Softwood	felling Low grade wood and bark for onsite fuel, pellets for domestic market Wood locally sourced	from fuel distribution Adds value to low value timber Provides access to Welsh sourced wood pellets
Commercial scale biomass CHP and heat only systems. (e.g. schools, hospitals, offices, retail)	Hardwood	Wood chip, wood pellets Typically uses locally sourced wood for wood chip. High grade pellets typically from locally sourced wood or wider UK. Some imports	Carbon neutral energy for heat, hot water and possibly electricity Potential opportunities for ESCO's selling heat rather than just fuel / service / equipment District heat networks
	Softwood		
Domestic scale biomass heating and hot water – excl logs.	Hardwood	Wood chip, wood pellets	Maintains a healthy wood chip and pellet market adding value to low value timber and supporting timber production
	Chip only Does not form good pellets	Typically M30 (30% moisture) chip or EN+ pellets Chip from local source. Some Welsh made pellets available and significant volumes of UK produced pellets. Some imports	Installation and maintenance of equipment Carbon neutral energy for heating
Domestic scale biomass heating and hot water - logs	Hardwood	A difficult section to capture as a lot of the trading is carried out by individuals and there is some self supply	Opportunities for seasoning and supplying logs
	Softwood	Most log burners will burn both hardwood and softwood logs	Offers a genuine potential for adding value to hardwood timber not suitable for higher value uses

Fig. A10: Biomass energy types and sources

Identifying, capturing and monitoring current demand for all bar the log market is made easier by the fact most have either had some form of capital grant (WEBS1, WEBS2) or are receiving ongoing

support through the Renewables Obligation (RO) for electricity production or the RHI for heat production.

What makes it difficult is predicting the uptake of the RHI in the future. A report commissioned by Woodfuel Wales estimated the formal demand for wood fuel in Wales to be around 190.5k green tpa for 2013. This report however whilst including the non-domestic RHI, was before the domestic RHI tariff was launched.

Biomass Support Mechanism	Site Name	Location	Wood Consumption (green tpa)	%age of total consumption	Support End Date
Renewables Obligation (RO)	Aberthaw Power Station	Barry	73,000	38%	2023
	Western BioEnergy Plant	Port Talbot	80,000	42%	2028
	UPM Shotton Biomass CHP	Shotton	0	0	2025
	Total RO		153,000	80%	
Renewable Heat Incentive (RHI)	Numerous installations	Wales	15,100	8%	2031-2040
		Herefordshire	11,400	6%	
		Shropshire	7,700	4%	
	Total RHI		34,200	18%	
WEBS2	42 boiler installations	Wales Convergence & Competitiveness Areas	3,200	2%	n/a
Wales (& Marches RHI) Total			190,400	100%	

Fig. A11: Grant aided biomass energy schemes in Wales

Predictions for future uptake of both RHIs are unclear, however a mechanism is in place to control RHI support level for future installations by reducing the tariff levels shown in the figure opposite. Uptake of biomass heating plants under the RHI is well ahead of budget so will undoubtedly be reviewed shortly. Other technologies supported by the RHI are however significantly underspent. (ASHP 1.5/6, GSHP 1.5/6, Solar Thermal 0.25/3)

The most difficult category to capture is the firewood market. This market is extensive however it is

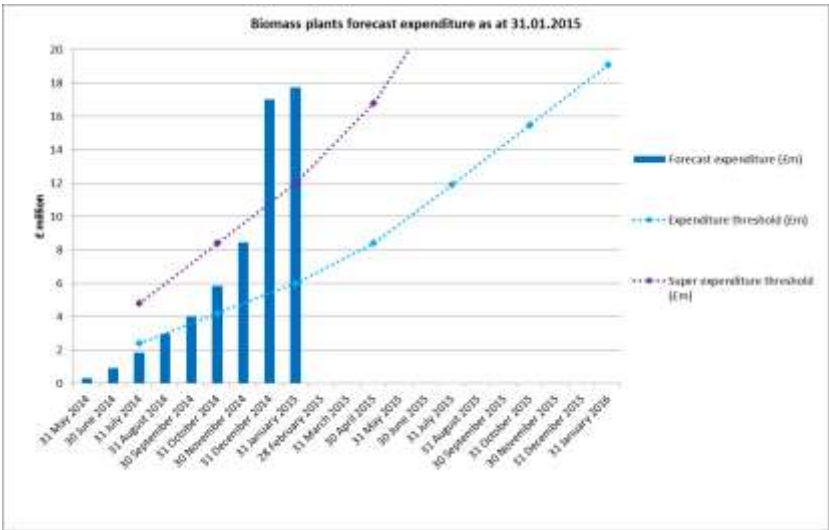


Chart A39: Forecast expenditure on RHI in UK

buildings become better insulated and require less heat, coupled with continued decarbonising of the electricity grid that advanced biomass conversion (gasification, pyrolysis etc.) at the non domestic level and electrical heating systems at the domestic level will replace basic wood burning appliances, gradually eroding the position of the lowly firewood log.

also very dispersed and far less formal. It also offers significant potential for exploitation for broadleaf forest as most wood log stoves / grates will cope with both hardwood and softwood logs.

Biomass based energy is however by most considered an interim technology particularly in its current form - combustion. The national plan is that as

11 Demand stimulation (e.g. Grown in Britain)

The Grown in Britain campaign was developed in 2013 and is in the early stages of implementation. A central feature is a certification scheme which is designed to increase visibility of home grown timber by licensing woodlands, timber and timber products that are grown in the UK. The licensing process provides assurance that the timber has been grown in the UK in accordance with the Government Timber Procurement Policies. It covers all types of wood grown within England, Northern Ireland, Scotland and Wales. The Grown in Britain label can be used on products to promote supply chain integrity and the British origin of the product. The Grown in Britain licensing scheme complements and integrates with other well proven forest certification schemes such as the Forest Stewardship Council (FSC) and the Programme for Endorsement of Forest Certification (PEFC). This type of 'local' branding has worked well in the food and drink (particularly beer) sector.

In the case of homegrown timber, perceptions of quality, particularly around traditional specifications in construction have been unhelpful to the UK resource. Many believe that the domestic material is inferior based upon the availability of largely C16 grades. However, typical applications such as in timber frame render this issue largely irrelevant.

Current policies to stimulate demand while staying within procurement rules are developing. It is not considered possible to specify 'homegrown' or 'Welsh' timber and stay within public procurement rules. However developments such as GiB and the Social Value Act 2013 are seeking to provide mechanisms through which local timber can be favoured. Below is a clause taken from the HS2 invitation to tender which demonstrates how the GiB label might help.

"B6.30.20 Responsible Sourcing

The Contractor in carrying out the Site Operations shall ensure that at least 90% of construction material is certified as Responsibly Sourced as defined by BES 6001 Framework Standard for the Responsible Sourcing of Construction Products.

The Contractor in carrying out the Site Operations shall use 100% Legal Timber and Sustainable Timber which is compliant with the UK Government Timber Procurement Policy. This means timber that is:

- *from schemes approved by the Central Point of Expertise on Timber (CPET) (e.g. FSC and PEFC); or*
- *from schemes that support the principles of the Social Values Act such as "Grown in Britain"; or*
- *Recycled Timber (verified), defined as recovered wood that prior to being supplied had an end use as a standalone object or as part of a structure."*

On the flip side, sawnwood is a commodity product and the market is determined by international pricing and exchange rates. Branding homegrown timber may add some value to the resource in the niche markets but is perhaps unlikely to have a significant effect on volume markets without significant intervention from Welsh Government.

Demand stimulation may perhaps best be secured through policies to support the integration of local/regional wood processing, that can then be encouraged (through a range of supply chain and marketing initiatives) to use timber grown more locally. These initiatives could include:

- Local branding.
- Consolidator arrangements for both timber supply and product offer. A “clearing house” initiative has been previously trialled on a small scale basis by a South Wales local authority and there is considerable interest amongst policy makers, financiers and the forestry industry around the consolidated offer that this could unlock for woodland owners, processors and end users.

It is likely that these initiatives will need to be different for hardwoods and softwoods.

In a study by the BRE (Building Research Establishment, 2011) focused on expanding the use of UK grown timber the following areas were considered worthy of additional consideration:

- UK wood manufacturers need to be made aware of procurement rules and relevant legislations (such as requirements for chemicals and other treatments).
- There is a need for a better understanding of engineering requirements and specifications – which will require education and the provision of successful examples for architects and engineers.
- Promotion of national approvals for innovative products.
- Provision of incentives especially for smaller manufacturers.
- Assistance in the development of new and innovative methods of processing, following the example of InWood Developments and Coed Cymru.
- Research into complementary areas for co-products such as wood pellets, insulation, bio-refining.

Substantial market transformations are commonplace and achievable in conservative industries like construction. The steel industry developed from a 25% share of the tall structures market (75% reinforced concrete) in 1970 to a 75% share by 1990. This transformation has not been mirrored in continental Europe where reinforced concrete still dominates. This change came about through a combination of technical innovation (in this case the development of composite metal decking) and significant strategic investment in education, training and support for designers.

International trade agreements make the implementation of policies designed to support particular national industry sectors very difficult. For example public procurement rules prevent the specification of ‘Welsh’ timber. Interestingly, unlike agriculture, national governments are largely free to set their own forest policies and as a consequence public intervention rates within Europe forestry vary substantially. The roadmap process will contain a review of all the options for demand stimulation as well as other potential policy initiatives and draw upon examples from overseas.

12 Global trends

The World economy is predicted to quadruple in size by 2050 (See Goldman Sachs' World Bank report). If this is the case it will create an unprecedented supply challenge for all commodities including timber. Whilst it is impossible to predict how this may play out – it can be confidently predicted that the demand for timber for both products and energy (in particular) will rise substantially. It is unclear how this increase in demand will be met, given that there are limits to production efficiencies (and there are signs that we are reaching these limits) particularly upon exhaustible commodities and to an extent on timber supply with short term predicted dips and inelasticity in supply.

The EU target is for 20% of its energy to come from renewable sources by 2020, with the UK required to achieve 15% average, across electricity, heat and transport. In the EU woody biomass accounts for about 50% of the total renewable energy supply (UN, 2011). The substantial opportunity to increase the biomass market is considered in the section on biomass.

Another potential area of growth is in construction products, particularly as policy is beginning to shift from a narrow focus on operational energy reduction to a more holistic focus on sustainability and resource efficiency. Timber products would also increasingly be favoured as the methodologies for accounting for carbon across forestry, biomass and construction products become more uniform. It is recognised that the current treatment is inconsistent and favours biomass ahead of products. The IPCC has agreed a method for accounting for the carbon in harvested wood products but there are as yet no policy drivers. Should countries begin to account for and value the carbon sequestered in harvested wood products then a substantial increase in demand could be predicted.

Global trends point to the substantial rise in the demand for timber. When considered alongside the substantial UK trade deficit in timber (and the UK is the World's 4th highest timber importing country) there is a clear economic opportunity for increased timber production in the UK.

An alternative vision of the future can be formulated around an increased resistance to globalisation. This can perhaps be characterised as a move from a focus upon market efficiency to a focus upon resilience and greater self-sufficiency. Such an alternative vision is credible when you consider the current disconnect between free market driven consumption growth (and consequent rising carbon emissions) and the need to avoid runaway climate change. Whilst the current trend is for greater market liberalisation there is also growing worldwide resistance. A future focused on the need for greater resilience would also point to the opportunity for substantial development of the UK timber industry. However, the focus and nature of public intervention for a future based upon a 'resilience scenario' would be very different to that based upon an 'efficiency scenario'.

The global outlook for forestry and forest products appears to be very strong, but the future is uncertain and the policy environment complicated. To support policy development the UN has produced a report containing scenario analysis outlining possible futures (UN, 2011).

The report is based upon the core policy challenges described as:

- Mitigating climate change
- Supplying renewable energy
- Adapting to climate change and protecting forests

- Protecting and enhancing biodiversity
- Supplying renewable and competitive forest products
- Achieving and demonstrating sustainability
- Developing appropriate policies and institutions

Furthermore, addressing these challenges must be set within the framework of ever diminishing public budgets which may cause the state to increasingly withdraw from certain activities and/or to seek external investment.

The scenarios are developed from a reference scenario which assumes a future without major changes in forest policy, which the report concludes would lead to a steady growth in consumption of forest products and wood energy along with the expansion of supply to meet this demand. Interestingly the scenario used to describe the background trends which take place outside the forest sector is the IPCC B2 scenario which is summarised as follows:

‘The B2 world is one of increased concern for environmental and social sustainability compared to the A2 storyline. Increasingly, government policies and business strategies at the national and local levels are influenced by environmentally aware citizens, with a trend toward local self-reliance and stronger communities. International institutions decline in importance, with a shift toward local and regional decision-making structures and institutions. Human welfare, equality, and environmental protection all have high priority, and they are addressed through community-based social solutions in addition to technical solutions, although implementation rates vary across regions.’ Synopsis of the IPCC B2 scenario. NOTE: The IPCC describe four scenarios for possible futures. For more information on the IPCC scenarios see (http://en.wikipedia.org/wiki/Special_Report_on_Emissions_Scenarios).

The four policy scenarios modelled in the report are:

- **Maximising biomass carbon:** explores how much carbon could be stored in the European forest by changing silvicultural methods, without affecting the level of harvest.
- **Priority to biodiversity:** assumes the decision makers give priority to the protection of biological diversity.
- **Promoting wood energy:** explores what would be necessary for wood to contribute to achieving the European targets for renewable energy.
- **Fostering innovation and competitiveness:** explores the consequences for the sector of a successful strategy of innovation, leading to improved competitiveness.

‘...the challenges posed by climate change, energy and biodiversity are exceptionally complex and long term, and require quite profound changes if they are to be satisfactorily resolved. It will require a very high level of sophisticated cross-sectoral policy making, sharply focused policy instruments and strong political will to mobilise enough wood for energy, to implement the right balance between carbon sequestration and substitution and to conserve biodiversity without sacrificing wood supply.....’ (UN, 2011)

Whatever the future holds it is difficult to conceive of a scenario within which forestry and forest products are not of considerable and growing importance. Strategic investment focused upon the expansion of the forest sector should therefore be considered a relatively safe bet.

13 Innovation

Expenditure on innovation in the forestry and timber sector is low. Product, process, marketing and organisational innovations may have a profound impact on the future outlook of the forest sector. What can we do in Wales? Some core opportunities are listed below.

- Engineered wood products in construction / prefabrication of timber buildings / retrofit solutions
- Increased demand for and types of amenity
- Lower cost silvicultural systems reducing establishment and management costs
- Marketing forest ecosystem services such as biodiversity and carbon helping to encourage afforestation
- Developing locally applicable technical solutions (such as Ty Unnos) and finding mechanisms to support procurement to stimulate local supply chains within the constraints of a globalised economy
- Bio-refining

In 2011 BRE were commissioned to look at promising product developments that may encourage the use of homegrown timber (Building Research Establishment, 2011). The product ideas considered most exciting were reported as:

- Cross Laminated Timber (CLT) panels
- Glue laminated timber beams (glulam)
- Larch cladding
- Ash solid wood flooring
- Wood fuel pellets
- Laminated Strand Lumber (LSL)

Other innovations that might have a profound impact on demand are wood modification (acetylation, polymer impregnation and heat treatment). Fast grown, low density Radiata pine has proved to be the favoured timber for the acetylation process due principally to its high porosity. It is worth noting that this opportunity was not foreseen when Radiata pine plantations were being created in New Zealand.

Equally, innovations that make selection easier and cheaper (either in the forest or mill) such as forwarder grading technology may bring quantities of timber to potentially higher value markets.

Innovation approaches could make inactive forest owners a thing of the past and draw new land into productive forestry. Forest owners could compete to provide wood, ecosystem services and recreational opportunities (mountain biking, riding, tourism, culture, hunting etc.)

Organisational innovations could help to drive development. These include

- A state backed or facilitated supply chain consolidator may have a dramatic effect on supply chain development - particularly in the hardwood sector where fragile supply chains preclude investment. This may also create a clear link between the farmer as a potential grower and the market for timber - to help to unlock new planting

- New approaches to the ownership and management of the WGWE which would help to create more dynamic and innovative industry? The most appropriate ownership and management approach could be considered on a case by case basis depending on site specific issues and opportunities
- Cooperatives and public/private partnerships

For innovation to have a profound impact on the future in Wales, strategic decisions would need to be made to ensure innovation is locked-in. This would require a plan to foster and support innovation which would have features which include the following, a good science and research base, educated and skilled work force, flexibility of organisation and regulation, access to capital, entrepreneurship, appropriate product standards, culture which welcomes and rewards innovation.

The fact that forestry is not generally considered by policy makers as a national priority area for investment has severely hampered innovation in the sector. The focus on industries believed to lead to GDP growth, and on areas where the UK is deemed to have a competitive advantage, has led to a lack of focus on timber. For example, the following graphs have informed where Innovate UK (formerly the Technology Strategy Board) consider favourable target sectors for intervention. The timber industry has clearly not been seen as a priority.



Fig. A12: Manufacturing sector growth - UK

(Technology Strategy Board, 2007)

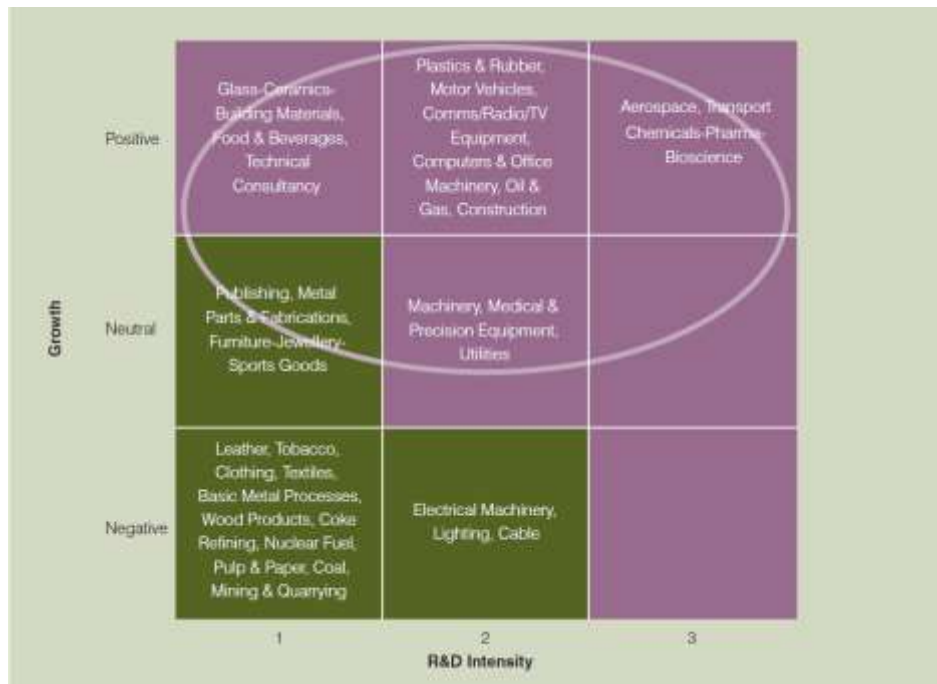


Fig. A13: R & D intensity vs. growth potential

However, in the words of David Willets MP:

‘Politicians of all parties have talked about the importance of rebalancing the economy. This means two things – first, ensuring that the economy does not become over-dependent on one sector and, secondly, that the economic divide between North and South should be narrowed’. David Willets MP (Policy Exchange, 2013)

The need to focus on sectors not conventionally considered to be Britain’s strongest (such as the timber industry) was clearly stated by Michael Heseltine in his influential report *No stone unturned: in the pursuit of growth*.

‘By recognising where we are strong and building on it, whilst understanding where we are weak and tackling it, we can develop an agenda relevant to the competition we face.’ (Heseltine, 2012).

14 Sustainability

14.1 Climate Change

The Welsh Government (WG) is committed to an overall target of reducing greenhouse gas (GHG) emissions in areas of devolved competence by 3% per annum with an expectation that all relevant sectors will make a contribution. Additionally it aims to cut all emissions by 40% by 2020 against a 1990 baseline.

While real progress has been made in terms of research on emissions in Wales, perhaps the most notable finding is the extent to which many of the actions to reduce GHG emissions have not been taken forward. For those measures sponsored by Government, this relates in part to a lack of clarity (a prime example being where to place woodland creation) and a lack of sufficient incentives for farmers and landowners (e.g. for woodland creation and peatland restoration) (ADAS, 2014)

2010 recommendation from LUCCG:

3. Forestry: to develop urgently detailed plans with a view to expanding current woodland / forest cover by about 100,000 ha over the next 20 years by planting a range of native deciduous trees, that are well adapted to the mean climate change scenario, and conifers, together with some natural regeneration. These should be grown on both acid upland soils and bracken land, but avoiding peats.

4. Forestry: to ensure that the current public - Forestry Commission (FC) - and private forest holdings are managed to optimise their greenhouse gas (GHG) sink potentials as well as providing a sustainable source of fuelwood and other timber products that form long term “carbon sinks” and/or substituting for fossil fuels.

The changing climate will affect Welsh forests in many unpredictable ways. Rising temperatures, changing patterns of rainfall, extreme events will make damage from fire, storms and disease more likely. While in some cases this will lead to theoretical increases in forestry yields, it is not sufficient however, to claim that this might yield broadleaf output “which might be valuable for high value uses such as furniture”. Existing over-mature standing stocks both in Wales and throughout the UK, woodland size, disparate ownership, lack of processing capacity and limited market pull, make the realisation of this theoretical value very difficult.

14.2 Carbon

Mitigating climate change is one of the largest and most complex challenges facing the world, with a unique complexity on the interface of biophysical processes, economic activity and considerations of geographic and intergenerational equity. The forest sector is at the origin of nearly a fifth of anthropogenic carbon emissions, mostly through deforestation, but also through wildfires, forest damage and wood harvest. At the same time, the forest sector can make a significant contribution to mitigating climate change. The main climate change mitigation strategies focused on the forest sector are:

- **Sequestering carbon in forests** by accumulating and maintaining carbon in the forest ecosystem (biomass and forest soil). Methods to achieve this include extending the resource or increasing its productivity, limiting harvests, reducing losses by improving protection against fire or insects or changing silvicultural approach.

- **Storing carbon in harvested wood products.** Until these products (e.g. sawnwood or panels in houses and furniture, paper in books) decay or are destroyed the carbon embedded in them is not released into the atmosphere. Making and using more of these products, and maximising their in-service life span, will sequester more carbon. A peer reviewed paper co-authored by RES indicated that policies designed to encourage the greater use of timber in construction could increase the carbon store in construction by a highly significant 22MtCO_{2e}/annum by 2050 (Robson, Sadler, & Newman, 2014). This can be compared to the entire embodied carbon of UK construction in 2010 of 33mtCO_{2e}.
- **Substituting for non-renewable materials.** Making products from wood from sustainably managed forests, to replace materials from non-renewable sources, should reduce carbon emissions, especially as wood processing often emits fewer greenhouse gases than its competitors (aluminium, concrete, etc.).
- **Substituting for non-renewable energy.** To the extent that wood from sustainable sources replaces non-renewable energy sources, carbon emissions are reduced. Wood already accounts for half of the renewable energy in Europe and thus plays an important role in meeting energy needs. In general, a 'cascaded' use of wood may be desirable (i.e. firstly for wood-based products, secondly recovered and reused or recycled and finally used for energy).

Land use

*In terms of **land use** and the "land use, land use change and forestry" (LULUCF) inventory, the main opportunities remain an expansion of woodland and restoring degraded peatland. Both measures rely on protecting and/or building carbon stores and reducing emissions associated with their management. Both can compete with food production in terms of land use and need to respect wider policy objectives for landscape and biodiversity, as well as socio-economic priorities, notably in the uplands. It is accepted that woodland needs to be located on less productive land, in areas which are not significant for other ecosystem services and the analysis suggests that there is sufficient land to deliver the 100,000 ha woodland planting target set out in the 2010 report. The question is the timescale over which this can be achieved, which relies on the nature and scale of incentive available (through Glastir grants) and a degree of behaviour change among farmers and landowners; this could take as long as 50 years. Net emissions reduction, allowing for carbon storage and sequestration from a combination of woodland expansion and peatland restoration, is estimated at 500 ktCO_{2e} per year but over an extended time period (ADAS, 2014).*

In the Welsh land use sector, the most significant climate change risks are those related to flooding. This includes the risks to domestic and business property, impacts on livestock from grazing and availability of feed, and potential yield impacts in the arable/horticulture and forestry sectors. The agriculture and land use sectors have an important role to play in adapting to flooding impacts. In particular planting of trees in specific areas may reduce risk of flooding to land and communities/businesses, whilst also minimising the effects of disease in livestock such as liver fluke by restricting access to wetter areas of land. (ADAS, 2014)

A snapshot of how woodland creation targeted at climate change mitigation can provide additional sustainability and ecosystem services.

	Provisioning Services			Regulation Services								Cultural Services	
	Food/fibre	Timber	Biofuels / Fuelwood	Erosion Control	Species Diversity	Climate Regulation	Flood Regulation	Air & Water Quality	Soil Quality	Disease & Pest Control	Recreation & Tourism	Employment	
Productive Agriculture													
Livestock productivity													
Nitrogen use efficiency													
New crops and tillage													
Land Use and Management													
Woodland creation													
Hedges / riparian buffers													
Peatland restoration													
Renewable Energy													
Biomass													
Biogas													
Wind													
Solar/ PV													
Hydro													
Key													
Increase provision	Increase or decrease provision				Potential to reduce provision but not all cases				Reduce provision				

Fig. A14: Afforestation benefits

Four broad overlapping and competing policy objectives for forestry. Taken from (UN, 2011).

14.3 Biodiversity

Key determinants in selection of tree species and subsequent management practices have often been portrayed as binary choices between productive plantation “monocultures” and planting for landscape remediation, amenity and biodiversity. Given the increasingly complex environmental and economic challenges for the future, a more complex framework is now required, particularly with research showing that lack of woodland management can impoverish the ecological value of our native woodlands. The lack of disturbance can cause a decrease in species suited to lighter open conditions diminishing the proportion of ruderal⁴ species and an increased representation of more competitive species. Bringing these woodlands into sustainable management would improve the condition of our native woodland and the species it is able to support.

The major challenges in protecting and enhancing biodiversity across the range of woodland types are:

⁴ Ruderal species are plant species that are first to colonize disturbed lands, typically dominating the disturbed area for a few years, gradually losing the competition to other native species.

- Improving biodiversity conservation whilst facing a strong competition for suitable land at national, landscape, district and stand levels
- Developing and financing strategies and policies which protect biodiversity but are still economically and socially sustainable
- Finding win-win solutions at landscape level that are effective in terms of biodiversity conservation but that attract the support of all stakeholders
- Ensuring consistency of biodiversity policies, forest policies and land use policies through a cross-sectoral approach. (UN, 2011)

Strategies focused on biodiversity include designating specific areas for biodiversity conservation, increasing rotation periods, intensified thinning, conversion after felling to mixed species, prohibition or limiting residue and stump extraction, altering silvicultural practices towards low impact silvicultural systems (LISS).

Some work has been completed in the area of identifying specific biodiversity issues through the Glastir Woodland Management Scoring Charts. 44 Categories of Biodiversity outcomes are plotted in total. The samples below both show Powys Central maps. The one on the left shows just areas scoring for maintenance of primary woodland cores and primary woodland networks. The one on the right shows all biodiversity outcomes showing the extent to which this grant is available across Wales.

Whilst these cover specific issues of developing forest management plans for a narrow range of outcomes for particular areas, it does not specifically address any of the major challenges identified above.

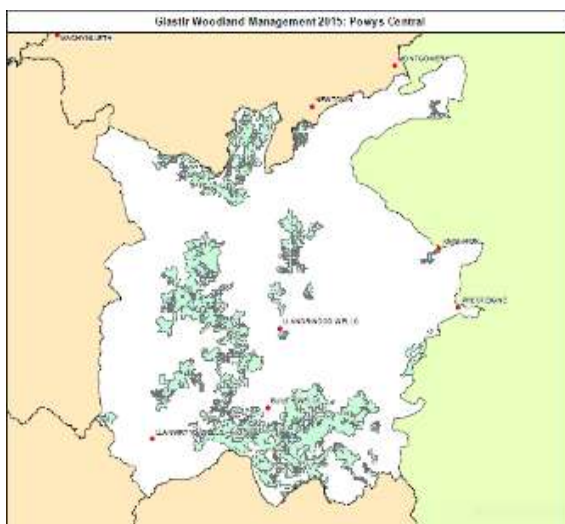


Fig. A15: Full Glastir Biodiversity map for Powys Central

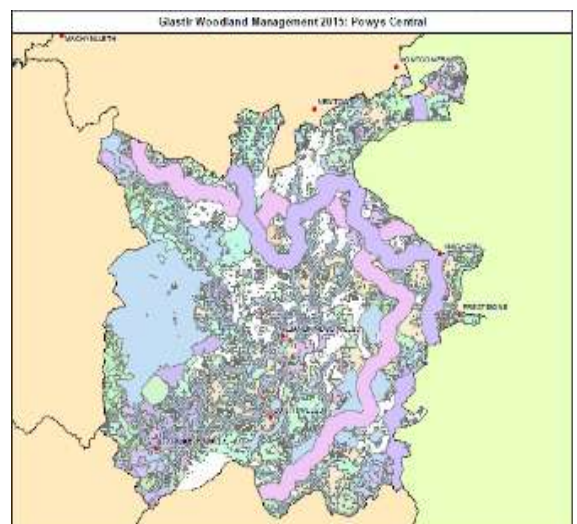


Fig. A16: Map excerpt from Glastir Biodiversity

Biodiversity policies have been around for some time but there is tension with the rising demand for wood for energy in particular leading to the need for trade-offs. There are no strict EU targets for biodiversity and win-win scenarios are considered to be increasingly hard to find. A move towards Payment for Ecosystem Services (PES) may provide one solution but scientific understanding to enable this approach to be fully implemented is not yet sufficiently developed.

Forestry is widely understood to make a significant contribution to climate change mitigation and adaptation, as well as addressing many other environmental issues and concerns. A key challenge that the roadmap will seek to address is how best to capture and value this contribution in a way that can help to stimulate economic growth in the sector.

15 Institutions

There are a large number of diverse public, private and third sector institutions that influence the timber supply chain and the policy environment (see Fig. A17 below). The sheer number of these institutions and their often conflicting interests can make decision making very slow and difficult and can stifle innovation.

There are tensions between the commercial, public and third sectors around many issues such as species, management methods, location for forestry and interventions. There are also internal tensions within the commercial sector around many issues (particularly public policy).

However, there are signs that the timber industry increasingly recognises the need to ‘speak with one voice’ and hence the signing of the ‘Timber Accord’ in 2012 which is an agreement between the signatories (the trade associations) to work together on timber representation.

The departmental nature of Government also makes policy difficult and leads to inertia. The responsibilities for meeting climate change targets, managing the woodland estate and providing housing rest with different departments. There is also fragmentation in terms of delivery of publically funded research as well as a lack of a strategic national plan for identifying and promoting appropriate innovation.

Organisation	Role	Key current interventions
Natural Resources Wales	Manages the WG woodland estate Enforce regulation	Enforce forest regulation Approve forest management plans Provide felling licences Marketing strategy for WGWE timber
Welsh Government	Forest owner Sets forest policy	Woodlands for Wales Strategy Operate Glastir Industrial policy incl. Welsh building regulations
Local Authorities	Support local and rural enterprises. Planning policy	Support local enterprises involved in the wood supply chain. Potential to support development of timber in construction through planning policy
UK Government	Set national policy	Sets overall industrial and energy policy. Responsible for national climate change targets
EU	Set high level industrial and land use policies, strategies and regulation. Operates the CAP	CAP supporting viability of upland agriculture Sustainable construction regulation Renewable energy targets European forest policy Carbon taxation Resource Efficiency Roadmap
Confor	Trade body representing woodland owners and processors	Lobbying for increased conifer planting

Organisation	Role	Key current interventions
CLA	Represent owners of unmanaged woodland and of potential planting land	Currently developing forest policy
WFBP	Promote the supply and demand for Welsh timber	General sector promotion through the website and newsletters, events and technical reports . Technical support
Coed Cymru	Bring broadleaf woodland into management	Product development and technical support
Wood for Good	Wood lobby organisation	Responsible for the 'Wood First' planning policy idea. Developed an embodied impact database for timber products
Other Trade bodies such as STA, BWF, TTF	Trade bodies representing the interests and improving standards of their members and member products	Stimulating market demand for member products using sustainably produced timber (not particularly involved in demand for home grown)
TRADA / BMTRADA	Membership organisation and testing and certification body	Developing standards and certifying timber frame details and methods
Universities and Colleges	Education, Training and R&D in forestry and forest products	Cardiff University – Architecture Bangor University – Forestry and Wood Science
Grown in Britain	Promote the supply and demand for home grown timber	General sector promotion Grown in Britain label
The Woodland Trust	The UK's largest woodland conservation charity	Protecting and restoring ancient, damaged or degraded woodland. Woodland creation
Llais y Goedwig	Promote and support community woodland groups	Promote the benefit of woodland Bring woodland into management

Fig. A17: Table of forestry stakeholders in Wales

It is clear that if there is to be substantial development of the sector in Wales there will undoubtedly need to be a change in the behaviour, roles and responsibilities of the guiding institutions – whether public, private or third sector. The roadmap will highlight these opportunities.

16 Policy incentives and interventions

Public support for private forestry has recently been focused upon state subsidies for planting and management. Grant support has been required to entice land owners into managing their forests and planting new forests. These grants schemes, 'Better Woodlands for Wales' and 'Glastir' have focused predominantly on environmental outcomes due to the objectives of the Rural Development Programme (RDP). Relative to the scale of the opportunity, it can be said that these schemes have met with limited success, and drawn criticism (from forest industries) that they reduce the productivity of the woodland, which leads to increased costs of processing and further place the liability of future management cost onto the public purse. Increasing costs may not simply lead to a proportionate reduction in output, but possibly to a sub-economic level and the withdrawal of existing enterprises from the sector. Resistance from the farming sector to take up these grants can be put down to a range of cultural (e.g. wedded to food production) and pragmatic financial issues. Other brakes on woodland creation include environmental concerns, high land prices, high proportion of tenanted land.

Whilst the solution is unclear, what is apparent is that current approaches are not working and a radical re-think is required. Tinkering at the edges is unlikely to lead to meeting the aspiration for sustainable development of forestry.

Additional value is derived through marketed non-wood services such as shooting, and in some cases amenity, and un-marketed services such as biodiversity and views. A further major service provided by forests and forest products is carbon sequestration equivalent to up to 10% of the carbon emissions for some European economies (UN Economic Commission for Europe, 2013). However this benefit rarely flows through to forest owners in terms of monetary value.

It is not clear how much money goes into subsidising forestry. According to the UN the average annual public expenditure on forestry in Europe is \$32/ha, but there is wide variation with 7 countries below \$10/ha and 6 countries above \$100/ha (UN Economic Commission for Europe, 2013). The non-monetary value derived from forestry is often the basis for subsidy. This subsidy can result in lower management cost and provide a de-facto subsidy to the processor, with little or no value returning to the grower in terms of higher returns. A major policy challenge is to provide framework conditions for an economically viable forest sector without being dependent on direct state subsidies for production.

'it is notable that all the countries with low public expenditure (on forestry) have a strong production oriented forest sector, whilst most of those with high public expenditure give a lower priority to wood production.' (UN Economic Commission for Europe, 2013)

This begs the questions, what is an appropriate level of subsidy? What is being paid for? And is Payment for Ecosystem Services (PES) the correct basis for introducing greater public investment into forestry? The shortcomings of PES relate to a lack of agreed metrics and do not necessarily inform key decisions such as where to plant.

It is widely understood that trees are a benefit to the environment and that increased planting is a good thing. Conventional analysis of the contribution of forestry to the economy typically considers the value of logs and primary processing. This contribution when expressed in terms of Gross

Domestic Product (GDP) in Europe is on average less than 1%. Even in heavily forested countries such as Finland, which has 73% forest cover, the contribution of forestry to GDP is approximately 7%. It is hard to sell the idea of developing forestry as a national priority solely on the basis of its contribution to GDP.

Perhaps investment in forestry should be justified in terms of the wider benefits or externalities. These externalities most commonly include factors to support well-being such as recreation and amenity as well as biodiversity, air quality and flood prevention.

However, forest policies based upon these externalities may lead to decision making which does not support or undermines the desire to develop productive forestry (in terms of species, location and management approach). For example, the reports from the Natural Capital Committee⁵ (Natural Capital Committee, 2014) suggest that the non-market value of afforestation far outweighs the market value and concludes that planting should be concentrated around urban centres to maximise 'natural capital' values. It is clear that many of these suggestions do not consider how public investment be framed to best support positive commercial outcomes, and therefore remain sustainable without continuing subsidy.

The natural capital committee propose an innovative accounting framework to enable the costs of sustaining and restoring natural capital to be evaluated and allocated to the private as well as the public sector. These include:

- Capital maintenance payments from public, not for profit and private sector asset owners
- Rents from non-renewable resources (e.g. oil or shale gas)
- Compensation payments from developers
- Greater use of economic instruments (e.g. taxes and charges)
- Reforming and eliminating perverse subsidies
- Potential new and innovative sources (e.g. plastic bag charge, crowd funding schemes, Payment for Ecosystem Services)
- Taking advantage of match funding opportunities (e.g. the EU Life Programme)

An underlying assumption of the Natural Capital report is that agriculture pays better than forestry at the moment (due to high demand for agricultural commodities) but future projections of demand for biomass for energy and the ongoing reduction of agricultural subsidies under the CAP may improve the competitiveness of forestry. A recent report commissioned by Confor (Confor, 2014) considered the returns from the land use options in Eskdalemuir in the south of Scotland of forestry and agriculture. The report concluded that in that particular location forestry was a more profitable option. However, there remains considerable resistance from land owners to forest management and afforestation.

It is clear from projections of global demand increase when considered alongside the sustainability benefits to be gained from the expansion of forestry that there is insufficient investment in the sector. Key to the substantial development of forestry and forest industries is the need to ensure that land owners are sufficiently incentivised to take the decision to plant trees ahead of other land

⁵ The Natural Capital Committee was established in 2012 to provide expert, independent advice to Government on the state of England's natural capital. It was set up following a commitment in the landmark 2011 Natural Environment White Paper, which was titled *The Natural Choice: Securing the Value of Nature*.

use options (such as grazing), and that the necessary management to ensure health of the forest and quality of the timber can be paid for. There are approximately 60,800 ha of woodland on farms in Wales – about 1/5 of Wales’ total woodland cover and in spite of 50% of this land now being nominally “in management”, it is evident that very little of this land is economically engaged or actively managed for specific results or outputs.

Currently forest planting and woodland management is incentivised almost entirely through public subsidy. It would seem that public investment alone is unlikely to encourage the desired expansion of the role of forestry in Wales in meeting economic, social and environmental sustainability targets.

The case for bringing external private finance into forestry (largely from pension funds) has historically been much greater in areas with high percentages of private commercial woodlands. There has been a small degree of private commercial establishment in Wales, but not nearly as much as evidenced in southern Scotland where private investment has established and re-planted woodland on poor upland grazing land. There has been increased evidence in recent years (in one case with direct involvement of RES) of appetite for establishment, remediation and management investment in Canada, where high levels of state retained land ownership are common.

EU Policy Priorities

Nia Griffiths, Head of the Welsh Government’s Rural Development Plan Reform and CAP Division, provided an update on the emerging EU legislative framework that will inform the operation of the new Rural Development Plan in Wales between 2014-2020. Innovation and Climate Change mitigation was at the heart of the EU’s rural development priorities. Overall she believed that the changes being suggested by the EU Commission would allow greater flexibility in developing the Welsh Rural Development Plan. So far as forestry was concerned the EU’s priorities were

- Afforestation of farmland
- Restoration and prevention of damage to forests
- Improving economic value

In Wales the current allocation of the Rural Development Plan budget (within the CAP allocation) is £841 million, of which the budget for forestry schemes is £32 million, or 4 per cent. Nia Griffiths felt this was meeting current demand. However, it was estimated that during the 2007-2013 Rural Development Programme period the total spend on forest-related measures would amount to between €12-16 billion. This would be around 7 per cent of the total Rural Development Plan expenditure, which suggests that Wales has some way to go to reach the average European Union spending on forestry.

There is considerable state intervention in Welsh forestry, through policy, ownership, regulation and investment. The roadmap will consider how this intervention can be configured to achieve maximum sector benefit as well as to highlight how private sector finance can be mobilised.

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Wales Forest Business Partnership
Unit 6, Dyfi Eco Park
Machynlleth
Powys
SY20 8AX

Tel: 0845 456 0342
Email: timber.info@wfbp.co.uk
Web: www.wfbp.co.uk



Resource Efficiency Services LGC Ltd.
Hen Capel, Glasinfryn, Bangor, Gwynedd. LL57 4UN