

# Land Use Policy Group

*The UK statutory  
conservation, countryside  
and environment agencies*

## World timber trade and implementing sustainable forest management in the United Kingdom

A report to the Woodland Policy Group

**Gerry Lawson and Gabriel E. Hemery**



FORESTRY  
HORIZONS

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The Land Use Policy Group (LUPG) of the UK statutory nature conservation, countryside and environment agencies comprises the Countryside Council for Wales, Natural England, Environment Agency, Environment and Heritage Service of Northern Ireland, Joint Nature Conservation Committee and Scottish Natural Heritage.

The LUPG aims to advise on policy matters of common concern related to agriculture, woodlands and other rural land uses. It seeks to improve understanding of the pros and cons of policy mechanisms related to land use, particularly farming and forestry; to develop a common view of desirable reforms to existing policies; and to promote these views. [www.lupg.org.uk](http://www.lupg.org.uk)

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[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

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[www.ehsni.gov.uk](http://www.ehsni.gov.uk)

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[www.jncc.gov.uk](http://www.jncc.gov.uk)

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### **To contact the LUPG:**

#### **Address:**

LUPG Support Officer  
Joint Nature Conservation Committee  
Monkstone House  
City Road  
Peterborough  
PE1 1JY  
UK

**Email:** [lupg@jncc.gov.uk](mailto:lupg@jncc.gov.uk)

**Website:** [www.lupg.org.uk](http://www.lupg.org.uk)

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# 1 Executive Summary

## 1.1 Executive Summary - English

### Introduction

This think-piece was commissioned by the interagency Woodland Policy Group (WPG) as a preliminary examination of the present and future relationship between the UK and the world timber trade in order to identify areas where further investigation by the Land Use Policy Group (LUPG) might be worthwhile. The authors were asked to explore the extent to which international factors affect UK woodland conservation and ways in which adverse impacts might be countered.

### Current forest resources

The ratio of felling to increment of growth in Western Europe (WE) has declined from 96 % in 1960 to 70 % today. Average annual increment increased from 3.3 m<sup>3</sup>/ha in 1960 to around 4.6 m<sup>3</sup>/ha now, with standing volumes/ha up from 80 m<sup>3</sup>/ha to 135 m<sup>3</sup>/ha. Through afforestation and abandonment of agricultural land, forest areas in WE have increased by 11 % since 1960.

UK forest area is now around 12 %, but new planting is only 8,000 ha/year, compared with 40,000 ha/yr in the early 1970s. Timber production in the private sector remains well below annual increment, particularly for hardwoods.

Harvesting and consumption declined dramatically in Russia in the early 1990s but both are now at record levels. Conifer production in WE has increased more rapidly than consumption, but the reverse is true for hardwoods, where imports are now 5 Mm<sup>3</sup>/yr. Production and consumption of both fibreboard and particleboard are rising rapidly, as are printing and writing paper. Total demand for raw wood materials in WE in 2000 was 525 Million tonnes (Mt).

In the UK, softwood timber production increased by 28.2 % between 1995 and 2004, whilst hardwood timber production decreased by 42.0 %. Exports increased to 11 % of total production in 2004, and this is a new factor for the UK. Tonnage of timber passing through sawmills has increased by 27 % over this period, and sawmills have modernised significantly. Coniferous roundwood imports to the UK have increased by 652 % since 1990, whereas hardwood roundwood declined by 47 %. The UK imported 960,000 tonnes of hardwoods/annum between 2000-2004, including 458,000 tonnes of tropical hardwoods.

### Future trends in production and consumption

Growing stock in Russia is 82 billion m<sup>3</sup>, with an annual increment of 900 Mm<sup>3</sup>, but removals are only 132 Mm<sup>3</sup>/yr, and increased exploitation may keep WE prices depressed in future. Three factors mitigate against this: a.) rapid economic growth in Russia itself, b.) export taxes rising to 80 % at the end of 2008, and c.) the sharp rise of consumption in China (where softwood imports are increasing at 4 Mm<sup>3</sup> per year, 80 % of which is provided by Russia). Official imports are 20 Mm<sup>3</sup>/yr, but true imports may be several times this. India is also becoming a major importer, with demand predicted to rise from 60 Mm<sup>3</sup> in 2005 to 153 Mm<sup>3</sup> in 2020, and domestic production likely to meet only 60 Mm<sup>3</sup>.

By 2020 total production and consumption of coniferous sawnwood in WE will be in balance at 89 Mm<sup>3</sup>/yr. Fibreboard and particle board production will continue to grow at around 3 % annually. Hardwood imports will increase to 8.4 Mm<sup>3</sup>/yr.

Overall production and consumption of industrial roundwood will increase more than 40 % from 2000 to 2020, with the ratio of fellings to net annual increment rising in all countries.

Most of the projected 38 % rise in production in the UK between 2004 and 2019 is on private estates, but it will peak around 2020 and decline to 2050. Future UK levels of hardwood production may be around 1 Mm<sup>3</sup>/yr, but prices are low and conventional markets uncertain.

### Financial profitability

Forestry contributed to 2.5 % of UK GDP in 2005 and directly employs almost 30,000 people in fulltime jobs, but its upstream economic, social and environmental benefits are much greater.

Direct and indirect subsidies to agriculture remain many times greater than to forestry, yet the UK relies on imports for 72 % of its timber needs and faces a growing need for bioenergy material. The dip in production after 2020 is likely to introduce a supply shortage.

Coniferous standing sales and sawlog prices have been in decline since 1990, and in real terms are 25 % of their March 1996 levels. Yet an index of the profitability of forestry, taking into account all sources of income and expenditure, shows an annual return of 3 % over the past 5 years. Over the past three years forestry has been more profitable than either gilts or bonds. Furthermore, price rises for softwood from the Baltic States has equilibrated prices across Europe and the current trend of UK softwood prices is upward.

### Socio-economic factors

Socio-economic valuations for GB forestry suggests a value for public good delivery of £365 ha/yr, or £1 ha/yr. One source for public expenditure on biodiversity indicated that grants to support management of England's SSSI woodlands averages £45 ha/yr.

Forestry provides high value public benefits but the market-based remuneration that woodland owners receive bears little relation to this.

Public-procurement policies and downstream support for timber products may deliver a viable forest sector at less public cost than through direct forest management subsidies. Nonetheless, support for 'forest-environment' payments is envisaged by all the UK countries in their draft Rural Development Plans 2007-2013, and can be used to stimulate sustainable management.

### Energy supply, carbon and emissions

The EU has ambitious targets to meet 20 % of total energy demand from renewables, and 10 % of transport fuel from biofuel by 2010<sup>1</sup>. It assumes that wood energy will provide 55 Mtoe<sup>2</sup> annually for electricity generation and 75 Mtoe for heating by 2010. Member states are being pressed to help meet these targets. However, a study of the '*environmentally compatible bioenergy potential of existing forests*' in the EU predicts that only a further 42 Mtoe can be produced annually without environmental impact, or without disrupting existing timber markets. The numbers therefore do not balance, and point to significant future shortage of wood resource.

<sup>1</sup> These targets were increased from 12 % and 5.75 % at the EU Summit on 9<sup>th</sup> March 2007.

<sup>2</sup> Million tonnes oil equivalent (oil has an energy content/ tonne approx double that of dry wood).

A 2003 study estimated that the total available wood resource in GB was 3.1 Mt/yr, reducing to 1.76 Mt/yr (dry weight) (~ 0.85 Mt oil equivalent) if competition with conventional forestry were avoided.

Bioenergy is a high priority for the UK Government, and an English Woodfuel Strategy is awaited soon. Use of wood-chips and pellets in co-generation power plants is at least 164,000 t/yr, and five wood-only power plants are being planned or built with a total planned intake of 1.5 Mt/yr (green). This again suggests that the UK, like Europe, may experience a shortage of fuel supply for bioenergy in the medium-term, and certainly after 2020.

Energy accounting, embodied energy calculations, and life-cycle environmental impact analyses are modern methods to contrast the energy and environmental impacts of different types of building material. Timber housing shows clear advantages using these methods, and should be favoured in planning and procurement policies, and initiatives such as Wood for Good given continued support.

The value of forests, forest vegetation and forest soils in sequestering carbon is illustrated using the latest UNFCCC returns. Carbon is now a traded commodity, and at current prices the carbon sequestered annually in UK forest land is worth around £150 million.

## UK forest policy

The UK countries differ widely in their forest resources (e.g. type, ownership), stakeholder interests and policy instruments. Each nation has a separate forestry strategy; the England Forestry Strategy is due for publication in 2007. The private sector in England is keen to see more emphasis on production and future markets, matching that in the Welsh, N Irish and Scottish strategies. FC England and Defra support production forestry but believe market forces should dominate and that there is no place for public intervention.

Much is changing in UK forestry due to globalised wood markets, climate change and CAP reform. The professional expertise of scientists, managers and business requires clear future strategies and implementation plans at regional levels.

The Forestry Commission's research agency, Forest Research, must continue to foster strong links with stakeholder needs, and identify future trends and changing research needs. Future research priorities could be: utilisation of farm woodlands, species for warmer climates and enhanced environmental protection, systems for combined timber and bioenergy production, and the need to produce quality broadleaves. The current emphasis on the breeding and improvement of Sitka spruce appears disproportional to the interests of the private sectors of England and Wales. The involvement of the private sector in research trials is a welcome dimension. It is encouraging that national offices are setting their own research agendas.

## Conclusions – the wider context

A stronger cross-sectoral approach is needed to make policy-makers and the public aware of the energy, environmental and social benefits of forestry. This includes awareness of the role of forestry in agricultural, trade, energy, environmental and social policies.

Climate change offers both opportunities (mitigation and adaptation roles) and threats to the forest sector. The sector should be proactive in analysing these impacts, quantifying the role and value of forests in a changing climate, and proposing innovations.

The emerging bio-energy revolution provides great opportunities for the sector but the implications for biodiversity and landscape must be considered and planned for. Joined-up thinking across a wide range of stakeholders is needed, and private innovation should be encouraged and documented.

Monitoring of environmental and social benefits from forests and forestry remains important despite some informative recent publications. New quantitative techniques of life-cycle energy analysis should be used to inform policy.

## Conclusions – the forest sector

The economic viability of UK forestry may be threatened by imports from Russia, although log export taxes and growing prosperity in Russia, China, India and elsewhere should ensure long-term softwood price increases. Certification and control of illegal timber (e.g. FLEGT) or wood-product imports should help maintain hardwood prices. Certification of imported timber should improve employment quality such as wages, training and career prospects, as well as the working environment and safety. It also should maintain prices for the benefit of the home-grown sector.

A key need is to strengthen links between forest owners and forest industries on a regional basis. Regional forest strategies and implementation plans are part of this effort, but there is a need to better understand the private-sector timber resource, and how and when it is likely to be offered to the market. An assessment should also be made of the timber resource in linear features and in areas of less than 2 ha, as these are not included in current resource inventories.

Other concerns include: a.) a lack of quality students at all levels; b.) woodland resources, particularly in SE and SW England being purchased as investments for their land value without any intention to manage for timber (hobby owners and 'lotting'); c.) the collapse of UK hardwood timber markets and insufficient support for the sector through e.g. Rural Development Plan support; d.) insufficient support for breeding and improvement of native hardwoods and species which may perform well under a changing climate.

Public and private procurement of wood products needs to be encouraged, perhaps through voluntary energy-offsets. These schemes can be quantified by research into the embodied energy and life-cycle energy consumption of wood versus other construction materials

Regional and local marketing advantages need to be explored and promoted, with lessons learnt from continental European working practises.

Forest certification is increasingly important in the wood-chain. Strategies for supporting owners in achieving a required status could be explored (e.g. group certification, incorporation in grant schemes), in collaboration with policy makers. Arguments that support domestic timber production, procurement and marketing need to be developed and communicated, to attract public funding towards innovation and business development. The private sector needs to become less reliant on grant income and to base management decisions on building long-term silvicultural investments.

Closer working relations between interests representing social, environmental and economic elements of the forestry sector must be developed to counter polarisation of strategies and vision.

## 1.2 Crynodeb Gweithredol - Cymraeg

### Rhagarweiniad

Comisiynwyd y darn hwn gan y Grŵp Polisi Coetiroedd rhyngasiantaethol. Ei fwriad oedd bod yn archwiliad rhagarweiniol i'r berthynas a geir yn awr ac yn y dyfodol rhwng masnach goed y DU a'r byd. Y gobaith wedyn yw gallu nodi meysydd ble gallai ymchwiliad pellach gan y Grŵp Polisi Defnydd Tir fod o fudd. Gofynnwyd i'r awduron ymchwilio i ba raddau y mae ffactorau rhyngwladol yn effeithio ar warchod coetiroedd y DU, gan ystyried ffyrdd y gellir eu rhoi ar waith er mwyn ceisio atal effeithiau niweidiol.

### Adnoddau coedwigoedd ar hyn o bryd

Mae'r gymhareb torri coed yn erbyn y cynnydd mewn twf yng Ngorllewin Ewrop wedi gostwng o 96% ym 1960 i o dan 70% heddiw. Cynyddodd y cynnydd blynyddol cyfartalog o 3.3 m<sup>3</sup>/ha ym 1960 i oddeutu 4.6 m<sup>3</sup>/ha ar hyn o bryd, gyda chyfeintiau sy'n sefyll/ha wedi cynyddu o 80 m<sup>3</sup>/ha i 135 m<sup>3</sup>/ha. O ganlyniad i goedwigoedd a throi cefn ar dir amaethyddol, mae coedwigoedd yng Ngorllewin Ewrop wedi gweld cynnydd o 11% ers 1960.

Mae arwynebedd coedwigoedd y DU bellach oddeutu 12%; fodd bynnag, dim ond 8,000ha/y flwyddyn a gaiff eu plannu, o'i gymharu â 40,000 ha/y flwyddyn yn nechrau'r 1970au. Mae cynhyrchu coed yn y sector preifat yn parhau i fod yn is o lawer na'r cynnydd blynyddol, yn arbennig ar gyfer pren caled.

Gwelir bod cynhyrchu coed conwydd yng Ngorllewin Ewrop wedi cynyddu'n gyflymach na'r defnydd a wneir ohonynt, ond mae'r gwrthwyneb yn wir am bren caled, lle mae mewnfurion bellach yn 5 Mm<sup>3</sup>/y flwyddyn. Mae cynhyrchu a defnyddio byrddau ffibr a byrddau gronynnau yn cynyddu'n gyflym, yn ogystal â chynhyrchu a defnyddio papur ar gyfer argraffu a phapur ysgrifennu. Roedd cyfanswm y galw am ddeunyddiau pren craidd yng Ngorllewin Ewrop yn 2000 yn 252 miliwn tunnell (Mt). Yn Rwsia, gostyngodd y cynaeafu a'r defnydd yn ddramatig yn gynnar yn yr 1990au, ond mae'r dda yn awr ar lefelau uwch nag erioed o'r blaen.

Yn y DU, gwelwyd cynnydd o 28.2% yn y gwaith o gynhyrchu pren meddal rhwng 1995 a 2004, tra gwelwyd gostyngiad o 42.0% yn y gwaith o gynhyrchu pren caled. Cynyddodd allforion i 11% o gyfanswm y cynnyrch yn 2004, ac mae hwn yn ffactor newydd o safbwynt y DU. Mae'r tunelli o goed sy'n mynd drwy felinau llifio wedi gweld cynnydd o 27% yn ystod y cyfnod hwn, ac mae melinau llifio wedi moderneiddio'n sylweddol. Mae mewnfurion bonyffion hir o goed conwydd i'r DU wedi gweld cynnydd o 652% ers 1990, tra bod bonyffion hir o bren caled wedi gweld gostyngiad o 47%. Mewnfuriodd y DU 960,000 tunnell o bren caled y flwyddyn rhwng 2000 a 2004, gan gynnwys 458,000 tunnell o bren caled trofannol.

### Tueddiadau o safbwynt cynhyrchu a defnyddio yn y dyfodol

Mae'r stoc sy'n tyfu yn Rwsia yn 82 biliwn m<sup>3</sup>, gyda chynnydd blynyddol o 900 Mm<sup>3</sup>. Fodd bynnag, dim ond 132 Mm<sup>3</sup>/y flwyddyn o goed a gaiff eu symud ymaith, ac fe all cynnydd mewn defnydd gadw prisiau Gorrlewin Ewrop yn isel yn y dyfodol. Ceir tri ffactor sy'n lliniaru hyn:

- twf economaidd cyflym yn Rwsia ei hun
- trethi allforion yn codi i 80% tua diwedd 2008

c) cynnydd sydyn yn y defnydd a wneir yn China (lle mae mewnfurion pren meddal yn cynyddu 4 Mm<sup>3</sup>/y flwyddyn, gydag 80% yn dod o Rwsia).

Gwelir bod mewnfurion swyddogol o foncyffion hir i China yn 20 Mm<sup>3</sup>/y flwyddyn, ond fe all y mewnfurion gwirioneddol fod yn llawer mwy na hyn. Mae India hefyd yn mewnfurio llawer – disgwylir y bydd y galw'n cynyddu o 60 Mm<sup>3</sup> yn 2005 i 153 Mm<sup>3</sup> yn 2020, er mai 60 Mm<sup>3</sup> yn unig, yn ôl pob tebyg, a gynhyrchir yn y wlad ei hun.

Erbyn 2020 bydd cyfanswm y cynnyrch a'r defnydd a wna Gorrlewin Ewrop o bren conwydd wedi ei lifio yn cyfantoli ar 89 Mm<sup>3</sup>/y flwyddyn. Bydd y gwaith o gynhyrchu byrddau ffibr a byrddau gronynnau yn parhau i gynyddu tua 3% y flwyddyn. Bydd mewnfurion pren caled yn cynyddu i 8.4 Mm<sup>3</sup>/y flwyddyn.

Fe fydd y cynnyrch a'r defnydd cyffredinol a wna diwydiannau o foncyffion hir yn cynyddu mwy na 40% rhwng 2000 a 2020, gyda'r gymhareb o goed sy'n cael eu torri yn erbyn cynnydd blynyddol net yn cynyddu ym mhob gwlad.

Mae cyfran helaeth o'r cynnydd amcanol o 38% yng nghynnyrch y DU rhwng 2004 a 2019 i'w weld ar stadau preifat, ond bydd yn cyrraedd ei frig oddeutu 2020 ac yn gostwng hyd at 2050. Gall lefelau cynhyrchu pren caled o fewn y DU yn y dyfodol fod oddeutu 1 Mm<sup>3</sup>/y flwyddyn, ond mae'r prisiau'n isel a'r marchnadoedd traddodiadol yn ansicr.

### Pa mor broffidiol yw hyn yn ariannol

Cyfrannodd coedwigaeth at 2.5% o Gynnyrch Mewnwladol Crynswth (GDP) y DU yn 2005, ac mae'r diwydiant yn cyflogi bron i 30,000 o bobl yn uniongyrchol mewn swyddi llawn-amser; ond mae'r manteision economaidd, cymdeithasol ac amgylcheddol yn uwch i fyny'r gadwyn yn llawer mwy.

Mae cymorthdaliadau uniongyrchol ac anuniongyrchol a gaiff amaethyddiaeth yn parhau i fod yn fwy o lawer na'r rhai a gaiff y diwydiant coedwigaeth. Eto i gyd, mae'r DU yn dibynnu ar fewnfurio 72% o'r pren y mae ei angen, ac mae'n wynebu galw cynyddol am ddeunyddiau bioynni. Mae'r gostyngiad mewn cynhyrchiant ar ôl 2020 yn debygol o arwain at brinder mewn cyflenwad.

Mae gwerthiannau o goed conwydd sy'n sefyll a phrisiau bonyffion wedi bod yn gostwng ers 1990, ac mewn termau gwirioneddol dim ond 25% o'r lefelau a gafwyd ym Mawrth 1996 a geir yn awr. Eto i gyd, mae mynegai o broffidioldeb coedwigaeth, gan roi ystyriaeth i'r holl ffynonellau incwm a'r holl wariant, yn dangos elw blynyddol o 3% yn ystod y pum mlynedd diwethaf. Dros y tair blynedd diwethaf mae coedwigaeth wedi bod yn fwy proffidiol na stociau a bondiau. Ymhellach, mae codiadau ym mhrisiau pren meddal o Wledydd y Baltig wedi cydbwysu prisiau ar draws Ewrop, a'r duedd ar hyn o bryd yw i brisiau pren meddal y DU gynyddu.

### Ffactorau cymdeithasol-economaidd

Mae prisiannau cymdeithasol-economaidd ar gyfer coedwigaeth y DU yn awgrymu gwerth am gyflwyno budd i'r cyhoedd o £365ha y flwyddyn, neu £1 ha y dydd. Nododd yn ffynhonnell yn ymwneud â gwariant cyhoeddus ar fioamrywiaeth fod grantiau i gefnogi'r dasg o reoli SoDdGA coetiroedd Lloegr ar gyfartaledd yn £45 ha y flwyddyn.

Mae coedwigaeth yn dod â manteision o werth uchel i'r cyhoedd, ond ychydig iawn o gysylltiad sydd rhwng hyn a'r gydnabyddiaeth ariannol (sy'n seiliedig ar y farchnad) a gaiff perchnogion coetiroedd.

Fe all polisïau caffael cyhoeddus a chefnogaeth i lawr y gadwyn ar gyfer cynhyrchion coed arwain at sector coedwigaeth hyfyw am lai o gost gyhoeddus na thrwy gymorthdaliadau uniongyrchol ar gyfer rheoli coedwigaeth. Er hynny, rhagwelir y ceir cefnogaeth i daliadau 'coedwigoedd-amgylchedd' gan holl wledydd y DU yn eu Cynlluniau Datblygu Gwledig drafft ar gyfer 2007-2013, a gellir eu defnyddio i ysgogi rheolaeth gynaliadwy.

## Cyflenwi ynni, carbon a gollyngiadau

Mae gan yr UE dargedau uchelgeisiol o ran sicrhau bod 20% o gyfanswm y galw am ynni yn dod o ffynonellau adnewyddadwy a bod 10% o danwydd cludiant yn fiodanwydd erbyn 2010. Rhagdybir y bydd ynni coed yn darparu 15 Mtoe<sup>4</sup> y flwyddyn ar gyfer cynhyrchu trydan a 75 Mtoe ar gyfer gwresogi erbyn 2010. Rhoddir pwysau ar aelod-wladwriaethau i helpu i gyrraedd y targedau hyn. Ond mae astudiaeth ar 'botensial coedwigoedd sy'n bodoli ar hyn o bryd ar gyfer cynhyrchu bioynni sy'n gydnaws â'r amgylchedd' yn yr UE yn rhagweld mai dim ond 42 Mtoe y gellir ei gynhyrchu'n flynyddol heb gael effaith amgylcheddol, neu heb amharu ar y marchnadoedd coed sy'n bodoli ar hyn o bryd. Nid yw'r niferoedd, felly, yn cydbwysu, ac maent yn awgrymu y bydd prinder sylweddol o goed yn y dyfodol.

Amcangyfrifodd astudiaeth yn 2003 mai cyfanswm yr adnoddau coed oedd ar gael ym Mhrydain oedd 3.1 Mt/y flwyddyn, yn gostwng i 1.76 Mt/y flwyddyn (pwysau sych) (~0.85 Mt o'r hyn sy'n cyfateb i olew) pe bai cystadleuaeth gyda choedwigoedd traddodiadol yn cael ei osgoi.

Mae bioynni yn flaenoriaeth uchel i Lywodraeth y DU, a disgwylir i Strategaeth Tanwydd Coed Lloegr ymddangos yn fuan. Mae'r defnydd o sglodion a pheletau coed mewn gweithfeydd cynhyrchu pŵer ar y cyd yn 164,000 t y flwyddyn o leiaf, ac mae 5 o weithfeydd pŵer sy'n defnyddio coed yn unig yn cael eu cynllunio neu eu hadeiladu gyda'r bwriad o ddefnyddio cyfanswm o 1.5 Mt/y flwyddyn (gwyrd). Mae hyn eto yn awgrymu y gall y DU, fel Ewrop, fod yn brin o danwydd ar gyfer bioynni yn y tymor canolig, ac yn sicr ar ôl 2020.

Mae cyfrifo ynni, cyfrifiadau ynni ymgorfforedig a dadansoddiadau o effaith amgylcheddol cylch bywyd yn ddulliau modern o gyferbynnu effeithiau ynni ac effeithiau amgylcheddol gwahanol fathau o ddeunyddiau adeiladu. Mae tai pren yn dangos manteision clir wrth ddefnyddio'r dulliau hyn, a dylid eu ffafrio mewn polisïau cynllunio a chaffael, yn ogystal â pharhau i roi cefnogaeth i gynlluniau fel 'Wood for Good'.

Dangosir gwerth coedwigoedd, llystyfiant coedwigoedd a phriddoedd coedwigoedd o ran neilltuo carbon trwy ddefnyddio'r ffurflenni UNFCCC diweddaraf. Mae carbon bellach yn nwydd sy'n cael ei fasnachu, ac yn ôl prisiau cyfredol mae'r carbon sy'n cael ei neilltuo yn flynyddol mewn coedwigoedd yn DU yn werth oddeutu £150 miliwn.

## Polisi coedwigaeth y DU

Mae gwahaniaethau mawr i'w gweld yng ngwledydd y DU o ran eu coedwigoedd (e.e. math, perchnogaeth), buddiannau eu budd-ddeiliaid a'u hofferynnau polisi. Mae gan bob cenedl strategaeth coedwigaeth ar wahân; disgwylir i Strategaeth Coedwigaeth

Lloegr gael ei chyhoeddi yn 2007. Mae'r sector preifat yn Lloegr yn awyddus i weld mwy o bwyslais ar gynhyrchu a marchnadoedd y dyfodol, gan gyfateb yr hyn a geir yn strategaethau Cymru, Gogledd Iwerddon a'r Alban. Mae Comisiwn Coedwigaeth Lloegr a Defra yn cefnogi coedwigoedd cynhyrchu; ond eu barn yw y dylai grymoedd y farchnad lywio ac nad oes lle i ymyrraeth gan y cyhoedd.

Mae llawer o bethau'n newid yn niwydiant coedwigo'r DU oherwydd marchnadoedd coed byd-eang, newid yn yr hinsawdd a diwygiadau i'r Polisi Amaethyddol Cyffredin. Mae arbenigedd proffesiynol gwyddonwyr, rheolwyr a busnes angen strategaethau clir ar gyfer y dyfodol a chynlluniau gweithredu ar lefelau rhanbarthol.

Rhaid i Asiantaeth Ymchwil y Comisiwn Coedwigaeth, 'Forest Research', barhau i feithrin cysylltiadau cryf gydag anghenion budd-ddeiliaid, gan nodi tueddiadau ar gyfer y dyfodol ac anghenion ymchwil newidiol. Fe all blaenoriaethau ymchwil ar gyfer y dyfodol fod fel a ganlyn: defnyddio coetiroedd ffermydd, rhywogaethau ar gyfer hinsoddau cynhesach, gwell gwarchodaeth amgylcheddol, systemau ar gyfer cyfuno cynhyrchu coed a bioynni, a'r angen i gynhyrchu coed collddail o ansawdd. Ar hyn o bryd, mae'r pwyslais ar dyfu a gwella sbriws Sitka yn ymddangos yn anghymesur i fuddiannau sectorau preifat Cymru a Lloegr. Mae cynnwys y sector preifat mewn treialon ymchwil yn rhywbeth i'w groesawu. Calonogol yw gweld bod swyddfeydd cenedlaethol yn gosod eu hagendâu ymchwil eu hunain.

## Casgliadau – y cyd-destun ehangach

Mae angen agwedd draws-sectoraidd gryfach i wneud llunwyr polisïau a'r cyhoedd yn ymwybodol o fanteision coedwigaeth o safbwynt ynni, yr amgylchedd a buddion cymdeithasol. Mae hyn yn cynnwys ymwybyddiaeth o rôl coedwigaeth mewn amaethyddiaeth, masnach, ynni, a pholisïau amgylcheddol a chymdeithasol.

Gwelir bod newid yn yr hinsawdd yn cynnig cyfleoedd (rolau lliniaru ac addasu) a bygythiadau i'r sector coedwigaeth. Dylai'r sector fod yn rhagweithiol wrth ddadansoddi'r effeithiau hyn, gan fesur rôl a gwerth coedwigoedd mewn hinsawdd sy'n newid a chan argymhell syniadau newydd.

Mae'r chwyldro bioynni sy'n ymddangos ar hyn o bryd yn cynnig cyfleoedd mawr i'r sector, ond rhaid ystyried y goblygiadau o ran bioamrywiaeth a thirwedd, gan gynllunio ar eu cyfer. Mae angen i ystod eang o fudd-ddeiliaid feddwl yn gydlynol, a dylid annog a chofnodi enghreifftiau o arloesedd preifat.

Mae monitro manteision amgylcheddol a chymdeithasol sy'n deillio o goedwigoedd a choedwigaeth yn parhau i fod yn bwysig, er gwaethaf rhai cyhoeddiadau diweddar. Dylid defnyddio technegau meintiol newydd o ddadansoddi ynni cylch bywyd er mwyn cyfarwyddo'r polisi.

## Casgliadau – y sector coedwigaeth

Gall hyfywra economaidd coedwigoedd y DU fod o dan fygythiad gan fewnforion o Rwsia, er y dylai trethi ar allforio boncyffion a ffyniant cynyddol yn Rwsia, China, India, ac mewn mannau eraill, sicrhau cynnydd ym mhrisiau pren meddal yn y tymor hir. Dylai ardystio a rheoli pren anghyfreithlon (e.e. FLEGT), neu fewnforion o gynhyrchion pren, helpu i gynnal prisiau pren caled. Dylai ardystio pren sy'n cael ei fewnforio wella agweddau ar ansawdd cyflogaeth, megis cyflogau, hyfforddiant a rhagolygon gyrfa, yn ogystal â'r amgylchedd gwaith a diogelwch. Dylai hefyd gynnal prisiau er budd y sector cartref.

<sup>3</sup> Cynyddwyd y targedau hyn o 12% a 5.75% yn Uwch Gynhadledd yr UE ar 9 Mawrth 2007.

<sup>4</sup> 'Million tonnes oil equivalent' (mae olew yn cynnwys dwbl yr ynni a geir mewn pren sych ym mhob tunnell.

Un o'r anghenion allweddol yw cryfhau'r cysylltiadau rhwng perchnogion coedwigoedd a diwydiannau coedwigoedd, a hynny ar sail ranbarthol. Mae strategaethau a chynlluniau gweithredu rhanbarthol ar gyfer coedwigoedd yn rhan o'r ymdrech hon, ond mae angen deall adnodd coed y sector preifat yn well, yn ogystal â sut a phryd y mae'n debygol o gael ei gynnis i'r farchnad. Dylid gwneud asesiad o'r adnodd coed mewn nodweddion llinol ac mewn ardaloedd sy'n llai na 2 ha o faint, gan nad yw'r rhain yn cael eu cynnwys mewn stocrestrau o adnoddau cyfredol.

Mae pryderon eraill yn cynnwys: a) diffyg myfyrwyr o ansawdd ar bob lefel; b) adnoddau coetiroedd, yn arbennig yn Ne Ddwyrain a De Orllewin Lloegr, yn cael eu prynu fel buddsoddiadau oherwydd gwerth y tir, heb unrhyw fwriad i'w rheoli er mwyn cael coed; c) cwmp marchnadoedd coed pren caled y DU a chefnogaeth annigonol i'r sector, er enghraifft trwy gefnogaeth y Cynllun Datblygu Gwledig; d) cefnogaeth annigonol ar gyfer bridio a gwella coed caled a rhywogaethau brodorol a all berfformio'n well o dan hinsawdd newidiol.

Mae angen hyrwyddo'r arfer o brynu cynhyrchion coed cyhoeddus a phreifat, efallai trwy gynlluniau gwirfoddol i'w gosod yn erbyn ynni. Gall y cynlluniau hyn gael eu mesur trwy ymchwilio i'r ynni sydd wedi ei ymgorffori yn y coed a'r defnydd o ynni yng nghylch bywyd coed o'i gyferbynnu â deunyddiau adeiladu eraill.

Mae angen archwilio a hyrwyddo'r manteision a ddaw wrth farchnata'n rhanbarthol ac yn lleol, gan ddysgu gwersi gan arferion gweithio gwledydd cyfandir Ewrop.

Mae ardystio coedwigoedd yn dod yn fwyfwy pwysig yn y gadwyn goed. Gellir ymchwilio i strategaethau ar gyfer cefnogi perchnogion i gyrraedd y statws angenrheidiol (e.e. ardystiad grŵp, eu cynnwys mewn cynlluniau grantiau) mewn cydweithrediad â llunwyr polisïau. Rhaid i ddadleuon sy'n cefnogi'r arferion o gynhyrchu coed domestig, caffael a marchnata gael eu datblygu a'u cyfathrebu er mwyn denu cyllid cyhoeddus i ariannu arloesedd a datblygiadau busnes. Mae angen i'r sector preifat fod yn llai dibynnol ar incwm gan grantiau, gan seilio'u penderfyniadau rheoli ar greu buddsoddiadau coedwrol tymor hir.

Rhaid datblygu cydberthnasau gweithio agosach rhwng y buddiannau sy'n cynrychioli elfennau cymdeithasol, amgylcheddol ac economaidd y sector coedwigaeth, er mwyn ceisio cael strategaethau a gweledigaethau mwy cytûn nad ydynt yn cynrychioli pegynau gwahanol.

### 1.3 Key Messages

1. Forest areas and productivities in Western Europe have expanded by 11 % and 30 % since 1950 but around 30 % less of the annual forest increment is being utilised. The forest resource in Eastern Europe and Russia is large and will continue to dominate markets in Western Europe.
2. Temperate timber and wood products are increasingly traded in globalised markets, although trade in tropical hardwood logs is declining. Production from tropical and temperate plantations will exceed 50 % of total trade by 2050. Increasing timber demands in China, India, and other Asian countries will reduce roundwood availability for Europe, and, together with a 50 €/m<sup>3</sup> tax on exports from Russia, will drive up softwood prices. UK softwood prices have now equilibrated with those from Sweden and Eastern Europe, and the UK is exporting 15 % of production.
3. The UK imports 72 % of its timber needs, and cheap supplies from Eastern Europe have reduced prices for UK standing sales in 2005 to 25 % of levels in 1995 in real terms. In the past two years timber prices have been recovering, and the overall profitability of UK forestry is around 3 %, with forestry contributing to 2.5 % of the UK Economy.
4. The EU has ambitious targets for wood biofuel consumption in member states, but these appear unobtainable without significant impact on the environment and on availability of timber for conventional purposes. This can only drive up prices, and more so if methanol production from wood becomes more economic. The UK will face a similar shortage of woody-biomass, and five major power plants are under construction with a combined requirement of 1.5 M tonnes annually.
5. Climate change and the energy revolution presents both opportunities and threats to UK forests. Flexible and targeted R&D activities are required, and must be innovative and unconstrained by historic interests and preconceptions.
6. Domestic forestry policy needs to respond quickly to the great changes taking place in world timber markets, carbon-trading, energy-accounting, CAP reform, downstream employment and public perceptions of forests, and environmental benefits such as flood mitigation and biodiversity enhancement.. Forestry delivers public good value of £1 per ha every day. Despite this non-market benefit, and the long-term opportunities, the financial profit to be made from forestry is insufficient, and the risk too great, to encourage owners to expand the national resource of woodlands.
7. There are both environmental and strategic-supply cases to expand the UK forest resource, and a 40 year lag for this to be done. State support is justified, with priorities set regionally, but this support need not be increases in conventional planting or management grants. Options such as support to wood-using industries, timber marketing data-services, extension of SFP payments to farm woodlands, and emissions trading tax or financial credits may well provide cheaper and more effective alternatives.
8. Accounting methods like lifecycle energy analysis and carbon accounting and embodied energy analysis will increasingly complement simple financial accounting and socio-economic cost benefit analysis to compare the private and public value of forestry and woodlands in the UK.
9. Lack of management is causing loss of biodiversity in some woodlands. Combined with over emphasis on social and environmental objectives, it limits the capability of the private sector to deliver sustainable forest management, and fosters a public-support reliant culture. UK woods are in poor condition and most under-managed (e.g. 600,000 ha in England). Uptake of Woodland Management Grants is insufficient, and costs of certification are acting as a barrier to management for many woodland owners
10. Forestry must integrate more closely with agriculture, environmental conservation, energy, transport and social agendas. Cooperation is required between a range of national and local Government agencies, and with the private and voluntary sectors.

**Prif Negeseuon**

1. Mae coedwigoedd a chynhyrchiant yng Ngorllewin Ewrop wedi ehangu 11% a 30% ers 1950, ond mae tua 30% yn llai o'r cynnydd blynyddol mewn coedwigoedd yn cael ei ddefnyddio. Mae coedwigoedd Dwyrain Ewrop a Rwsia yn fawr, a byddant yn parhau i lywio marchnadoedd Gorllewin Ewrop.
2. Mae cynhyrchion coed a phren tymherus yn cael eu masnachu'n gynyddol mewn marchnadoedd byd-eang, er bod masnach mewn boncyffion pren caled trofannol yn gostwng. Erbyn 2050, fe fydd cynnyrch planhigfeydd trofannol a thymherus yn fwy na 50% o gyfanswm y fasnach. Bydd y gofynion cynyddol am goed yn China, India a gwledydd eraill Asia yn lleihau nifer y boncyffion hir fydd ar gael i Ewrop. Fe fydd hyn, ynghyd â 50 €m3 o dreth ar allforion o Rwsia, yn arwain at gynydd ym mhrisiau pren meddal. Mae prisiau pren meddal y DU bellach wedi cyfantoli gyda rhai o Sweden a Dwyrain Ewrop, ac mae'r DU yn allforio 15% o'r cynnyrch.
3. Mae'r DU yn mewnfario 72% o'r pren y mae'r wlad ei angen, ac mae cyflenwadau rhad o Dwyrain Ewrop wedi lleihau prisiau ar gyfer gwerthiannau o goed sy'n sefyll y DU yn 2005 i 25% o'r lefelau a geid ym 1995 mewn termau gwirioneddol. Yn ystod y ddwy flynedd ddiwethaf, mae prisiau coed wedi dod atynt eu hunain, ac mae proffidioldeb cyffredinol coedwigaeth yn y DU oddeutu 3%, gyda choedwigaeth yn cyfrannu hyd at 2.5% at economi'r DU.
4. Mae gan yr UE dargedau uchelgeisiol ar gyfer defnyddio biodanwydd coed yn yr aelod-wladwriaethau, ond mae'n ymddangos nad oes modd eu cyrraedd heb gael effaith sylweddol ar yr amgylchedd ac ar argaeledd coed at ddibenion traddodiadol. Mae hyn yn sicr o gynyddu prisiau, ac yn fwy felly os bydd cynhyrchu methanol trwy ddefnyddio coed yn dod yn fwy economaidd. Bydd y DU yn wynebu prinder tebyg o ran biomas coediog, ac mae pump o orsafoedd pŵer mawr yn cael eu hadeiladu ar hyn o bryd – fe fydd y rhain gyda'i gilydd angen 1.5 M tunnelli y flwyddyn.
5. Mae newid yn yr hinsawdd a'r chwyldro ynni yn dod â chyfleoedd a bygythiadau i ran coedwigoedd y DU. Mae angen gwaith Ymchwil a Datblygu hyblyg, wedi ei dargedu, a rhaid iddo fod yn arloesol, heb gael ei gyfyngu gan fuddiannau a rhagdybiaethau hanesyddol.
6. Mae angen i bolisiau coedwigaeth domestig ymateb yn gyflym i'r newidiadau mawr a welir yn y meysydd canlynol: marchnadoedd coed y byd, masnachu carbon, cyfrifo ynni, diwygio'r PAC, cyflogaeth i lawr y gadwyn, amgyffred y cyhoedd ynglŷn â choedwigoedd, a manteision amgylcheddol fel lliniaru llifogydd a gwella bioamrywiaeth. Mae coedwigaeth yn cynrychioli gwerth da i'r cyhoedd o £1 yr hectar y dydd. Er gwaethaf y budd nad yw'n ymwneud â'r farchnad, a'r cyfleoedd tymor hir, mae'r elw ariannol a ddaw yn sgil coedwigaeth yn annigonol a'r risg yn rhy fawr i annog perchnogion i ehangu coetiroedd y wlad.
7. Ceir rhesymau amgylcheddol a rhesymau'n ymwneud â chyflenwad strategol dros ehangu adnodd coedwigoedd y DU, gydag oediad o 40 o flynyddoedd i wneud hyn. Gellir cyfiawnhau cymorth y wladwriaeth, gyda blaenoriaethau'n cael eu pennu'n rhanbarthol, ond nid oes angen i'r gefnogaeth hon gael ei chyflwyno ar ffurf cynnydd mewn grantiau plannu neu grantiau rheoli traddodiadol. Efallai y bydd dewisiadau fel rhoi cefnogaeth i ddiwydiannau sy'n defnyddio coed, gwasanaethau data marchnata coed, ymestyn taliadau sengl (SFP) ar gyfer coetiroedd ffermydd, a threth masnachu gollyngiadau neu gredydau ariannol, yn ddewisiadau rhatach a mwy effeithiol.
8. Bydd dulliau cyfrifo fel dadansoddi ynni cylch bywyd, cyfrifo carbon a dadansoddiadau ynni ymgorfforedig, yn ychwanegu mwyfwy at gyfrifyddu ariannol syml ac at ddadansoddiadau cost a budd cymdeithasol-economaidd er mwyn cymharu gwerth preifat a chyhoeddus coedwigoedd a choetiroedd y DU.
9. Mae diffyg rheolaeth yn arwain at golli bioamrywiaeth mewn rhai coetiroedd. Ynghyd â gorbwyslais ar amcanion cymdeithasol ac amgylcheddol, mae'n cyfyngu ar allu'r sector preifat i gyflwyno rheolaeth gynaliadwy mewn coedwigoedd, gan feithrin diwylliant lle dibynnir ar gefnogaeth gyhoeddus. Mae coedwigoedd y DU mewn cyflwr gwael ac mae'r rhan fwyaf yn cael eu tan-reoli (e.e. 600,000 ha yn Lloegr). Mae'r nifer sy'n manteisio ar y Grantiau Rheoli Coetiroedd yn annigonol, ac mae costau ardystio yn rhywbeth sy'n rhwystro nifer o berchnogion coetiroedd rhag eu rheoli.
10. Rhaid i goedwigaeth integreiddio'n well ag agendâu amaethyddiaeth, gwarchodaeth amgylcheddol, ynni a chlundiant, ynghyd â'r agenda gymdeithasol. Mae angen cydweithredu rhwng ystod o asiantaethau'r llywodraeth yn genedlaethol a lleol, a chvda'r sectorau preifat a gwirfoddol.

## 2 Introduction

### 2.1 Aims and objectives

This ‘think-piece’ was commissioned by the interagency Woodland Policy Group (WPG) as a preliminary examination of the present and future relationship between the UK and the world timber trade in order to identify areas where further investigation by the Land Use Policy Group (LUPG) might be worthwhile. The authors were asked to explore the extent to which international factors affect UK woodland conservation and ways in which adverse impacts might be countered.

**Goal:** To review the belief that UK timber production is unprofitable and present a framework for future UK research and policy initiatives in a globalised timber, energy and carbon market, where many previous assumptions have become unreliable.

**Purpose:** To analyse historical, current and future timber production, markets and prices: learning from previous errors in predictions and focusing on options to stimulate the market and policy context for wood and wood products. This analysis starts with options to increase the financial profitability of UK forestry, and widens to consider socio-economic accounting methods which allocate shadow prices to the many benefits of multi-purpose forestry. Finally consideration is given to techniques which use energy lifecycle analysis or greenhouse gas emissions as a means of deciding between alternative energy sources or construction materials. Priorities for research and policy initiatives will be highlighted at each stage.

### 2.2 Definitions and abbreviations

The term sustainable forest management (SFM) was defined by the Ministerial Conference for Protection of Forests in Europe in Helsinki 1993 and adopted by the EU Forestry Strategy of 1998. SFM is:

*the stewardship and use of forests and forest lands in a way, an at a rate, that maintains their biological diversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological economic and social functions, at local, national and global levels, and that does not cause damage on other ecosystems<sup>5</sup>.*

Much of the emphasis on sustainable forest management in Europe in the early 1990s stemmed from earlier discussions in the tropical context, particularly as part of the International Tropical Timber Agreement. Both the FSC and PEFC<sup>6</sup> certification schemes are now global in context, and discussions on criteria and indicators of Sustainable Forest Management are relevant in both tropical and temperate tropical countries. A recent international conference on SFM [2] indicated that delivery should take place in seven thematic areas: (i.) extent of forest resources, (ii.) biological diversity, (iii.) forest health and vitality, (iv.) productive functions of forest resources, (v.) protective functions of forest resources, (vi.) socio-economic functions and (vii.) legal, policy and institutional framework.

Geographic terms referring to the ‘UK’ and ‘GB’ have not been used arbitrarily in the text but were adopted carefully in the context of the evidence or reference.

Other specialist terms and acronyms used in the text are explained further in the [glossary of terms](#).

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<sup>5</sup> <http://www.fao.org/docrep/003/x6896e/x6896e0e.htm>

<sup>6</sup> Forest Stewardship Council ([www.fsc-uk.org](http://www.fsc-uk.org)), Programme for the Endorsement of Forest Certification schemes ([www.pefc.org](http://www.pefc.org))

Table 1 *Economic, environmental and social values of forests*

Function	Values
Economic	<ul style="list-style-type: none"> <li>– providing a source of income;</li> <li>– serving as a place of employment;</li> <li>– providing renewable resources for production and household consumption;</li> <li>– being a local and renewable source of energy;</li> <li>– provision of recreation and social provision;</li> <li>– supplying materials for high quality wood products.</li> </ul>
Environmental	<ul style="list-style-type: none"> <li>– being a valuable ecosystem containing a diversity of species;</li> <li>– a landscape element providing ecological stability and integrity;</li> <li>– serving a protective function for water resources;</li> <li>– providing protection from flooding events;</li> <li>– mitigating the effects of climate change through carbon sequestration;</li> <li>– being an important element for ecological stability in mountainous regions, especially in safeguarding against avalanches and landslides;</li> <li>– preventing and stopping soil erosion;</li> <li>– providing nitrogen filtration;</li> <li>– combating desertification;</li> <li>– purifying the air;</li> <li>– preserving the historic environment;</li> <li>– reducing fossil fuel greenhouse gas emissions when used for energy or to replace materials with higher embodied energy</li> </ul>
Social	<ul style="list-style-type: none"> <li>– providing relief and amenities to urban inhabitants;</li> <li>– providing recreational and preventive healthcare opportunities;</li> <li>– protecting against natural disasters;</li> <li>– making rural areas attractive for living;</li> <li>– being a cultural heritage and spiritual refuge.</li> </ul>

## 2.3 Methods

This report is a desk study. Contributors are listed in the Acknowledgements.

- [Chapter 3](#) analyses trends in forest production in the UK and Europe over the past 40-50 years with some comments on forest policy.
- [Chapter 4](#) presents predictions in future production and consumption of timber on global, European and UK scales, but emphasises the massive impact that Chinese consumption and exports are having on global timber markets.
- [Chapter 5](#) examines trends in UK timber prices and overall financial profitability for forestry. It looks at current financial support for forestry and farm forestry and possible future changes.
- [Chapter 6](#) examines the socio-economic profitability of forestry, and approaches to the valuation of a range of non-market services, and possible market values of non-timber forest products.
- [Chapter 7](#) looks at all aspects of the energy revolution – production of bioenergy from forests, energy-accounting, and carbon-trading.
- [Chapter 8](#) examines forest strategy in the UK countries and potential impacts of issues considered in this report.
- [Chapter 9](#) draws together conclusions and recommendations for further research.

This report and its recommendations will be explored in a follow-up stakeholder meeting, form the evidence base for a WPG Research Note, and will contribute to a broader LUPG conference in Brussels in September 2007<sup>7</sup>.

<sup>7</sup> <http://www.lupg.org.uk>

## 2.4 Background

There is a perception in some parts of the conservation movement that the most biodiverse forests are those which are least managed. However, generally some form of management in UK woodlands is desirable, particularly beyond the protected sites network, to deliver public goods and services, including biodiversity. A recent report [3] highlighted a decline in woodland plant diversity, linking this with lack of active management. Specific taxonomic studies across the UK have also linked lack of management directly or indirectly (*e.g.* lack of light) with adverse impacts on birds [4], butterflies [5], and flowering plants [6]. However, the exact nature of the ‘natural’ successive state of Britain’s woodlands has been the subject for recent debate [7], centring on whether the increased shading seen today is a lag-effect following heavy thinning of woodlands during the war years. The most important woodlands for biodiversity are either ancient or those containing native species. Currently, in England, this area can be estimated to total over half 0.5 Mha of priority woodland habitat, including 200,000 ha of ancient semi-natural woodland, 140,000 ha of plantations on ancient woodland sites (PAWS), and 210,000 ha of other non-ancient or secondary native woodland [8].

There is also a perception that cheap timber imports have reduced UK forest’s profit margins to the extent that good silviculture can no longer be afforded.

The closure of hardwood mills like Sudbrook has significantly restricted the market for thinnings. Rising energy prices, and implementation of tougher environmental regulations, have caused significant closures of softwood mills in recent years<sup>8</sup>

In the early 1970s the forest estate was expanding at 40,000 ha/year. In 2005/06 new-planting rates were only 8,500 ha/year. The main factor in this change occurred in 1988 when the then Chancellor of the Exchequer, removed the tax benefits which had successfully powered high levels of new planting and management of private forests through the dedication scheme.

Starting with the Treasury inter-departmental cost-benefit study of forestry in 1972 [9], and continuing with the NAO assessment of the Forestry Commission in 1986 [10], forestry has been viewed as unprofitable and only justifiable through its environmental and social benefits. Its yields are too long-term and any realistic interest rate makes Net Present Value (NPV) and Internal Rate of Return (IRR) calculations unappealing. Few incentives to encourage good silvicultural practice are provided, and there has been a powerful argument that forests should be left largely unmanaged as a public service resource for recreation, wildlife and landscape enhancement.

The majority (72 % [11]) of the woodland resource in GB is in private hands, and this is the sector with scope for expansion. Yet these landowners need reassurance that the very unattractive current prices for timber will not exist long into the future. Increasing worldwide demand for timber is crucial in this equation, as are new markets such as biofuels or engineered wood.

Important too will be potential payments for maximising the environmental and social value of forests. Current payments for these forest services are very small indeed, resulting in low priority being given to woodland management, particularly in England. Only 3 % of woodlands are estimated to have an annual management grant under the Woodland Grant Scheme [11].

Is there scope for a campaign to support home-grown timber? This might be encouraged if much of the imported timber, or imported wood products, are derived from illegally managed forests elsewhere in the world.

Subsidies given to agricultural production have inflated land values, and the apparent profitability of both arable and pastoral farming in comparison to forestry. Several studies (*e.g.* [12]) have shown that forestry is frequently more profitable than agriculture when these subsidies are removed, but these have had little practical relevance - until now. The recent introduction of the Single Farm Payment has indeed removed

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<sup>8</sup> Between August 2000 and August 2006, 36 mills closed in the UK, with the loss of 1.6 million tonnes of capacity and nearly 5,000 jobs. However, paper production has remained reasonably static, as capacity has been taken up by other mills. There are now only 60 mills (excluding the very small producers of hand-made paper) in the UK (<http://www.paper.org.uk/news/06/pr0108energy.htm>)

production-based subsidies, albeit with the basis for SFP calculation differing between the countries. Comparisons of economic return can now be made free of subsidy, and can include shadow prices for the many-non market benefits of forestry.

Yet the fact that a farmer will lose his Single Farm Payment on any part of his farm planted with trees remains a massive disincentive to new forest planting. A temporary mechanism, called ‘consolidation’ or ‘stacking’, exists to allow planting on up to 50 % of a farm enterprise, whilst retaining full SPF entitlement. This has been implemented on a semi-permanent basis in Ireland<sup>9</sup>, and temporarily in Northern Ireland, Scotland and Wales. Its retention in the UK would prove a massive boost for farm woodlands, at modest cost<sup>10</sup>

This report will consider these questions in the context of current wood-supply, of predictions of supplies in Europe and in the UK, and in terms of valuation forestry using financial, socio-economic, or energy accounting. It will consider the current Forestry Strategies of the four UK nations, and consider the way that changing world and European timber markets will impact on these.

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<sup>9</sup> [http://www.agriculture.gov.ie/publicat/single\\_pay\\_sch.pdf](http://www.agriculture.gov.ie/publicat/single_pay_sch.pdf)

<sup>10</sup> but see discussion on ‘cross-compliance’ in Section 3.1.2.

### 3 Historical patterns of supply and demand in forestry

This section will consider issues related to **forest resources** (forest area, growing stock, increment, fellings, removals, management and policy implications) separately from **forest products** (primary wood products - sawnwood, wood pulp, wood residues and recovered paper and secondary or value-added forest products and non-wood forest products).

#### 3.1 Forest resources

##### 3.1.1 World forest resources

While there are many debates over what constitutes forest land and the reliability of data on forests and trade, the most widely used categories are those of FAO. Forested land is defined by FAO as land with tree crown cover greater than 10 % and a mature tree height exceeding 5 m on over 0.5 ha (although most countries have their own definitions). Based on this definition, the total area of forests in the world today is estimated at 3.87 billion ha or almost 30 % of the global land area. Forests in tropical countries account for 48 % of the world's forests, covering 39 % of that climatic region's land area. Forests in temperate and boreal countries comprise 52 % of the world's forests and cover 25 % of the temperate land area. Approximately 95 % of the total forest area is natural forest, the remaining 5 % comprising plantations of various sorts (both softwood and hardwood). Plantations account for 4 % of forested areas in tropical countries and 6 % of forested areas in temperate and boreal regions. The main areas of plantation are in China, East and South Asia and the former USSR [13].

Over the decade to 2000, around 14.6 Mha (million hectares) of forest were lost globally each year, but 5.2 Mha were newly established, leaving a net decrease of 9.4 Mha, equating to a global annual rate of forest loss of 0.24 %, but with an increase of 2.9 Mha/year in non-tropical areas (Table 2).

Table 2 Annual changes in forest area Mha/year 1990 -2000 [13]

		Tropical areas	Non-tropical areas	World
<b>Natural Forest</b>	Deforestation	-14.2	-0.4	-14.6
	Conversion to forest plantation	-1.0	-0.5	-1.5
	Total loss	-15.2	-0.9	-16.1
	Natural	+1.0	+2.6	+3.6
	<b>Net change</b>	<b>-14.2</b>	<b>+1.7</b>	<b>-12.5</b>
<b>Plantation</b>	Conversion from natural forest	+1.0	+0.5	+1.5
	Afforestation	+0.9	+0.7	+1.6
	Net change	+1.9	+1.2	+3.1
<b>Total forest</b>	<b>Net change</b>	<b>-12.3</b>	<b>+2.9</b>	<b>-9.4</b>

Total annual wood harvests currently exceed 3 billion m<sup>3</sup>, and have growth at 1 % per annum since 1961. More than half of this production is fuelwood: 26% in temperate countries and 82 % in the tropics [14].

##### 3.1.2 European forest resources

Several studies on the European forest sector have recently been completed by the UN Economic Commission for Europe and the Food and Agriculture Organisation [15-22].

Total **forest area** in Western Europe (WE) increased from 137 Mha in 1980 to 150 Mha in 2000. The forest area available for wood supply in WE has increased by 11 % since 1950 [20]. These increases are partly explained by forest policies which encourage afforestation of agricultural land. For example, during the 5 year span of Regulation 2080/92, around 1.04 Mha were established in the Europe of 15<sup>11</sup>. Accompanying social pressures have encouraged rural depopulation and encroachment of forests into agricultural land,

<sup>11</sup> [http://europa.eu.int/comm/environment/climat/pdf/aid\\_schemes.pdf](http://europa.eu.int/comm/environment/climat/pdf/aid_schemes.pdf)

although this is resisted by Agricultural Departments, and a precondition of the Single Farm Payment is that farmland must be maintained in 'Good Agricultural and Environmental Condition', which includes an assumption that encroachment of woody vegetation will be controlled<sup>12</sup>. This sets the UK apart from much of Europe in that land abandonment is not a significant issue and increase in forest cover is generally encouraged.

Total **growing stock/ha** in Europe increased by up to 50 % between 1950 and 2000 (Figure 1). This is explained partially by lower removals of roundwood (Figure 2) and partly by higher forest yields (Figure 3). Less than 60 % of the current volume increment in Europe is now harvested (Figure 2).

Figure 1 Trends in growing-stock per ha 1950 -2000 [23]

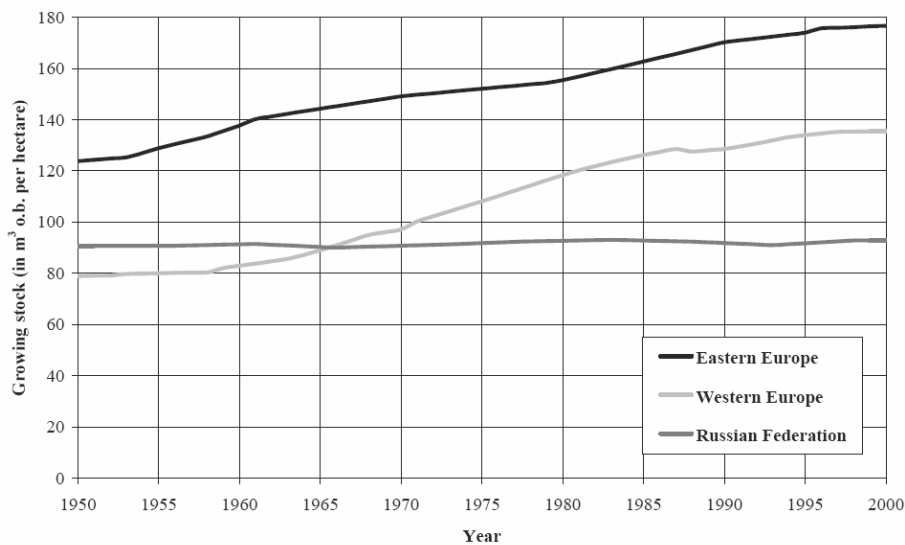
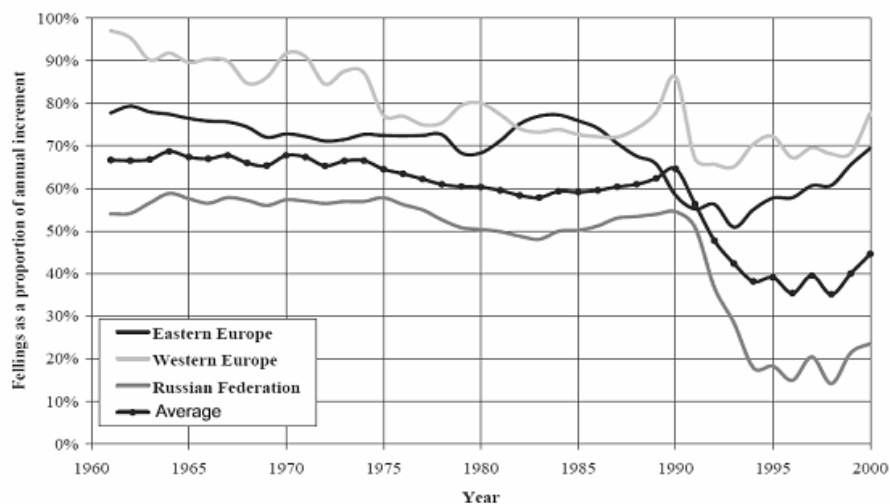


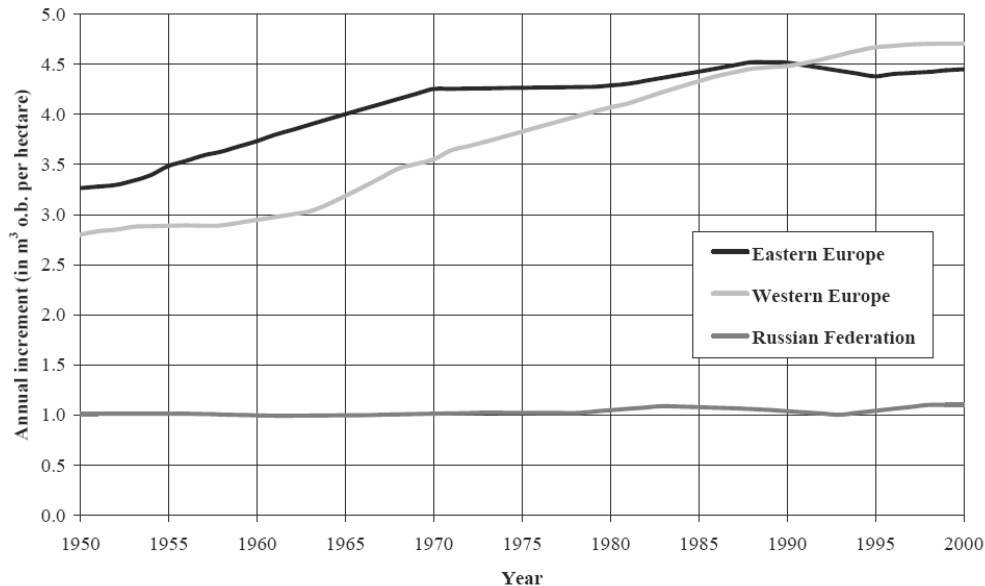
Figure 2 Trends in fellings to increment ratio in European regions [23]



<sup>12</sup> The only counter-indication to tree-planting, or natural regeneration on farmland is GAEC Measure 23 'Avoid infestation by species which degrade the agricultural and environmental value of the land to the extent that there is substantial prejudice in the ability to use the land for agricultural purposes. Avoid severe encroachment of other species which degrade the agricultural capacity of the land, but allow encroachment which may be environmentally desirable as part of a mosaic of habitats'. Note that this should not preclude silvo-arable or silvo-pastoral systems (e.g. parkland, wood pasture, or cultivated orchards).

The annual increment per unit area of forests in Eastern and Western Europe has consistently increased since 1950. The increase is greatest in Western Europe – amounting to 64 %. It is explained by a combination of management, atmospheric deposition of nitrogen and other fertilizers, CO<sub>2</sub> fertilization and temperature changes [24, 25] (Figure 3).

Figure 3 Trends in annual increment 1950 -2000 [23]



### 3.1.3 UK forest resources

The UK forest resource has doubled in area from an all time low of 5 % in the early 1900s, to 12 % by the early 2000s. Four overlapping periods can be distinguished during this time<sup>13</sup>.

- A first period with an emphasis on creation of a strategic forest reserve, and a focus on planting forests rapidly on land available to the Forestry Commission. Often this was on cheaper land in the uplands, but sometimes involved establishing conifers on existing semi-natural upland or lowland woodlands. This period ended around 1974, when reductions were made to the Forestry Commission's budget following publication of the controversial Treasury inter-departmental cost-benefit study of forestry [9].
- A second period followed when private forestry increasingly filled the new-planting role from which the Forestry Commission was withdrawing, and tax incentives and the stability provided by the Forest Dedication Scheme allowed investment companies and private individuals to establish large areas of commercial coniferous forestry in the uplands. This period continued until the budget in March 1988 withdrew the option to move forest estates between tax-schedules<sup>14</sup> and caused a collapse of confidence in the forestry sector. For several years thereafter new planting collapsed and the industry suffered an extended depression: ironically with timber prices and profitability much higher than it is today.
- A third period, starting after the 1988 budget, when planting grants, particularly for broadleaves, rose to a level that farmers and other landowners were persuaded to establish new woodlands, primarily for amenity on 'surplus' agricultural land. This subsidy was subsequently cross-financed by EU funds designed to reduce agricultural surpluses. This has been termed the 'reflective turn' in the Forestry Commission's development, defined by a new corporate identity and an emphasis on multi-purpose forestry [26]. This period also reflected national and European legislation which stressed the role forestry as a provider of landscape, environmental and social services, rather than the need to

<sup>13</sup> e.g. <http://www.forestry.gov.uk/forestry/cmon-4uum6r>

<sup>14</sup> There was a 3-year period of transitional relief (hence planting rated did not drop till 1989-90), and exemption from capital gains tax on land and inheritance tax on both land and crop continue to the present day.

achieve financial profitability. An example of this is the operational deficit allowed to Forest Enterprise, even in Scotland [27].

- The fourth period has just started. Reform to the CAP, reduction in agricultural price support and production subsidies, the introduction of the Single Farm Payment, and decreasing planting grant budgets held by the Forestry Commission have further reduced the area of new planting taking place in the UK. Few farmers are now willing to reduce their hectareage eligible for payment of single farm payments by planting trees. Yet this decline in planting is in the context of significant future markets for biofuels and home-grown timber.

There has been a tendency to assume that trees planted on surplus agricultural land, or for environmental services, need not also produce valuable timber. In parts of the conservation movement there is a perception that conventional forest management is too regimented, and that newly planted woodlands maintain higher biodiversity and environmental values if management is minimised. This has led to many broadleaf planting schemes having poor survival and growth, and the trees suffering from insufficient pruning and thinning. Insufficient thought was often given to the quality of planting stock, either in terms of adaptability (e.g. phenology, disease resistance) or production qualities (e.g. growth, yield, quality characters) [28]

Until relatively recently, there was a UK 'planting target' of 33,000 ha/yr. Its removal at the end of the 1990s was recognition that it was unachievable given existing policies. Currently only Scotland and Northern Ireland have new-planting targets (Annex III). However, the UK Habitat Action Plan includes a target to increase native woodland resource by 83,500 ha by 2010<sup>15</sup>, along with targets for restoration, maintaining extent and achieving condition. New planting rates continue to fall, and, in GB, only 8,200 ha were achieved in 2005-06 (Figure 4). Restocking in GB is stable however at between 13.5 and 14.0 thousand ha/yr.

The UK (Scotland 17.1 %, Wales 13.7 %, England 8.6 %, N. Ireland 6.4 %) remains with the third lowest forest cover in the European Union (average 31.8 % for the EU of 25), only exceeding Ireland and the Netherlands. Ireland has however been achieving 14,000 ha/yr in new private sector planting in recent years and is committing to 20,000 ha/year in its draft Rural Development Strategy 2007-13 [29], this may be the reason why the Irish have retained 'stacking' (see footnote to [Section 2.4](#)).

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<sup>15</sup> <http://www.ukbap.org.uk/bapgroupage.aspx?id=98>

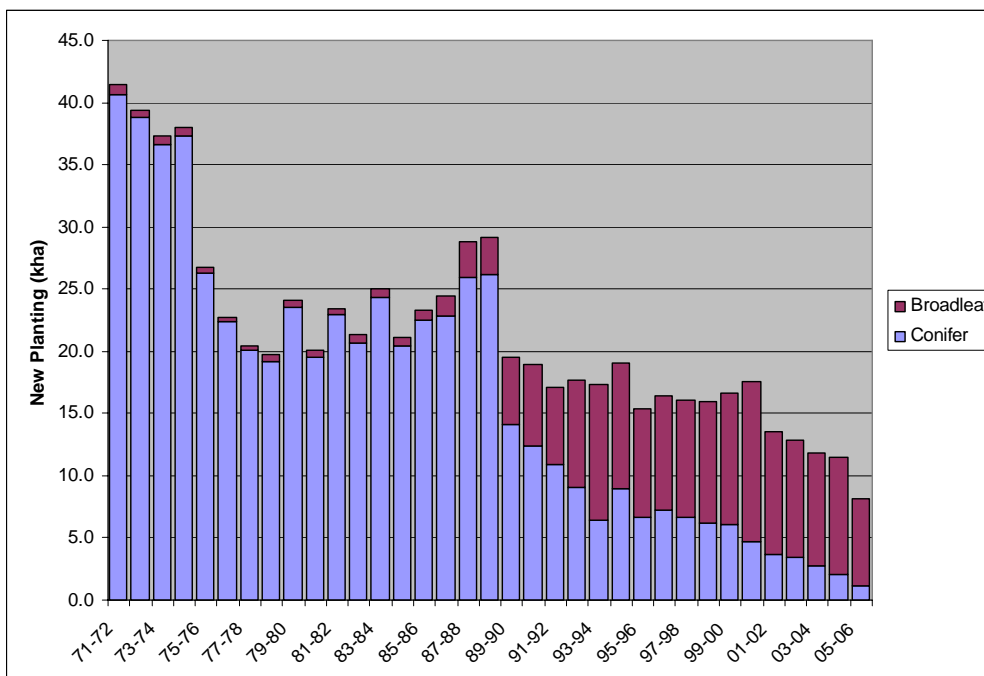
# World timber trade and implementing sustainable forest management in the United Kingdom

## 3. Historical patterns of supply and demand in forestry

Table 3 UK Habitat Action Plan forestry and woodland expansion targets (revised 2006; www.UKBAP.org.uk).

Habitat name	Target number	Target
Lowland wood-pasture and parkland	T4	Expand the area of wood-pasture and parkland, in appropriate areas, to help reverse fragmentation and reduce the generation gap between veteran trees at 50 sites by 2010.
Native woodland - UK	T5	Expand the current native woodland resource in the UK by 83.5 kha, by 2010.
Native woodland - England	T6	Expand the current native woodland resource in the UK by 83.5 kha, by 2010.
Native woodland - Scotland	T5	Expand the total area of native woodland by 76.5kha by 2015.
Native woodland - Wales	T4	Expand the area of native woodland by creating 1,600 ha of new native woodlands (1.3% of the 1995 total native woodland resource) on currently unwooded sites by 2010.
Native woodland - Wales	T5	Expand the area of native woodland by converting 1,600 ha of non-native non-ancient woodlands (1.3% of the 1995 total native woodland resource) to native woodlands by 2010.
Lowland mixed broadleaved woodland - Scotland	T5	Expand the area of lowland mixed broadleaved woodlands by 4kha by 2015.
Native pine woodlands	T6	Expand the area of native pine woodland outwith CPI core areas by 25.8kha by 2015.
Native pine woodlands	T7	Expand the area of native pine woodland within CPI core areas by 14kha by 2015.
Upland birchwoods	T5	Expand the area of upland birch woodland by 12.1kha by 2015.
Upland mixed ashwoods - Northern Ireland	T6	Establish 160 ha of mixed ashwood by 2010 and a further 180 ha by 2015.
Upland mixed ashwoods - Scotland	T5	Expand the area of upland ashwood by 4.4kha by 2015.
Upland oakwood - Northern Ireland	T6	Establish 120 ha of oakwood by 2010 and a further 120 ha by 2015.
Upland oakwood - Scotland	T5	Expand the area of upland oakwood by 10.9kha by 2015.
Wet woodland - Northern Ireland	T6	Establish 120 ha of wet woodland by 2010 and a further 140 ha by 2015.
Wet woodland - Scotland	T5	Expand the area of wet woodland by 5kha by 2015.

Figure 4 New planting in GB [30, 31]



### 3.2 Wood products

#### 3.2.1 World Wood Products

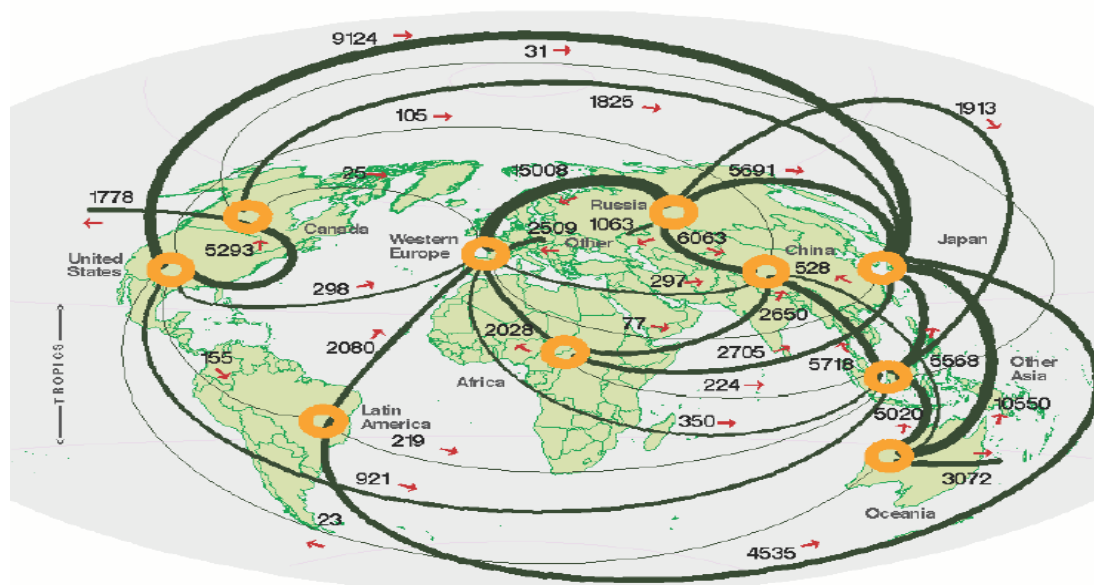
Since 1961, roundwood production from tropical countries has increased from 8.4 % of total production to 17 %, with much of the expansion explained by the expansion in tropical hardwood exports. This increase has not continued in the 1990s however, and tropical plantations, particularly from South America, account for an increasing proportion of tropical roundwood production. There is clearly scope for an increase in production from the former USSR (Table 4).

Europe is the largest importer of roundwood, mainly coming from the Russian Federation, but with increasing amounts from plantations in South America (Figure 5). Global trade in timber is comparatively modest compared to local production (Figure 5, Table 4), however global exports have trebled since 1961 and in 2000 were 114 Mm<sup>3</sup>. The trend is for decreases in hardwood log export from developing countries, and for increases in exports processed of wood products [14].

Table 4 World and regional distribution of industrial roundwood production (FAO Stat)<sup>16</sup>

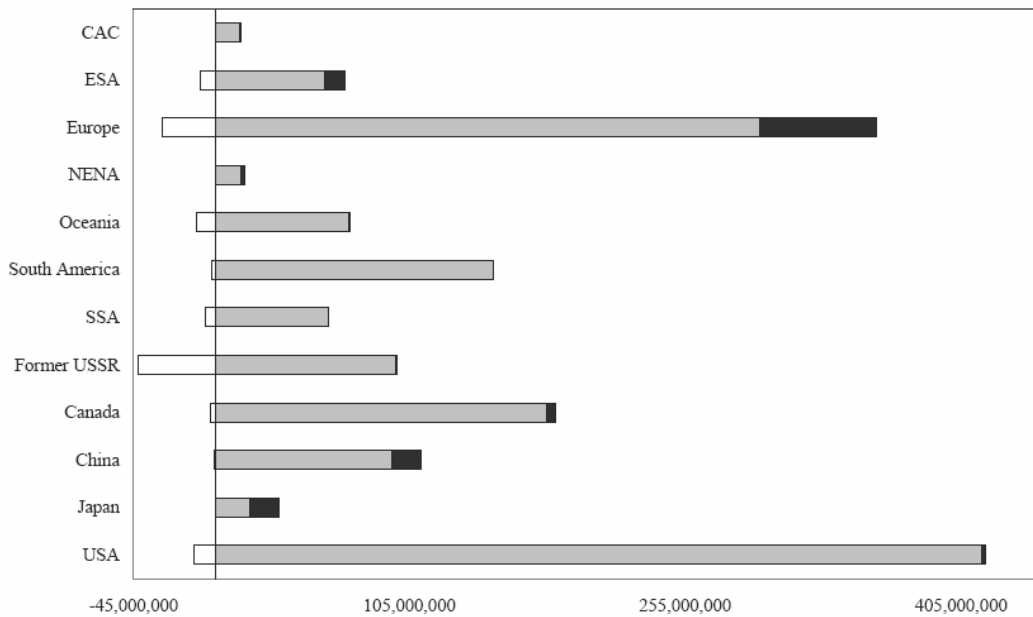
Region	1961	1971	1981	1991	2000	Change
CAC	6	9	11	11	13	2.9%
ESA	26	49	72	87	68	4.0%
Europe	223	273	280	267	325	1.1%
NENA	8	12	13	9	13	1.6%
Oceania	30	49	63	81	83	4.4%
South America	28	41	84	114	153	11.2%
SSA	24	40	50	54	67	4.5%
Former USSR	253	298	277	275	139	-1.1%
Canada	87	116	139	153	183	2.8%
China	35	43	76	90	96	4.4%
Japan	49	45	31	28	18	-1.6%
USA	248	320	317	388	428	1.8%
Tropical	85	146	222	274	283	5.8%
Non-tropical	932	1,151	1,190	1,284	1,303	1.0%
<b>Total</b>	<b>1017</b>	<b>1295</b>	<b>1413</b>	<b>1557</b>	<b>1586</b>	<b>1.4%</b>

Figure 5 Main net flows ('000 m<sup>3</sup>) of wood raw materials in 2000 [14]



<sup>16</sup> CAC = Central America and Caribbean, ESA = East and South Asia; NENA = Near East and North Africa; SSA = Sub Saharan Africa

Figure 6 Regional Balances for Industrial Roundwood (2000) [14] (black imports, white exports, grey internal use –in m<sup>3</sup>)



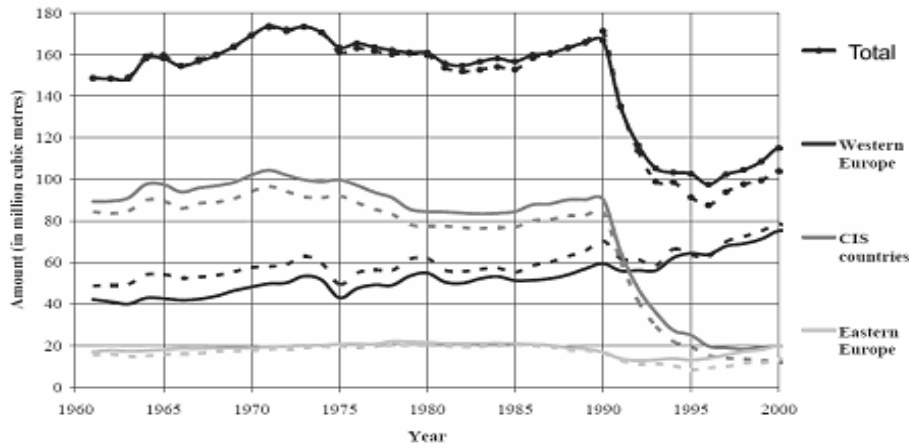
### 3.2.2 European wood products

Wood products include sawnwood; wood based panels; and paper and paperboard. Europe has moved from an approximate balance between production and consumption of coniferous sawnwood over the period 1960 to 1990, to a situation where it is a net exporter. By 2000 annual European production exceeded consumption by more than 10 Mm<sup>3</sup>, or around 10 % of production (Figure 7). By 2002 this net export had reached 15 Mm<sup>3</sup>. Two main changes lie behind this development:

- production of coniferous sawnwood in Western Europe has increased more rapidly than consumption, significantly reducing net imports into the sub-region<sup>17</sup>, with new producers such as Ireland and the UK playing a significant part;
- Eastern Europe has moved from a position of approximate balance in production and consumption (until 1990) to one where production exceeds consumption by 7 Mm<sup>3</sup> (or about one-third of production). The three Baltic States account for much of the growth in production in this sub-region (Figure 7).

<sup>17</sup> Net imports were around 12 million m<sup>3</sup> in 1990, 4 million m<sup>3</sup> in 2000 and approximately zero in 2002

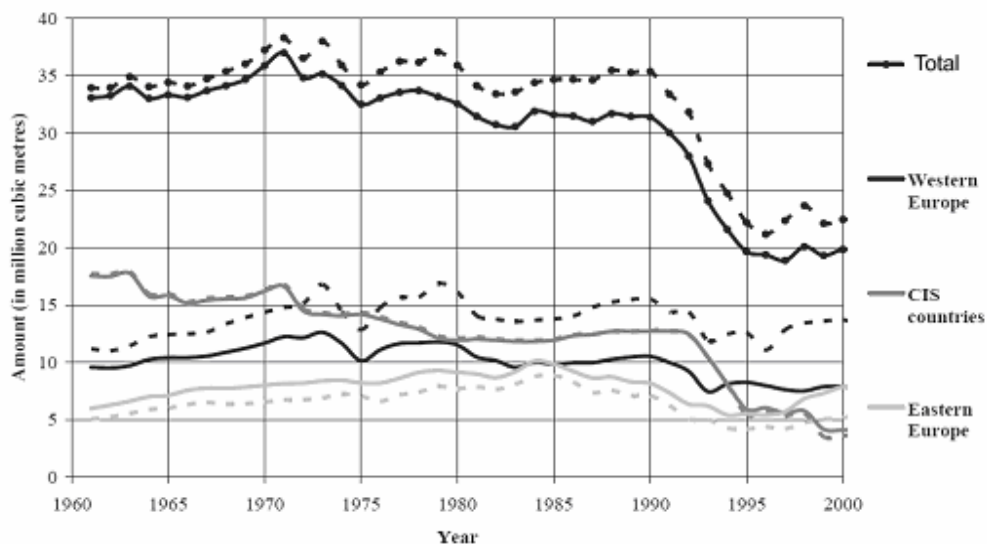
Figure 7 Trends in production and consumption of coniferous sawnwood (1961-2000). Solid lines are consumption, dashed lines are apparent consumption [20].



Thus the relative importance of different regions of Europe has changed: Historically, Western Europe accounted for around 35 % of European consumption and 30 % of production, but it now accounts for 65 % and 75 % of production and consumption of coniferous sawnwood respectively.

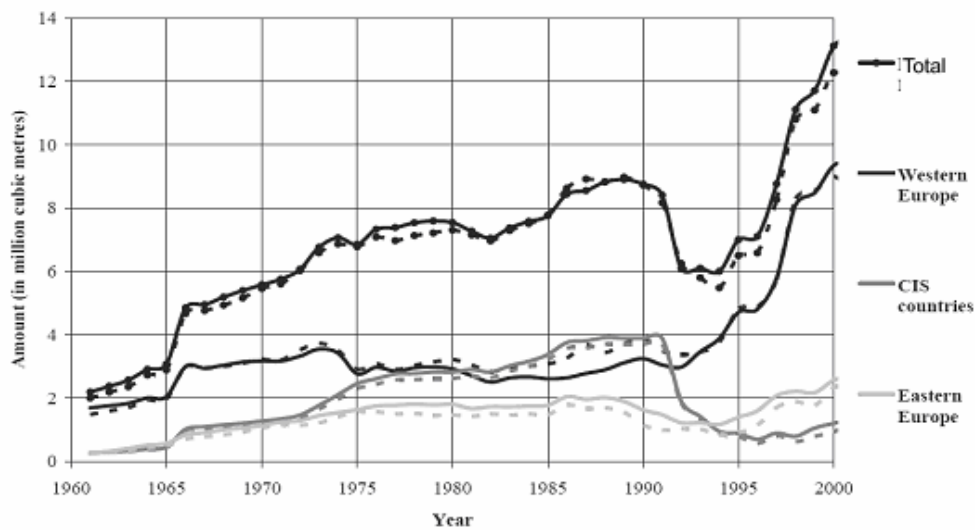
Europe has always been a net importer of non-coniferous sawnwood and net imports have increased in recent years, caused by a combination of decreasing harvests in Eastern Europe and an increase in imports to Western Europe (Figure 8).

Figure 8 Trends in production and consumption of non-coniferous sawnwood (1961-2000). Solid lines are production and dashed lines are apparent consumption [20].



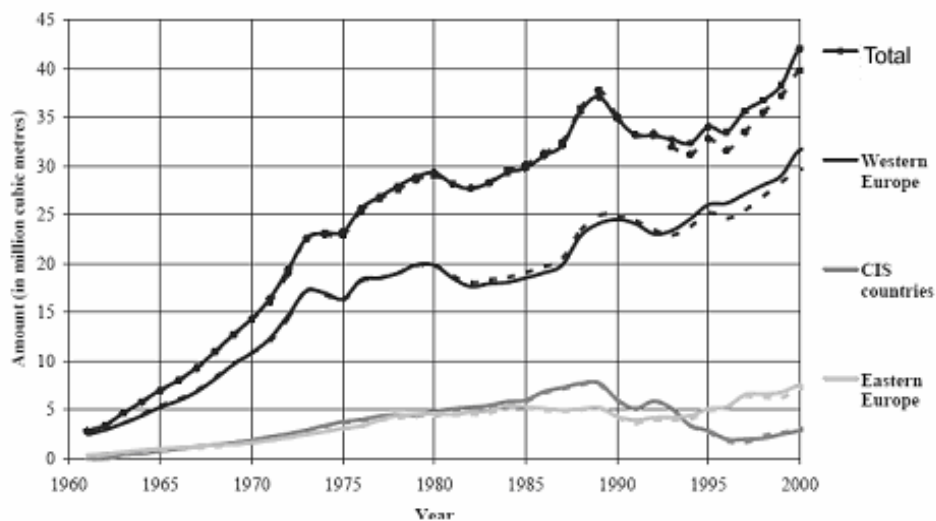
Production and consumption of fibreboard have increased six fold in the past 50 years (Figure 9). From 1992 to 2000, both production and consumption of fibreboard (medium density fibreboard (MDF), insulating board and hardboard) in Western Europe trebled from a level of 3 Mm<sup>3</sup> in 1992 to just over 9 Mm<sup>3</sup> in 2000, almost all of the increase being due to MDF.

Figure 9 Trends in production and consumption of fibreboard (1961-2000)[20]



Particleboard (e.g. chip-board, orientated strand board) production shows an even more dramatic trend, with production increasing from 2 Mm<sup>3</sup> to 42 Mm<sup>3</sup> in 39 years (Figure 10). In Western Europe the market for particleboard has grown persistently at around 4.8 % annum, although it has slowed slightly in recent years.

Figure 10 Trends in production and consumption of particleboard (1961-2000)



Plywood and veneer sheet consumption in Europe exceeds production by around 1.7 Mm<sup>3</sup> in 2000, with production in Western Europe being around 32 Mm<sup>3</sup> in 2000.

Paper and paperboard can be categorised as newsprint, printing/writing paper and paperboard. Newsprint production and consumption have increased by a factor of 3 since 1961 to around 13 Mm<sup>3</sup> in 2000, with production exceeding supply by around 0.5 Mm<sup>3</sup> per year.

Western Europe has always been an exporter of printing/writing paper with production exceeding supply by around 5 million tonnes in 2000. Production has grown by around 4.7 % per year over the past 40 years. Use of recovered paper has grown more dramatically in Western Europe: increasing from 5 Mt in 1961 to 40 Mt in 2000.

The above information is summarised in Table 5, and is compared with predictions for 2020 in Section 4.2.2.

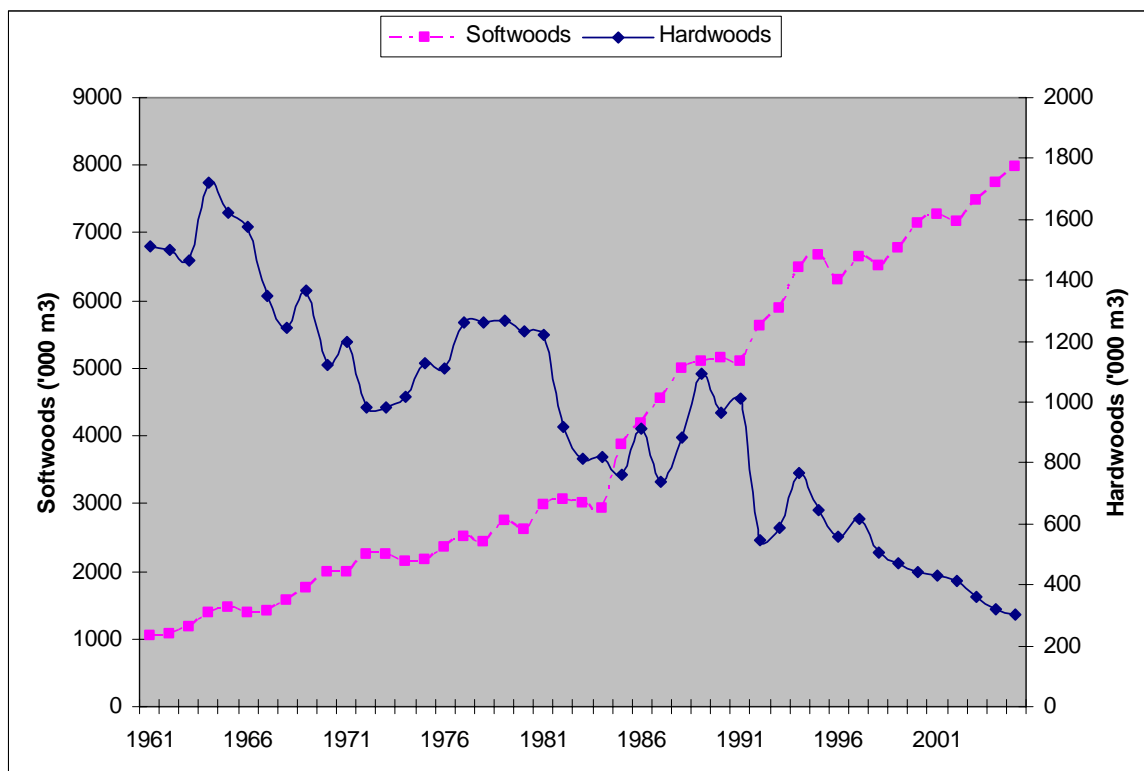
Table 5 European wood raw material balance average (1996-2000 average) in Million tonnes wood raw material equivalent

Component	Europe	Sub-regions		
		W. Europe	E. Europe	CIS
<b>Derived demand for wood raw materials</b>				
Other industrial roundwood	34.3	6.3	11.1	16.9
Sawnwood, plywood and veneer sheets	234.2	150.5	41.5	42.2
Reconstituted panels	71.7	50.8	14.5	6.4
Net pulp exports	31.7	24.5	1.1	6
Paper and paperboard	335.2	293.3	25	16.9
<b>Total derived demand</b>	<b>707.1</b>	<b>525.4</b>	<b>93.3</b>	<b>88.4</b>
<b>Consumption of wood raw materials</b>				
Industrial roundwood	431.4	270.8	81	79.7
Recovered paper	139.6	123.7	10.4	5.5
Net pulp imports	55.6	51.9	3.3	0.3
Other	80.6	79.1	-1.4	2.9
- net imports of chips, particles and residues	0.1	2.6	-1.8	-0.6
- utilisation of wood residues	80.4	76.5	0.4	3.5
<b>Total consumption</b>	<b>707.1</b>	<b>525.4</b>	<b>93.3</b>	<b>88.4</b>

### 3.2.3 UK wood products

UK softwood production has been increasing since the early 1960s, with a matching decrease in hardwood production (Figure 11).

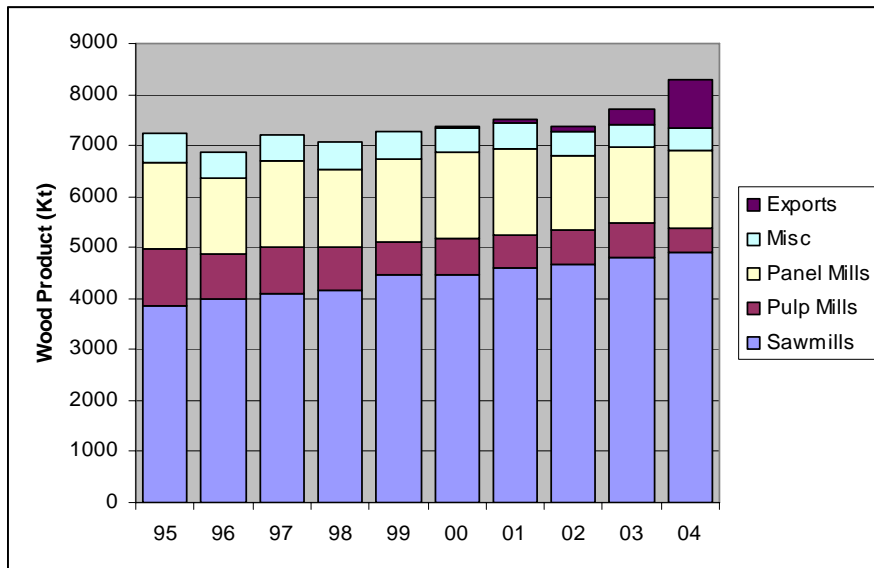
Figure 11 UK production of hardwoods (solid line) and softwoods (dashed line) 1961 – 2005 (FAOSTAT)[30]



Uses for the increasing volume of UK softwoods have changed over the past 10 years. Pulpwood consumption has declined by 56 % (through closure and run-down of processing capacity), and use of sawlogs has increased by 27 % (although the number of sawmills fell from 456 to 280 during the same period). More than 11 % of consumption in 2004 went for export, mainly to Scandinavia (Figure 12). Closure of the Sudbrook semi-chemical fluting hardwood paper mill in South Wales left a big hole in the

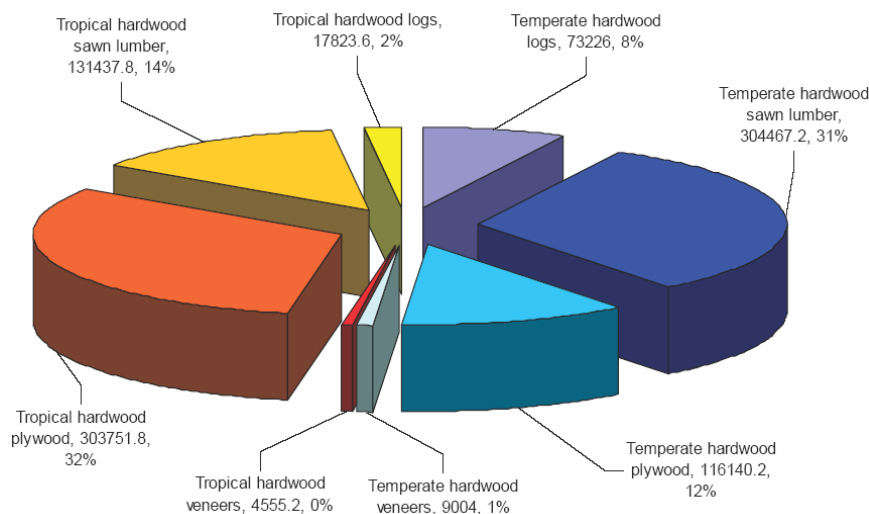
English and Welsh market for hardwood thinnings. At its peak this mill used 200,000 tonnes per year, supporting management operations in around 5,000 ha of woodlands annually. It was almost the only market for poplar, and particularly important for chestnut and oak thinnings which sell less well as firewood<sup>18</sup>. The Sittingbourne mill closed its hardwood intake line in 1991, moving to producing paper from around 70 % recycled timber. Unfortunately closure of even this ‘New Thames’ mill took place in January 2007<sup>19</sup>.

Figure 12 Recent use of UK softwood [30]



Imports of coniferous industrial raw materials into the UK increased by 652 % between 1990 and 2005, whilst hardwood raw material imports declined by 47 % (FAOSTAT). The UK imported around 960,000 tonnes of hardwoods/yr in the 2000-2004 period, with around 458,000 tonnes of tropical hardwoods (Figure 13) (half of which is shared represented by imports from Malaysia and Cameroon). Government procurement policies and certification issues are considered in Section 4.3.1.

Figure 13 UK Imports of primary hardwood products by product type[32]



<sup>18</sup> <http://www.forestryandtimber.org/downloads/stregisclosureefip.doc>

<sup>19</sup> <http://www.printingtalk.com/news/mea/mea168.html>

## 3.3 Summary

There are 3.87 million ha of forest in the world, or 30 % of the global land area. Forests in temperate and boreal countries comprise 52 % of the world's forests and cover 25 % of the land area. Plantations account for 4 % of forested areas in tropical countries and 6 % of forested areas in temperate and boreal regions. Production from the tropics increased from 8.4 % in 1961 to 17 % in 1991. This proportion has remained relatively constant since then with modest increases in production from natural forests in the tropics being supplemented by a marked rapid increase in production from tropical plantations.

Felling to increment ratios in Western Europe declined from 96 % in 1960 to around 70 % in 2005. Average annual increment has increased from 3.3 m<sup>3</sup>/ha to around 4.6 m<sup>3</sup>/ha. These two changes combine to cause an increase in average standing volume per ha from around 80 m<sup>3</sup>/ha to 135 m<sup>3</sup>/ha now. Furthermore the area of western European forests has increased by 11 % since 1950, through a combination of afforestation schemes and abandonment of agricultural land.

The UK forest area has doubled from 5 % in the early 2000s to 12 % now, but current new planting is only 8,000 ha/yr, down from more than around 40,000 ha/yr in the early 1970s. The UK remains with the 3<sup>rd</sup> lowest forest cover in Europe, and is being overtaken by Ireland which has an annual new-planting target of 20,000 ha/yr. England and Wales have no new-planting targets, and funds are limited for planting grants, particularly in England. A legitimate question is whether woodland creation should be prioritised when it has already been acknowledged that there is a problem with under-management of existing woodland? Timber yields in the private sector are much lower than our favourable climate permits, particularly for broadleaves.

A key need is to strengthen links between forest owners and forest industries on a regional basis. Regional forest strategies and implementation plans are part of this effort, but would benefit from a national survey of woodland owners linked to an inventory of growing stocks coordinated on a regional basis. Other concerns include: a lack of forestry students at all levels; and woodland resources, particularly in SE and SW England being purchased as investments for their land value without any intention to manage.

Outputs of timber and wood products declined drastically in Eastern Europe and Russia in the early 1990s, but are now exceed previous levels. Production of sawnwood in Western Europe has increased more rapidly than consumption, but the opposite is true for hardwoods, where the shortfall in production compared to demand has increased from around 2 Mm<sup>3</sup> in 1960 to 7.5 Mm<sup>3</sup> now. Production and consumption of both fibreboard and particleboard are rising rapidly, as are printing and writing paper. Total derived demand for wood raw materials in Western Europe in 2000 was 525 Million tonnes (paper and paper board 55.8 %, sawnwood 29.6 %, panels 9.6 %, pulp exports 4.7 %, other 1.2 %).

In the UK, softwood production increased 28 % between 1995 and 2004, whilst hardwood production decreased by 42 % in the same period. Exports increased to 11 % of total production in 2004, and this is a new factor for the UK. The tonnage of UK timber passing through sawmills has increased by 27 % over this period, even though the number of active mills has decreased significantly. UK hardwood imports have been relatively stable since 2000 at 960,000 tonnes of hardwoods annually, with around 50 % coming from the tropics.

Lack of woodland management is currently a problem, as indicated for example in the low uptake of FC England's Woodland Management Grant. Certification may be one of the barriers preventing uptake by the private sector.

### **Box 1: Current timber resources - issues for further study.**

- How reliable are the predictions of timber supply in the ex-Soviet states – recent studies show they may underestimate volume significantly, but over-estimate quality?
- How accurate have previous estimates of timber supply proved to be, and what lessons can be learnt from inaccuracies?
- To what extent is fuelwood removal represented in current production figures of temperate and tropical countries?
- How reliable are official production and export/import figures globally, when trade in 'illegal' timber is widespread?
- How reliable are the figures for hardwood production: do they account for conversion in small and portable mills?

## 4 Future patterns of supply and demand in forestry

### 4.1 World forest resources and production

There are four major trends in future world timber production: a) a continuing decrease in hardwood roundwood exports from the tropics as old-growth forests are reduced in size and quality, and as tropical countries impose export restrictions; b) increasing importance of tropical and temperate plantations; c) increasing exploitation of massive timber resources in Russia; d) increasing consumption of timber in China, India and other 'industrialising' countries. Several projections of future production agree that intensive plantations in both temperate and tropical countries will come to yield more than 50 % of total production by the middle of this century (Table 6), with old-growth forests increasingly managed for conservation. Falling tariff barriers would in theory stimulate trade in plantation and semi-natural forest products, but many tropical countries are resisting the trend to free-trade and imposing log export bans or high taxes. Predictions of future production and markets are therefore particularly difficult in the forest sector because of political and economic instability, climate change, energy shortages and increasing environmental constraints.

Table 6 Estimated current and forecast industrial roundwood supply by forest management type (% global harvest) [33]

Forest type	2000	2050
Old-growth	22	5
Second-growth (minimal management)	14	10
Indigenous second-growth (managed)	30	10
Industrial plantations indigenous	24	25
Industrial plantations, fast-growing	10	50

The Russian Federation is a key player on world timber markets. Its growing stock is around 82 billion m<sup>3</sup>, which is over 20 % of the global forest resource. Removals decreased considerably during the mid 1990s, but rose to around 100 Mm<sup>3</sup> in 2000 and 132 Mm<sup>3</sup> in 2005. This is far smaller than the estimated allowable annual cut of 564 Mm<sup>3</sup>, but the Russian Government estimates<sup>20</sup> that inaccessibility restricts the economically available annual harvest to around 250 million m<sup>3</sup>. This is nevertheless an increase of 90% on current harvests, so there is significant scope for exports to increase. Together with Eastern Europe Russia provides 80 % of net imports of wood raw materials into Western Europe (Figure 5), and this supply will clearly have a major effect on prices in Western Europe [34]. The potential for increasing exploitation is clear [34].

However major uncertainty has just been introduced to these UNECE/FAO export predictions. A 5 % export tax was introduced on log exports from Russia in late 2005, but on February 5, 2007 new taxes were announced to be introduced over the next two years:

- on July 1, 2007 tax will be raised to 20 %, with an underpinning minimum of €10 m<sup>3</sup>;
- on April 1, 2008 tax will rise to 25 %, with a minimum of €15 m<sup>3</sup>;
- on January 1, 2009: tax will rise to 80 %, with a minimum of €50 m<sup>3</sup>.

The clear intent is to stimulate the domestic processing of timber [34]<sup>21</sup>.

China's impact on the world timber market is enormous and increasing year by year. Softwood imports are increasing by around 4 Mm<sup>3</sup> per year, and Russia provides around 80 % of this (Figure 14), and 70 % of total timber needs. China is already the world's biggest log importer by volume, and second biggest by value. A small part of China's imports is of certified origin but it is asserted that a significant share may be from illegal sources [35]. According to official Russian sources, China imports 19.2 Mm<sup>3</sup> of logs from Russia, but Russian experts estimate that in addition to that volume there is a significant supply of logs from the Far East

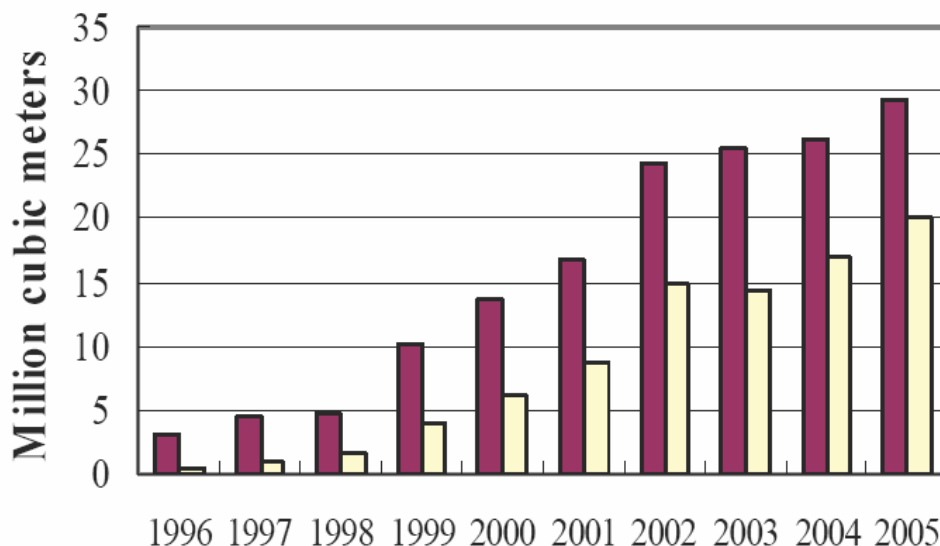
<sup>20</sup> [http://conferences.cibcwm.com/hour/DownloadPresentation.aspx?CONF\\_CALL\\_ID=63](http://conferences.cibcwm.com/hour/DownloadPresentation.aspx?CONF_CALL_ID=63)

region of Russia based on illegal logging [36]. China's recent ban on logging has increased import demands [37].

Investments in Chinese mills and transportation, aided by government incentives, have led to a huge expansion in value-added processing, especially furniture, millwork and mouldings. Over the last decade China's furniture exports have grown at a rate of 34 %. China's low-cost labour is balanced by rising raw material, energy and transportation costs. Exports of manufactured timber products have major influence on world markets. They have increased in value from \$3.6 billion in 1997 to \$17.2 billion in 2005 – a period in which imports of Chinese wood products rose 1000 % in the US and 800 % in Europe [22].

These trends will almost certainly continue in the medium term, and internal markets will also increase. Implications of this complete re-engineering of world timber markets both for temperate and tropical timbers are not fully understood, and efforts to predict impacts on European and UK forest sectors should be supported [38, 39]. These studies should also consider the continuing concern about the sustainability and legality of wood, and options for European governments and trade associations to enact procurement policies for wood and paper products.

Figure 14 Recent growth in conifer log imports in China (red bars) and amount supplied by Russia (yellow bars) [40]



India is also likely to face severe shortage of supply of timber to meet its requirements. Demand for timber is predicted to grow from 58 Mm<sup>3</sup> in 2005 to 153 Mm<sup>3</sup> in 2020, and the domestic supply only to increase from 29 Mm<sup>3</sup> in 2000 to 60 Mm<sup>3</sup> in 2020. Productivity of timber in India is only 0.7 m<sup>3</sup>/ha/year whereas the world average is 2.1 m<sup>3</sup>/ha/year. The supply of timber is mainly from forest plantations, and, in the absence of adequate supply from domestic sources, the nation has to depend heavily on imports to meet its demand for timber. This will increase the nation's forest footprint, particularly in South East Asia [41].

## 4.2 European forest resources and production

UNECE/FAO predictions described in this section are based on a 'baseline' scenario [42], where long-term historical relationships in forest products markets remain the same in the future. In terms of forest resources, this assumes that future developments in the bio-physical characteristics of Europe's forests will be largely determined by the existing status of forest resources. Constant prices and the baseline economic growth projections are used to produce the forest product market forecasts. However, there are various factors that may mean that simply extrapolating from past trends is not sufficient (see previous discussion of Russian log export taxes).

### 4.2.1 Processed wood products

European sawnwood production by 2020 will rise significantly because of continued growth in Eastern Europe and the Russian Federation. Coniferous sawnwood production is projected to grow at 1 % annually

and consumption at 0.8 %. By 2020 Western Europe will be in net balance with both production and consumption at 89 Mm<sup>3</sup>. Eastern European production will rise to 28 Mm<sup>3</sup> whilst consumption will be only 19 Mm<sup>3</sup>. In the Russian Federation both production and consumption are predicted by UNECE/FAO to increase three-fold by 2020, with production increasing from 20 Mm<sup>3</sup> to 59 Mm<sup>3</sup> by 2020 and net exports of 23 Mm<sup>3</sup>/yr<sup>22</sup>. The Russian Federation’s share of total European production of all forest products is expected to increase from 10 % at present to 20 % by 2020 (Table 7).

In Western Europe, production of non-coniferous sawnwood will grow at a slow rate of 0.7 %, from 8.2 million m<sup>3</sup> in 2000 to 9.4 million m<sup>3</sup> in 2020. Consumption will increase faster, at 1.1 % per year: i.e. from 14.2 million m<sup>3</sup> in 2000 to 17.8 Mm<sup>3</sup> in 2020. The level of net imports is therefore likely to expand from 6.0 Mm<sup>3</sup>/yr to 8.4 Mm<sup>3</sup>/yr over the same period [20].

Consumption of tropical sawnwood and non-coniferous sawnwood from North America will account for a large share of these net imports, although imports from Eastern Europe will continue to grow (Table 7).

Wood-based panels are expected to show strong growth. For Europe as a whole production and consumption of fibreboard will increase at 3.1% and 2.9% respectively and double by 2020 – representing a production of 23 Mm<sup>3</sup>. Europe’s position as a net exporter of fibreboard will therefore increase significantly. Consumption and production of particle board are both expected to rise at 2.6 % per annum, with an increase in production from 40 Mm<sup>3</sup> in 2000 to 67 Mm<sup>3</sup> in 2020, with a corresponding increase in consumption from 38 million m<sup>3</sup> to 64 million m<sup>3</sup>. A rapid rise in exports from of plywood and veneer products from the Russian Federation is anticipated: rising from 1 Mm<sup>3</sup> to 3.1 Mm<sup>3</sup> – mostly to Western Europe (Table 7).

Table 7 Average annual projected growth rates in production and consumption of forest products from 2000 to 2020 under the baseline scenario[20]

		Western Europe	Eastern Europe	Russian Federation
<b>Production</b>				
Sawnwood	2.30%	0.90%	2.30%	5.20%
Wood based panels	2.70%	1.90%	3.60%	6.00%
Paper and paperboard	2.60%	2.00%	5.00%	6.10%
<b>Consumption</b>				
Sawnwood	1.80%	0.80%	2.40%	5.00%
Wood based panels	2.60%	1.80%	4.00%	6.20%
Paper and paperboard	2.90%	2.30%	5.40%	6.00%

Trade patterns will also change as net exports increase strongly, in particular from the Russian Federation. Net exports from Eastern Europe will increase less rapidly and even decline in some cases, because the domestic market will grow as fast as or faster than domestic production. The main developments in European net exports in the future will come from the Russian Federation (Table 8).

<sup>22</sup> Note, these 2005 predictions may already be very inaccurate – one recent study estimates total roundwood exports from the Russian Federation to be roughly 53 million m<sup>3</sup> in 2006!

Table 8 Net trade by European sub-region in 2000 and 2020 (in millions)[20]

Product	Western Europe		Eastern Europe		Russian Federation	
	2000	2020	2000	2020	2000	2020
Sawnwood (m3)	-8.8	-8.2	8.4	12.5	7.9	23.5
Wood based panels (in CUM)	-1.7	-1.2	0.9	0.2	1.2	3.3
Paper and paperboard (in MT)	9.3	6.1	-1.9	-7.1	1.6	5.3

Note: positive values are net exports and negative values are net imports.

#### 4.2.2 Consumption of wood raw materials in 2020

The forecast expansion of consumption and trade will require a higher level of production in all European countries. For Europe as a whole, production and consumption of industrial roundwood are forecast to increase by slightly more than 40 % from 2000 to 2020. The ratio of fellings to net annual increment, which is an indicator of the sustainability of wood supply, is expected to rise in all countries, but it is not expected to exceed 100 %. Furthermore, European production and consumption are expected to remain roughly in balance, with exports from east to west in 2020 at similar proportions to currently

The greatest increase in production is expected in the Russian Federation, where the harvest in 2020 could be double the level recorded in 2000. In Western Europe, production and consumption will expand at the same rate as in the past (or maybe slightly higher, due to maturing forest plantations in some countries). In Eastern Europe, production and consumption growth will slow down compared to recent years (i.e. since 1990) as some countries start to reach the limits of available wood supply. .

Table 9 The European wood raw material balance in 2020 [20]

Component	Europe	Sub-regions		
		Western Euro	Eastern Euro	CIS
<b>Derived demand for wood raw materials</b>				
Other industrial roundwood	27.7	6.9	10.1	10.7
Sawnwood, plywood and veneer sheets	383.9	191.8	72.1	119.9
Reconstituted panels	141.8	85.2	32.1	24.4
Net pulp exports	52.1	21.5	3	27.7
Paper and paperboard	604.1	465.1	69.9	69.1
<b>Total derived demand</b>	<b>1,209.70</b>	<b>770.6</b>	<b>187.2</b>	<b>251.8</b>
<b>Consumption of wood raw materials</b>				
Industrial roundwood	659.4	337.4	130	192
Recovered paper	315.4	246.5	38.3	30.7
Net pulp imports	83.1	72.3	9.2	1.6
Other	151.8	114.5	9.8	27.6
- net imports of chips, particles and residues	0.1	5.9	-4	-1.8
- utilisation of wood residues	151.7	108.5	13.8	29.4
<b>Total consumption</b>	<b>1,209.70</b>	<b>770.6</b>	<b>187.2</b>	<b>251.8</b>

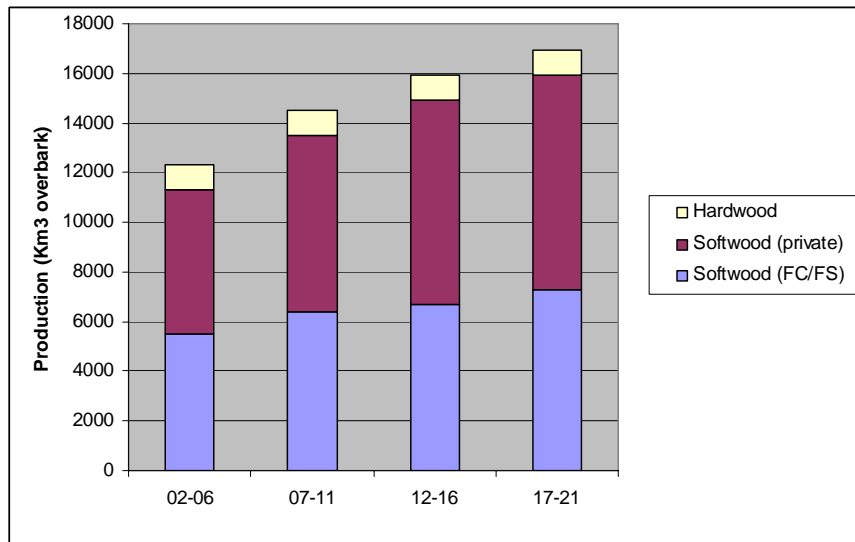
The UNECE/FAO summary predictions of supply and demand in 2020 (Table 9) can be contrasted with those given in the previous section for actual production in 2000 (Table 5). For Western Europe overall demand in 2020 is predicted to be 47% higher than in 2000, with the biggest rise in reconstituted panels (68%) and paper and paperboard (59%). Net import of chips particles and residues will rise by 127% (mainly from E Europe & Russia) and recovered paper by 99%. Total consumption of industrial roundwood will rise from 434 Mt in 2000 to 659 Mt in 2020, and consumption of non-roundwood, including recovered paper and wood residues will rise from 245 to 551 Mt over the same period.

In Europe, the rises in supply costs are being reinforced by increasing demand for “bio-energy”. Pulp mills are getting squeezed on both energy and raw material costs, and more closures can be expected.

### 4.3 Trends in UK forest resources and production

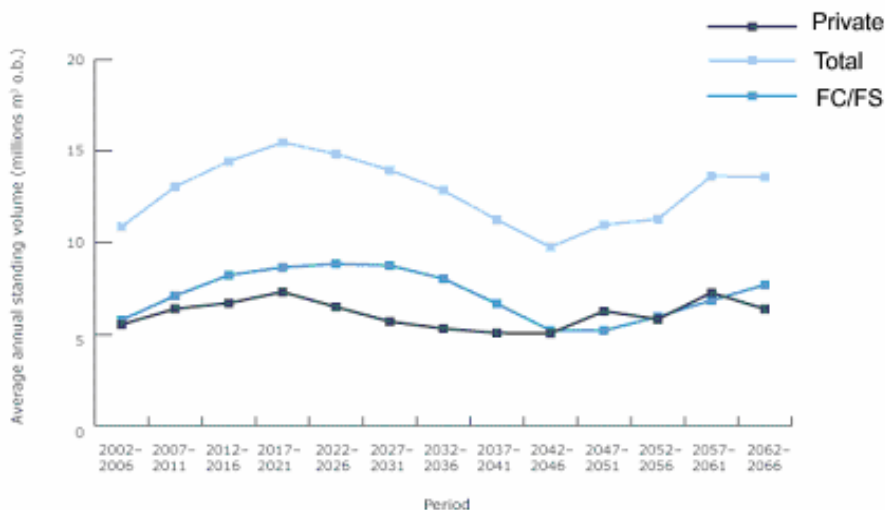
Most of the projected 38 % rise in UK timber harvest projected between 2004 and 2019 is from softwoods on the private forestry estate (Figure 15)<sup>23</sup>.

Figure 15 UK wood production forecasts ('000 m<sup>3</sup> overbark standing) [30]



However, 2017 – 2021 represents the peak in UK production - due to the fall in planting after tax reform in the 1980s there is a clear projected fall in timber production through to at least 2047-2051 (Figure 16). In the 1980s and 90s, when this collapse in planting took place, the official UK planting target remained at 33,000 ha per year. If stability of the UK timber reserve remains a priority for the future, this period demonstrates the ineffectiveness of maintaining a notional planting target, which is heavily dependent on the private sector, without the policy focus or tools necessary to ensure the target is fulfilled.

Figure 16 Long-term trends in UK timber production [11]



Despite the significant reduction in UK hardwood production in the past decade (Figure 11), current Forestry Commission projections for hardwood production continue at 1,000,000 m<sup>3</sup> for the next 20 years (Figure 15), around 90% of which will come from the private estate.

<sup>23</sup> This estimate comes from the Forestry Commission Statistics website, but other FC estimates, taking account of sustainable management considerations show the peak softwood production in 2017-2011 to be just over 14 Mm<sup>3</sup> rather than the 16 Mm<sup>3</sup> shown here (43. Halsall, L., et al., *United Kingdom: a new forecast of softwood availability*. 2006, Forestry Commission: Edinburgh. p. 25.).

### 4.3.1 *Illegal timber trade and importation*

A recent report calculated that the UK is the world's third largest importer of illegally harvested or traded timber and wood products, after China and Japan, and Europe's largest importer [44]. The majority (c. 2.8 Mm<sup>3</sup>) of this illegal trade originates or passes through Sweden, Finland, Russia, Estonia and Latvia, with a significantly smaller volume (c. 370,000 m<sup>3</sup>) from tropical countries of Brazil, Indonesia, Malaysia and Central/West Africa. The UK is estimated to spend £712 M on illegal timber and wood products per year, equivalent to £11.76 for every person in the UK [44].

The Central Point of Expertise on Timber (CPET)<sup>24</sup> has been undertaking assessments of certification schemes, developing guidance on alternative forms of assurance. CPET is also working with UK Government departments and those local authorities that are pursuing their own policies in an effort to co-ordinate public sector implementation domestically.

FLEGT is an EU Initiative for voluntary agreements which strengthened governance in the producing country, through to a commitment to implement a licensing scheme [45]. All partner countries need to agree a definition of legality and have (or be committed to developing) a credible legal and administrative structure with adequate systems to verify that exported timber is legal according to national laws.

This implies a commitment to: (i.) ensuring that the applicable forest law is consistent, understandable, enforceable and supportive of basic sustainable forest management principles; (ii.) developing credible technical and administrative systems to make sure that harvesting operations conform with relevant laws, and to track timber from the point of harvest to the point of export; and (iii.) developing procedures to license exports of legally harvested timber.

In some wood-producing countries, meeting these commitments would require considerable institutional strengthening and capacity building. To assist countries in meeting these commitments, EU technical and financial assistance could be included in Partnership Agreements. Commitment to this by all EU countries will not only help developing countries but ensure that producers and manufacturers in this country compete on a level playing field.

Illegal timber procurement was the subject of a Westminster Hall Debate on February 28th 2007. Joan Walley<sup>25</sup> stated: *“Let us make no mistake: the trade in illegal timber encourages unsustainable forestry practices. It depresses market prices by 6 to 17 % and clearly undermines legitimate operators. I can vouch for that, having just come from a meeting with representatives of the wood panels industry and having been in contact with representatives of the Wood for Gold campaign. They and many others repeatedly make the point that illegal operations undermine the rule of law in many producer countries”*<sup>26</sup>. Barry Gardiner<sup>27</sup> concluded the debate by stating: *“...it is time for serious, mature and more detailed debate about the options to begin. Of particular interest are proposals to make the import, export and commercial transfer of timber products illegally logged in their country of origin, illegal in the EU. That approach, which relates to the remarks that my hon. Friend made about a Lacey-style Act, has a number of merits. It is not discriminatory against imports, but does discriminate against illegality wherever that occurs, and places a duty of due diligence and a risk of prosecution upon anyone who deals in timber. Such an approach also avoids the need for mandatory and complex paper trails to accompany all timber shipments.”*

On 5 March 2007, the UK government presented its Sustainable Procurement Action Plan<sup>28</sup>. The headline target is to achieve a saving of 1 million tonnes of CO<sub>2</sub> emissions by 2020. The Action Plan also announced a change in timber procurement policy to be implemented by 2009, stating that from 1<sup>st</sup> April 2009 “only timber and timber products originating either from independently verified legal and sustainable sources or from a licensed Forest Law Enforcement, Governance and Trade (FLEGT) partner will be demanded for use

<sup>24</sup> <http://www.proforest.net/cpet>

<sup>25</sup> Member of Parliament, Stoke-on-Trent North, Labour

<sup>26</sup> <http://www.theyworkforyou.com/whall/?id=2007-02-28a.308.0&s=speaker%3A10619#g311.0>

<sup>27</sup> Parliamentary Under-Secretary, Department for Environment, Food and Rural Affairs

<http://www.sustainable-development.gov.uk/publications/pdf/SustainableProcurementActionPlan.pdf>

## World timber trade and implementing sustainable forest management in the United Kingdom

### 4. Future patterns of supply and demand in forestry

on the Government estate and that appropriate documentation will be required to prove it. A further longer term target states that from 1<sup>st</sup> April 2015 “only legal and sustainable timber would be demanded”. This is a tightening of existing policy that requires legal timber but only prefers sustainable timber, and will bring UK policy in line with German policy<sup>29</sup>, which require from procure timber from verifiably legal and sustainable forest management.

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[/www.bmu.de/english/nature/press\\_statements\\_speeches/pm/38640.php](http://www.bmu.de/english/nature/press_statements_speeches/pm/38640.php)

#### 4.4 Summary

At a global level there will be: a.) an continuing decrease in hardwood roundwood exports from the tropics due to decreasing resources and increasing export restrictions, b.) increasing importance for tropical and temperate plantations; c.) an increasing impact on raw-material and wood product exports from Russia, d.) increasing consumption of timber in China, India and other 'industrialising' countries.

Growing stock in Russia is 82 billion m<sup>3</sup>, with an annual increment of 900 Mm<sup>3</sup>. Removals are currently only 100 Mm<sup>3</sup> and clearly have potential to flood markets in Western Europe and keep prices down. However: a) only around 250 Mm<sup>3</sup> are economically extractable, b) exports to China from Russia are growing at up to 4 Mm<sup>3</sup> per year, c) Russia is imposing an export tax of up to €50/m<sup>3</sup> by the end of 2008.

Official roundwood imports to China are 20 Mm<sup>3</sup>, although illegal imports and subsequent exports of timber products will increase this significantly. China's forest products exports increased in value from \$3.6 billion in 1997 to \$17.2 billion in 2005 [39].

India is also becoming a major importer, with demand rising from 60 Mm<sup>3</sup> in 2005 to 153 Mm<sup>3</sup> in 2002, and domestic production likely to meet only 60 Mm<sup>3</sup>.

Exports of tropical roundwood will continue to decrease, with greater local processing. Softwood trade will continue to increase, but will remain dominated by trade within major regions like Europe. Most projections indicate that production from plantations and semi-natural forests will represent more than 50 % of production by 2050. However predictions of future production and markets are particularly difficult in the forest sector because of political and economic instability, climate change, energy shortages and increasing environmental constraints.

By 2020 Western Europe is expected to be in sawnwood balance, with production and consumption of timber equalling 89 Mm<sup>3</sup>. Production of hardwood sawnwood will grow slowly (0.7 %/yr) whilst consumption will increase more quickly (1.1 %/yr), exacerbating the current shortage of supply, and increasing imports to 8.4 Mm<sup>3</sup>/yr. Fibreboard and particle board production will continue to grow at around 3 % annually.

Overall production and consumption of industrial roundwood in Europe is forecast to increase more than 40 % from 2000 to 2020, with the ratio of fellings to net annual increment rising in all countries. Exports from eastern to Western Europe are expected to remain in similar proportion to currently.

In the UK most of the projected 38 % rise in production between 2004 and 2019 is on the private estate, but production will peak around 2020 when the declining planting figures of the 1980s and 90s have their inevitable consequence. Despite declines in hardwood harvests, current FC predictions till 2020 remain at 1 Mm<sup>3</sup> (overbark standing). Increased demand for certification in the industry, and in public procurement legislation, will place increased demands on the UK industry, yet offers increased opportunities for domestic production.

The basis for the above projections may however be thrown in to question if major new factors such as bioenergy and climate change make extrapolation from past trends unreliable

Future trade in timber and timber products is notoriously difficult to predict because of economic instability and market fluctuations. Climate change, energy trading, environmental constraints, certification and WTO rules will all affect future timber supply, demand and price. These issues are considered in the following sections.

**Box 2: Future timber resources - issues for further study.**

- Exports from Russia and Eastern Europe will continue to control softwood prices in the UK, but growth in demand in these areas is outstripping previous predictions and new log export taxes in Russia will significantly increase local processing.
- Declared timber imports to China, especially from Russia, are growing rapidly. Undeclared imports may be even higher. The effect of this market on exports to Western Europe requires further scenario modelling.
- Growth in biofuel feedstock markets in Europe and the UK should be modelled alongside conventional timber production, and competition for supply between the two sectors considered. Models should also include environmental constraints on fuelwood harvesting.
- The projected dip in UK production beyond 2020 may be reduced by extending rotations in certain areas, but does the risk from windthrow restrict this option?
- What will be effect on future demand and supply of inclusion of developed-country plantations and developing-country forest conservation in the Kyoto Protocol or its successor.? Similarly, what are the implications of the inclusion of plantations in the EU Emissions Trading Scheme, and enhanced use of engineered wood-products?
- Do conventional yield forecasts sufficiently account for climate change, atmospheric fertilization and changes in silviculture.
- Current UK yield models focus on forests greater than 2ha: estimates of yields from copses, hedgerows and isolated trees should be considered.

## 5 Improving the financial profitability of UK forestry

### 5.1 Current financial profitability of forestry

A barrier to the expansion of forestry in the UK, or to the introduction of better silviculture, is the lack of clear financial profitability and a perceived dependence on public subsidy. It is argued that a sector which requires continual and ongoing public investment cannot be sustainable in the long term, even if good environmental and social values are provided. Yet forestry has to compete for land with agriculture, and direct and indirect subsidies given to agriculture have historically been many times greater than those given to forestry [46].

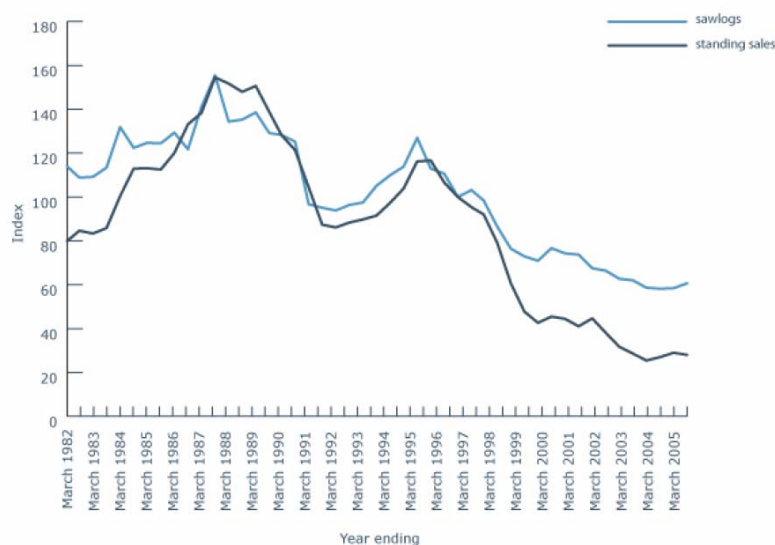
From the perspective of both the forestry sector and of Government, it is therefore desirable to generate sufficient income from forest products and related activities to cross-subsidise the management operations needed to generate environmental and social outputs. Multi-purpose management was traditionally carried out on the good private forestry estates. Nowadays, there is an expectation that, if timber income is to be foregone in the interest of the environment or access, landowners should be compensated from the public purse. This is exactly the case with agri-environmental payments in agriculture. Indeed Article 36b of the EU Rural Development Regulation (2007-2013)<sup>30</sup> encourages countries to introduce ‘forest-environment’ payments. It is not certain whether the UK countries will seek to reclaim significant expenditure under this Article from the EU. The recent shortage of funding for existing forestry grants is not a good sign.

Forestry contributes around 2.5 % of the UK economy [47], and directly employs around almost 30,000 people in full-time jobs [48]. However its value is much greater in terms of upstream economic benefit and wider contributions to the UK environment. It is possible that the forest estate will expand, and be brought into more sustainable management through the application of socio-economic accounting methods – which include allowances or payments for environmental services provided, or through energy accounting – which considers the net energy balance of forests, timber and housing. This section focuses on the conventional financial profitability of forestry.

### 5.2 Current timber prices

A crucial issue in this report is the collapse of standing timber and sawlog prices over the past 20 years. This is shown in Figure 17 as a Timber Index related to prices in 1996. In real terms coniferous sawlogs were worth around 30% of their value in 1998, and standing sales of conifers only 20 %.

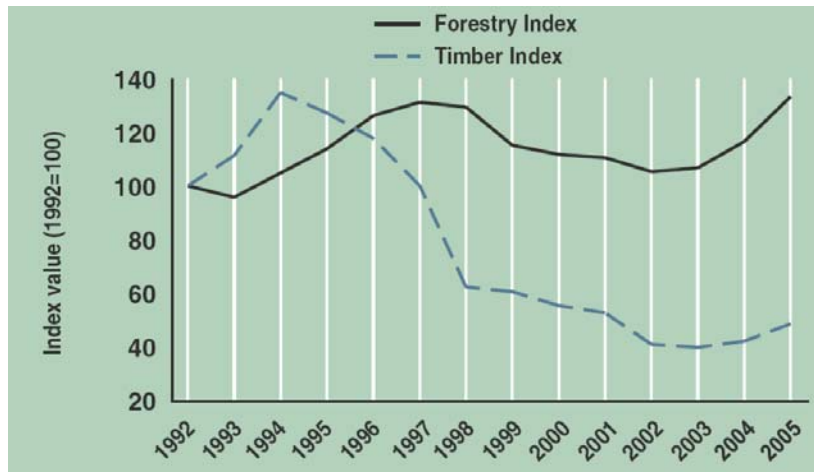
Figure 17 Coniferous standing sales and sawlog price indices in real terms (1996 = 100) [30]



<sup>30</sup> [http://eur-lex.europa.eu/LexUriServ/site/en/oj/2005/l\\_277/l\\_27720051021en00010040.pdf](http://eur-lex.europa.eu/LexUriServ/site/en/oj/2005/l_277/l_27720051021en00010040.pdf)

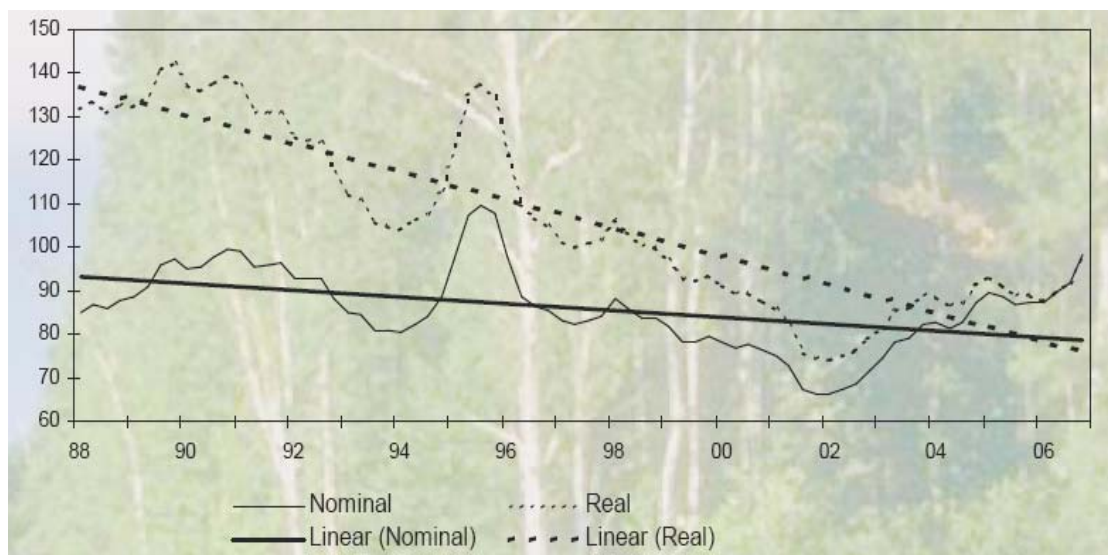
However returns to the forest owner are made up of more than the sales of timber (standing or felled). They also include sales of other goods and services, increases in the value of the woodland (from annual increment or market factors), and the net income from subsidies (e.g. planting grants) less taxes. The owner's costs are made up of employment costs and other purchases. Estimates of the overall return from commercial Sitka spruce plantations are produced annually by the Investment Property Databank (IPD), and termed the UK Forestry Index. It is calculated from a sample of private sector plantations in mainland Britain. The annualised return in the three years from 2002-2005 is 3 % per annum. Returns from plantations age 1-10 years are as high as 25 %! This is a welcome recovery from declining returns of recent years (Figure 18).

Figure 18 Forestry index and timber index [49]



World timber and pulp prices also showing marked recovery in real and absolute terms, showing a comparative shortage of timber up to 1996, oversupply between 1996 and 2002, and recovery in prices thereafter (Figure 19).

Figure 19 Global average price of softwood fibre (real and absolute US \$)

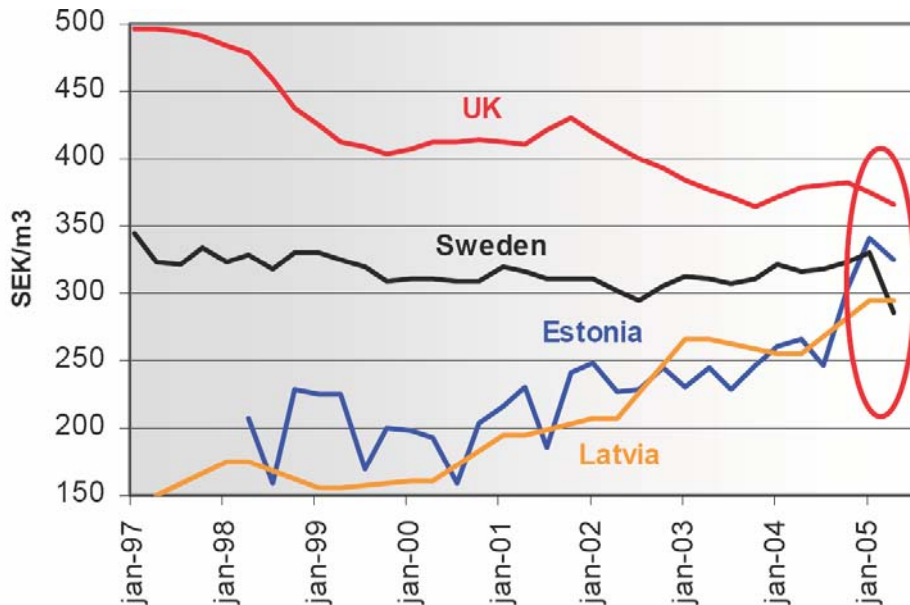


With barriers to trade eliminated, European roundwood prices are clearly equilibrating, and regional differences are much reduced (Figure 20). Factors explaining this 'globalisation' are [50]:

- Increased competition;
- Transparent and free markets;
- Capital is flowing to low cost regions;
- Mergers and acquisitions mainly by Scandinavian sawmill companies;

- Overcapacity and investment in mills in Eastern Europe;
- Ongoing development of engineered wood products.

Figure 20 Equilibrating trends in prices (Swedish Kroner in real terms) of softwood (spruce & pine) [50]. The dip in prices in 2005 (circled) followed bad storm damage in Sweden. In January 2005 13.0 Kroner were equivalent to £1 sterling.



These factors, together with the imposition of heavy export taxes on log exports from Russia (qv), rising demand for biofuel feedstock in electricity power stations and smaller scale combined heat and power schemes are causing an expectation of significant future rises in UK timber prices (Stuart Goodall<sup>31</sup> *pers. comm.*)

This returning buoyancy was reflected in the UPM-Tilhill Market report for 2005 [51], which noted many increases in forest land values since 2004. Forests sold in 2005 recovered £36.4 million (up 50 %), the area sold was 16,509 hectares (up 23 %), at an average price of £2209/ha (up 22 %); and an average transaction value of £351,000 (up 35 %), and average premium over guide price of 11% (up 10 %).

### 5.3 The case for financial support to UK forestry

#### 5.3.1 Forestry

Rising global demand for wood and wood products (Section 4.1), and concern over energy costs in transport, should lead the Government to encourage greater use of home-grown timber. The realities of global free trade regulations make overt regulation or subsidy difficult, but support can be given (under WTO ‘green-box’ exemptions) to forest owners who accept financial penalties to provide environmental benefits. Improved management of the UK forest resource will also:

- benefit biodiversity and deliver wider public goods and services (see Section 6);
- increase woodland income for owners leading to reduced reliance on public support;
- make it easier to certify that UK timber is produced using the best silvicultural and environmental practices;
- contribute to a lower carbon footprint of forestry through reduced timber miles;
- support local downstream economic activity using residues and adding value to the timber produced.

Not all agree that there is a case for public support to forestry *per se*. One report [52] argues that there is “*virtually no case*” for public provision although there “*may be an argument if private landowners are*

<sup>31</sup> Director of ConFor, <http://www.confor.org.uk/>

*failing to maximise private returns*” and a case for “*intervention to support commercial forestry [when] biodiversity benefits are at risk*”. They qualify this by stating “*any case would need to demonstrate higher returns to the public than from direct investment to procure public good output elsewhere*” [52], and this is cited in the development [53] of the recent review of forestry strategy for England [54].

However, several issues have gained greater prominence since these authors produced their report in 2003 [52], including: the need to ensure feedstocks for the new generation of wood-fired power stations, the recognition that woodland management for production purposes also brings biodiversity benefits, the new 20 % renewables target, the new 10 % biofuels in transport fuel target, the zero-emission housing by 2013 target, the need to substitute for illegally produced hardwood imports, the concept of energy- rather than financial accounting, the European Carbon trading scheme, and the likelihood that this will have real importance when the Kyoto Agreement is superseded in 2013. The planning horizon for forest plantations is at least 40 years, and financial assessments of the current profitability of forestry need a longer-term vision.

There is no doubt that the UK must rely largely on imports to satisfy current and predicted demands for wood and related products. However, the case for a stronger domestic market is compelling including any contribution to a lower carbon footprint through reduced timber miles. Marine transport can have enormous fuel-efficiency advantages over road and rail when many thousands of tonnes are being conveyed in a single vessel. With typical payloads of 1,000 tonnes or less, marine timber transport is more fuel-efficient than road haulage, but appears to be much less fuel-efficient than rail, by a factor of two or three [55]. When the need for road legs (and associated handling) at each end of the sea transit are factored in, then coastwise marine transport appears to have only a marginal fuel-efficiency advantage over road transport. Further detailed technical and economic analysis of this issue may be required.

Previous sections have indicated that yields and areas of forests are increasing in both the UK and Western Europe though global warming, atmospheric fertilisation and loss of profitability of marginal agriculture. Succeeding sections will suggest that domestic forestry policy needs to respond quickly to the great changes taking place in world timber markets, carbon-trading, flood mitigation, energy-accounting, CAP reform, downstream employment and public perceptions of forests.[i.e. 47]. Despite these long-term opportunities the financial profit to be made from forestry is insufficient, and the risk too great to encourage owners to expand the national resource of woodlands. That is the justification for incentives<sup>32</sup> – but these need to be embedded in more comprehensive and responsive forestry and energy-sector models than heretofore.

### 5.3.2 Agroforestry

Agroforestry is mentioned here as a special case because of its potential to restore areas of farm woodlands, parklands, riparian strips, wood pasture, timber belts and other mixed use of trees on farms. It is under considerable threat with implementation of the revised CAP regulations. The threat arises from the fact that areas of ‘woodland’ are specifically excluded from payment of the Single Farm Payment under Pillar 1 of the revised CAP. However nowhere is there a definition of ‘woodland’. Other CAP Regulations do continue to class farmland with trees as ‘agricultural land’ providing that animal or cropping use is largely undisturbed, but the interpretation of EU rules adopted by most agricultural departments through Europe is that any area with more than 50 ‘trees’ per ha can be classed as ‘woodland’ and is therefore ineligible. This interpretation arises from a guidance note produced by the EU Joint Research Centre at Ispra 33 but it was always intended to be open to wide interpretation by national agencies.

Clearly it is nonsense that pasture with 51 saplings per ha should be classed as woodland, but nowhere is there an accepted definition of what constitutes a ‘tree’<sup>34</sup>. No farmer will therefore plant trees at parkland

<sup>32</sup> There are some high level questions around why subsidies to agriculture necessarily in turn provide justification for subsidising forestry (Alex Dauncey, pers. comm. – Senior Policy Officer, Defra Policy Unit). The likely impacts of CAP reform will be far reaching, as policies are developed that better protect the environment, more effectively support those most in need, and promote more broad-based sustainable economic development in rural areas.

<sup>33</sup> <http://agrifish.jrc.it/Mapping/Shared%20Documents/Working%20Document%20CGPD-15-12-04-%20On-thspot%20checks.doc>

<sup>34</sup> Although the FAO definition would suggest that ‘trees’ should have more than 15cm dbh (seedling are up to 1m tall, sapling are up to 7cm in diameter, poles are 7-15cm diameter, and mature trees over 15 cm diameter, when reproductive stage begins). In the UK, trees were included in the ‘national inventory of woodland and trees’ if they are bigger than 7cm dbh (1980) or 2m height (1998) 56. Commission, F., *National Inventory of Woodland and Trees*. 2003, Forestry Commission: Edinburgh. p. 68.

spacing if he is likely to lose both agricultural and forestry payments, and significant areas of existing wood pasture are under threat.

## 5.4 Summary

Direct and indirect subsidies given to agriculture were and remain many times greater than given to forestry, yet we rely on imports for 72 % of our timber needs and have a growing opportunity to provide bioenergy from wood residues, which will be constrained by future shortages in supply, particularly after 2020.

Forestry contributes around 2.5 % of the UK GDP and directly employs almost 30,000 people in fulltime jobs, but its upstream economic and environmental benefits are much greater.

Coniferous standing sales and sawlog prices have been in decline since 1990, and in real terms are around 25 % of their levels in March 1996! Yet an index of the profitability of forestry generally, taking into account all sources of income and expenditure, shows an annual return of 3 %, with returns from young plantations as high as 25 %. Over this period forestry has been more profitable than either guilds or bonds. Furthermore the rise in prices paid for timber from the Baltic States has brought most European timber to the same price level, and the market expects recent rises in UK timber prices to continue.

Thus, increases in demand for most types of wood product, and wood energy, suggest a bright future for forestry in pure financial terms, and increasing global demand for wood and wood products, and concern over energy costs in transport, should lead the Government to encourage greater use of domestically-grown timber. Benefits from a stronger domestic forestry industry are manifold in terms of public good outputs, especially for rural economies, the environment and social welfare ([Section 6](#)).

The strategic environmental argument in support of public subsidy for forestry therefore appears to be a strong and valid one. Timber prices and confidence are currently low, but global production and consumption of timber are expanding, and the future markets for UK timber are predicted to expand even more rapidly as markets for engineered wood products and biofuels increase. Yet the decline in UK planting levels from 1990 onwards means that timber production will peak in 2020. Imports can be looked to meet the supply gap, but will this be acceptable in circumstances where life-cycle energy analyses are used?, where carbon-sequestration potential is lost to overseas countries?, and where import for raw materials will rise as many tropical and temperate countries introduce log export taxes?

In this new climate of uncertain timber-supply markets, rising energy prices, commitments to bioenergy production, and carbon trading options, UK forest policy-makers would be well advised to re-examine the wider cost benefits of incentive schemes to encourage sensitive extension of sustainably managed woodlands throughout the UK, with priorities set regionally. These incentives need not be increases in conventional planting grants however. Other options include:

- support to wood-using industries and wood-product innovations (e.g. through Application of the Article 29 of the EU Rural Development Regulation);
- support to regional timber and biofuel marketing organisations, which provide maps of current timber resources and owners, for both hardwoods, softwoods, thinnings and coppice, and models of future supply (perhaps linked to the digitised IACS land-use database)
- extension of single farm payment ‘stacking’ which allows tree-planting on up to 50% of a farm, with the SPF for that area to be transferred to the remainder of the farm (the Irish plan to use this throughout the 2007-2013 period – and it seems an ideal mechanism to increase tree cover on better land in an environmentally sensitive manner, and for little additional cost (i.e. only planting grant is paid – there is no need for income support – e.g. FWPS equivalent);
- permission for SFP payment to continue on wood-pastures with more than 50 stems/ha provided that agricultural production continues.
- consideration of tax credits, VAT reductions or carbon-trading credits for new afforestation schemes in the UK, and perhaps an enhanced-rate for broadleaf schemes aimed a production of timber products with longer-term carbon capture.

**Box 3: Financial Profitability - issues for further study.**

- How to overcome disincentives to farm forestry and agroforestry through their exclusion from Single Farm Payments?
- How to halt the closure of hardwood sawmills and restore the quality and profitability of UK hardwood production?
- Can novel silviculture, including agroforestry, short rotation forestry, coppice (for energy) and standards (for timber) be encouraged, at least on an experimental basis, providing that results and public-good impacts are monitored and disseminated?
- Will early thinning and high-pruning be more profitability if the market for residues markedly improves?
- How to introduce incentives for sustainable forest management based on tax changes, energy credits or extended eligibility of farm woodlands for the CAP Pillar I Single Farm Payment, **rather** than increased planting grants

## 6 Improving the socio-economic profitability of UK forestry

### 6.1 Introduction

Countries with extensive natural forest reserves have frequently faced tension with environmental organisations over the exploitation of old-growth forests. The extreme conservation position has been termed ‘illusion of preservation’ [57] since it neglects the fact that if sustainable domestic timber are not sustainably managed they will be replaced by imports from parts of the world with less scrupulous management and ethics, potentially at the expense of pristine natural forests. In the UK, very few such forests exist, although biologically-rich ancient semi-natural woodland provides valuable habitat. The most valuable of these resources are covered by protected sites network legislation (LNRs, AONBs, SSSIs, SACs *etc.*), and their management largely catered for through public funding. The majority of woodlands are outside this protective network, however, and their role in the wider landscape and environment is hugely important. This section explores drivers influencing the UK forestry sector and its ability to manage woodlands sustainably.

### 6.2 The economics of public good outputs

#### 6.2.1 Valuing non-timber forest products

A recent study valued non-timber woodland products in the UK at £40 million for the year of 2000, but the estimates are provisional and very incomplete (Figure 21). No valuation was made of non-commercial harvesting of food or other products in the forest. This would be an area for further study.

Figure 21

*UK Estimates of Non-wood forest products from national contribution to Global Forest Resource Assessment [58]*

FRA 2005 Categories	Unit	Quantity			Value (US \$ '000)		
		1990	2000	2005	1990	2000	2005
Plant products / raw material							
1. Food	tonnes	162	162	162		1000	
2. Fodder							
3. Raw material for medicine and aromatic products	tonnes	15	15	15		8	
4. Raw material for colorants and dyes	tonnes	14	14	14			
5. Raw material for utensils, handicrafts & construction							
6. Ornamental plants	tonnes	45	45	45		6200	
6a Christmas trees	tonnes	62500	137500	162500	24000	53000	93000
7. Exudates							
8. Other plant products	tonnes	13	13	13		225	
Animal products / raw material							
9. Living animals							
10. Hides, skins and trophies							
11. Wild honey and bee-wax	tonnes	200	122	183	1000	800	1300
12. Bush meat	tonnes	800	2600	3500		3900	6200
13. Raw material for medicine							
14. Raw material for colorants							
15. Other edible animal products							
16. Other non-edible animal products							
Total						65133	

Notes: a) food is mainly mushrooms (*Boletus*, *Chantrelle* *etc.*), berries (*Vaccinium*, *Rubus*), flowers (*Sambucus nigra* *etc.*); 2 Tree leaf fodder is used occasionally but not quantified. 3) mainly yew clippings for production of *Taxol*, 4) mainly oak tan bark, 5) mainly willow, but chestnut coppice for hop stays and hazel *etc.* for hurdles could be included; 6) ornamentals are mainly moss (*Hypnum jutlandicum*, *Sphagnum*, *Hylocomium splendens*, *Pleurozium schreberi* *etc.*); 7. birch sap (for wine *etc.*); 11) honey derived from hedgerow trees, hawthorn, lime *etc.*, and understorey wild flowers; 12) red deer.

#### 6.2.2 Valuing public good outputs

In terms of economic activities generated by the forestry sector, a recent study concluded that the forest industries supported 2.5 % of the UK economy in 2005 and 727,000 jobs [47]. Positive impacts on society and the environment extend beyond this straight financial estimate and are forecast to become more significant as concern for the environment grows and with increased demand for natural sources of energy [47]. The forestry sector commissioned a ‘mapping study’ to analyse the whole sector and to identify

weaknesses and opportunities [59]. The estimated GDP contribution for forestry was £13 billion in 2006, involving some 40,000 businesses [59]. The report concluded that the forestry sector was a significant contributor to the English economy and to peoples' lives through recreation, tourism, environment and quality of life. Forestry was therefore relevant at national and regional level and to industrial development strategies. Sector employment was estimated at 420,000 FTE in England. With the growing demand for benefits such as recreation, tourism and environmental protection/enhancement the key goal identified for the sector was to realise the untapped potential to secure greater benefit.

Willis *et al.* [60] provided estimates for the non-market annual values of forests in Great Britain, totalling £1 billion, based on the following estimates: recreation £393 M, landscape £150 M, biodiversity £386 M, carbon sequestration £94 M (this figure is discussed further in [Section 7](#)) and air pollution absorption £0.39 M. If the capitalised value of woodlands is included, the value of GB's woodlands is considerable at approximately £29.2 billion [60]. As this calculation largely relates to woodlands of 2 ha or over, the per hectare valuation for Great Britain based on recent woodland area statistics [2,743,000 ha: 11], equates to a value of £10,665 per ha, of which the annual value (*i.e.* excluding capitalised value) can be estimated at £365 per ha per year.

Woodland delivers public benefits worth £1 per hectare every day.

Estimating public expenditure on public good delivery through forestry proved difficult within the 12-day timeframe of this project. For England, 31,091 ha of woodlands within England's protected site network (SSSIs) were under WGS agreements, costing some £1.4 M in WGS payments in 2005/06 (George Hinton<sup>35</sup>, *pers. comm.*), equating to approximately £45 ha<sup>-1</sup> yr<sup>-1</sup>. Of these 86 % were meeting the [PSA](#) target. For the agri-environmental scheme as a whole, scenario planning by Natural England (PSALM95 model) generally predicts a three fold increase in costs, rising from £17.1M in 200/01 to over £55.4M in 2010/11 (George Hinton, *pers. comm.*).

### 6.2.3 Conservation returns

Using the estimate in the previous section, the private sector across Great Britain (owning 1,972,000 ha [11]), is delivering public good outputs worth £720 M every year. In England, under the EWGS, a total of £17.4 M was available in 2006 from FC England, including £4.8 M for woodland creation, £700 k for woodland regeneration, £750 k for woodland management grants, £1.7 M for public access and BAP priorities, and £400 k to support sustainable management [61]. Using figures available for England, we can compare this with the £17.4 M of public expenditure through the EWGS, whilst the private sector alone delivers £9.79 billion of public good delivery (918,000 ha of non-FC woodlands in England) [62]. What is the true balance of public expenditure for public good delivery through forestry, and how does this balance with conservation returns? Further economic studies would be helpful in this area.

Human activities, including agriculture, have led to an increasingly fragmented and impermeable terrestrial landscape over which it is likely to be difficult for species to migrate in response to climate change. It may already be the case that numerous species are attempting to track their preferred climatic conditions but are unable to do so because of a fragmented landscape. Hence there are targets for expanding and improving the management of woods under the Biodiversity and Habitat Action Plans<sup>36</sup>.

However, how is this best done in terms of delivering greatest ecological value for money? Given the long development period for new woodland, any new plantings will take perhaps 50 years to deliver ecological niches and therein provide an effective link at landscape scale. More work to model this should be undertaken and research into effective management techniques to expedite the delivery of 'good' habitat.

<sup>35</sup> Senior specialist, Analysis & Monitoring, Natural England.

<sup>36</sup> <http://www.ukbap.org.uk>

## 6.3 Climate change

### 6.3.1 Background

Climate change now demands strong attention from politicians and the economic community. The consequences of inaction for the global community were recently highlighted by the seminal Stern review [63] with the simple message that the benefits of strong, early action on climate change would outweigh the costs. “The science of climate change is the moon landing of our day” added the Prime Minister [64]. The most recent understanding of anthropogenic warming and cooling influences on climate has led the IPCC to state with “*very high confidence*” that the globally averaged net effect of human activities since 1750 has been one of warming [65]. The IPCC is currently in the process of developing the remit and scope for its full fourth assessment report, which will be due for publication later in 2007. The forestry sector recently gathered to discuss its response to climate change, concluding that despite limited measures under the UNFCCC and Kyoto Protocol, forestry had a major role to play in the future with the development of certification to fully promote SFM [66].

A key focus for biodiversity mitigation and adaptation policies has been the concept of an integrated landscape. The Ecosystem Approach of the [CBD](#) promotes the development of connectivity between reserves, whilst a key target of the [PEBLDS](#) is the integration of Natura 2000 and other site-oriented approaches into a networked landscape that enables species migration. It should also be noted that greater connectivity may also facilitate the spread of invasive species. Defra [67] and the devolved administrations are actively promoting mitigation and adaptation strategies.

Forest Research [68] is aiming to further develop understanding of the interactions between climate, trees, site and landscape and the linkage to flora and fauna so that practical guidance on forest adaptation can be given. Understanding of forest carbon sequestration will need to be developed to influence national and international policy in this area, and to provide an interface with the private sector developing carbon trading strategies.

### 6.3.2 Woodland ecosystems and climate change

Woodlands are ecosystems dominated by long-lived species and as such are likely to be slow to change. Although modelling scenarios indicate that the long generation periods of trees and time taken to reach reproductive maturity would limit their distributional response [69], trees might persist within a site for a prolonged period, despite the potential impact of climate on vulnerable life stages such as seedlings. The consequences of climate change for the regenerative potential of such communities would become evident only very slowly. In the UK, seasonal changes (phenology) appear to be more marked than elsewhere in Europe, and may lead to changes in natural communities due to relative competitive changes [70]. Furthermore, climate change and the need to maintain woodland cover may invite consideration of non-native species on some sites [71].

At the species level under all but the most extreme climate scenarios, most species remain unaffected directly in terms of distribution. However, this will depend on the timeframe, with the ‘extreme’ scenario in 2050 equivalent to the ‘moderate’ scenario of 2080. A recent presentation by Roger Street<sup>37</sup> (UKCIP) to a LUPG meeting on February 13th 2007 highlighted that the ‘low’ emissions scenario is now looking unachievable. Beech (*Fagus sylvatica*) is one species however that is predicted to be adversely effected due to water shortage in its favoured sites [71]. However, the influence of indirect factors may have a far higher impact, particularly pests and diseases. For example, Corsican pine (*Pinus nigra* var *maritima*) is well suited to the future climate predicted for England but red band needle blight, already a serious disease of commercial crops, could become more prevalent (Mark Broadmeadow<sup>38</sup>, *pers. comm.*). Further widespread planting of this species as a climate change adaptation measure is therefore questionable. More importantly, the example highlights the danger of planting a narrow species range when predictions of the future climate and associated direct and indirect interactions are so uncertain.

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<sup>37</sup> Technical Director, UK Climate Impacts Programme.

<sup>38</sup> Project Leader, Environmental and Human Sciences Division, Forest Research.

### 6.3.3 Forests and mitigation of climate change

Globally, forest ecosystems play a key role in addressing climate change by absorbing CO<sub>2</sub> from the atmosphere and storing it in growing vegetation and in the soil. Forests can therefore play a leading role in mitigation through sequestration and by substitution of fossil fuels and materials. Deforestation alone currently accounts for some 20 % of global emissions of CO<sub>2</sub>, and its prevention around the world is therefore a global priority over any afforestation initiatives. The European Union's Forest Action Plan states the "the role of forests as carbon sinks and reservoirs within a European Union can be best ensured through sustainable forest management". It adds: "[meeting climate change strategies] can be best achieved through the protection of existing carbon stocks, the establishment of new carbon sinks and encouragement of the use of biomass and wood-based products.

Domestically, it is not feasible for the UK to become 'carbon neutral' through afforestation alone. It is estimated that an additional 50 million ha of woodland sequestering an average of 3 tC/ha/yr would be required - approximately twice the land area of the UK [72]. Furthermore, once this woodland had reached maturity, it would cease to be a sink. It is also a sobering thought that the all woodland in the UK only contains as much carbon as is emitted by the UK in a single year [73]. However, woodlands do make a small, but significant, contribution to helping meet national and international emissions reduction targets. Woodlands in England are currently sequestering nearly 1.5 MtC/yr, largely because of the relative youth of the forest estate [74]. Woodland planted since 1990, the so-called 'Kyoto forest', is removing nearly 200 ktC/yr. Forest soils maintain a larger carbon reservoir than the trees and it is therefore important that these soil carbon stocks are maintained and protected. Woodland can also play a limited role in mitigating against the effects of climate change by, for example, reducing soil erosion, alleviating flooding and providing shade in both the urban and riparian environment. Although these functions are not compelling in their own right, when associated biodiversity and public access benefits are included, the case for intervention becomes stronger [75].

In contrast to the UK approach, in Scotland where forestry is a devolved resource, the administration is using forests as a viable resource in sequestration targets, given the relatively low population density and high level of woodland cover (Simon Hodge, *pers. comm.*). There is compelling evidence for climate change in Scotland in recent decades with decreases in snow cover, changes in growing season and average temperatures [76]. FC Scotland has proposed forestry climate change targets<sup>39</sup> which will fit within the Scottish Climate Change Programme. Three measures of reducing atmospheric CO<sub>2</sub> levels have been identified (1) carbon sequestration by afforestation (9,000 ha annually), (2) substituting wood fuel for fossil fuels, and (3) short rotation coppice. It is estimated that these measures would cost £8-10 M per annum to ensure delivery, but based on the UK Sustainability Commission's figure of £75 per tonne of carbon emission 'avoided', the package would offer a positive cost benefit.

The amount of additional carbon sequestered each year by Wales' woodlands is currently decreasing and predictions indicate that Wales' woodlands will be a net source of carbon by 2010 due to the age and species structure and predicted harvesting and restocking rates at that time, this includes an estimate for new woodland creation at current levels but not for deforestation [Indicator D5: 77].

The concept of indirect sequestration, where a domestic timber market would reduce both unsuitable deforestation abroad and have a lower carbon footprint (e.g. lower wood miles and encouragement of material substitution through branding and marketing) needs to be developed further. Product substitution could potentially be a significant tool in reducing greenhouse gas emissions. A report for FC Scotland estimated that GHG emissions could be reduced by up to 86 % if timber for internal and external building materials and fittings were specified wherever possible rather than typical practice Scottish building materials [78]. The same report provided an estimate highlighting that the least carbon-intensive methods of transport were by train, or by 44 tonne lorry from locally-sourced forests.

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<sup>39</sup> paper to the National Committee NC 26/05.

### 6.3.4 Forests and adaptation to climate change

Forests can play a crucial role in assisting biodiversity in tracking the climate window as change occurs. Adaptation will be necessary to minimise negative impacts and to secure any benefits. The warmer climate expected for the UK will result in increased productivity for northern England, Scotland and parts of Wales, whilst an increase in severity of summer droughts in southern England will adversely affect growth rates and impact species suitability [71]. Predicted impacts and responses include continued phenological changes, range shifting (northerly trend), disruption of communities, increased disturbance and species turnover, and increase of “weedy” species [69].

The choice of species and provenances will therefore be increasingly important as climate change impacts in the future. However, broadleaved policy advocating native and local provenance have been based on the assumption that over time, natural selection has led to adaptation. The Forestry Commission developed regions of provenance and local seed zones for the UK [79], stating that “all planting stock should be of a local provenance”. The policy was welcomed by conservationists and was easy to advocate (*e.g.* Flora Locale<sup>40</sup> and Woodland Trust<sup>41</sup>) but not welcomed by the forestry sector due to an increased economic and administrative burden on tree nurseries among others, but more fundamentally by forest scientists citing lack of evidence. A recent review of scientific evidence [80] argues that in the face of a lack of extensive trials of native British trees that the precautionary principle, previously cited as the basis for this policy, is potentially dangerous. Inbreeding depression and the loss of genetic diversity should be given greater consideration, where extensive gene flow and adaptation at a broad scale would be advantageous to develop the capacity to adapt to current and future conditions. The review [80] concludes that the emphasis on local seed sources may also cause problems, in that given the long life of trees and predicted climate change, the environment of a site may no longer experience the conditions under which the trees evolved. The Woodland Trust is currently reviewing its own policies relating to local provenance (Hilary Allison<sup>42</sup>, *pers. comm.*), whilst the FC is evidently broadening its thoughts regarding its own policies in this area [81].

We may need to consider further (*e.g.* [82]) the concept and definitions of “nativeness”, since the creation and maintenance of robust future-proof woodlands may require using a variety of sources of native species in combination with introduced species where appropriate. Species such as *Acer pseudoplatanus*, *Castanea sativa*, *Fagus orientalis*, *Juglans regia*, *Nothofagus* spp., *Ostrya carpinifolia*, *Sorbus domestica* and *Quercus pubescens*, *Q. rubra* and *Pinus radiata*, may come to play an important role in the productive and healthy forests of the future. Some consideration may be needed towards appropriateness of these non-native species, some of them archaeophytes, in terms of continental nativeness, historical context, associated biodiversity richness, environmental protection benefits (*e.g.* flood alleviation, soil protection), productiveness (*e.g.* timber, short-rotation forestry, bioenergy), climatic suitability (climate matching), economic potential, along with any potential negative impacts (*e.g.* invasiveness). This will be an even greater challenge for nature conservation bodies. It should be noted that the impacts of climate change will not impact on woodlands to the same extent throughout the UK – non-native species may therefore not need consideration throughout the nation.

The major negative impacts of climate, and current predictions suggest a modest increase in mean wind speed [83], in addition to increased extreme events (wind, flooding and drought). The UK already has a ‘severe’ wind climate, and current predictions suggest a modest increase in mean wind speed. However, of greater concern is an estimated increase in frequency of gales. It may be that greater fluctuation in timber prices is likely with increased storm events in the future. Climate change may also provide opportunities by providing climate space for new species, increased growth rates, demand for wood for heat and energy.

<sup>40</sup> [www.floralocale.org](http://www.floralocale.org)

<sup>41</sup> [www.woodland-trust.org.uk/campaigns/briefingsmore/seed.htm](http://www.woodland-trust.org.uk/campaigns/briefingsmore/seed.htm)

<sup>42</sup> Policy Director, The Woodland Trust.

**Questions arising from Climate Change issues**

What will the role of timber be in a future economy which emphasises sustainability and C sequestration?

Should we return to managing woodlands with production of timber as a key objective?

Are native populations of broadleaved species likely to be able to adapt to the climate of the future?

Can we afford to ignore the genetic resource at our disposal?

“Local” is currently being reviewed: how long before “native” needs to be redefined?

In some cases in the future might a healthy wood containing “non-natives” be more desirable than a degenerating “native-species” wood?

Research into negative impacts (*e.g.* is fire-risk in the UK likely to increase, pests and diseases?))?

**6.4 Environmental and social benefits**

Forest biodiversity may be richest of all terrestrial systems. Together, tropical, temperate and boreal forest offer diverse sets of habitats for plants, animals and micro-organisms, holding the vast majority of the world's terrestrial species<sup>43</sup>. The current composition of biodiversity within forested landscapes will change over time and space as species and habitats are both lost and gained in direct or indirect response to climate change.

**6.4.1 Role of forests in environmental protection**

Trees and forests play a crucial role today towards environmental protection, and will do so increasingly as climate change impacts. Roles include flood management, atmospheric pollution and soil (*e.g.* carbon stores, slope stability). The Water Framework Directive<sup>44</sup> has implications for forestry, and indeed forestry must play an important role in meeting targets. It is highly unlikely that any River Basin Management Plan (RBMP) can be implemented successfully if it is not supported by key stakeholder groups such as local residents and land and water users. If they do not participate in developing the plan they will not be committed to it (thereby failing to meet Article 14<sup>45</sup>). Well-located and managed forests can benefit the aquatic environment, for example by protecting soils from erosion and by providing a ‘buffer’ between a watercourse and agricultural land (thus helping to retain pollutants). Pressures on the water environment associated with forested catchments include acidification, nutrient enrichment, siltation and local changes in stream flows. Riparian woodland can also help to moderate water temperatures and thus protect fish populations [70].

Globally, as a result of climate change, a significant increase in fire occurrence is predicted to occur over the next 70 years. The interactions between climate change, fire and forest biodiversity has been characterized as a cascading relationship [84]. Changes in climate will directly affect fire frequency and severity, and will also directly impact the composition of current ecosystems by changing ‘climate space’. Species that require late-successional habitat in ecosystems that are intolerant of fire or drought are at greatest risk to climate change and its interaction with fire [85]. In the UK, an increase in fire frequency may be expected, particularly with expansion of urban and peri-urban forests. On the other hand, a change in the proportional composition of UK forests generally from young conifer woodlands (‘thicket stage’) to mature conifer and broadleaved forests is likely to decrease susceptibility.

<sup>43</sup> <http://www.biodiv.org/programmes/areas/forest/default.asp>

<sup>44</sup> [http://www.environment-agency.gov.uk/commondata/acrobat/bn\\_forestry\\_v02\\_1192827.pdf](http://www.environment-agency.gov.uk/commondata/acrobat/bn_forestry_v02_1192827.pdf)

<sup>45</sup> WFD: ‘Member States shall encourage the active involvement of all interested parties in the implementation of this Directive.’

### 6.4.2 Social welfare

There has recently been a ground swelling of interest in using the natural environment to improve people's quality of life. Environments that encourage people to choose and experience more healthy lifestyles are of importance for policy makers seeking to reduce health expenditure. A report for HM Treasury and the Department of Health suggested that the importance of people engaging in exercise may have a £30 billion cost implication by 2022/23 (half the current NHS expenditure), based on the differences between best and worst case scenarios [85]. Association (*e.g.* contact, view, exercise *etc.*) with the natural environment has been shown to have positive health benefits, for example where "green exercise" improves mood and self esteem [86], walking in the natural environment led to stress reduction/changes in blood pressure [87], and in relieving mental fatigue [88].

Recently a new approach in assessing accessible green space mapped accessible natural greenspace across the whole of the South East [89]. The research indicated that 57 % of accessible natural greenspace is provided by woodlands but that this represented only 30 % of the region's woodland area. This work is likely to prove important in helping target provision for accessible greenspace.

The Social and Economic Research Group of FR has produced a number of documents to summarise evidence and propose future areas for research. The most recent of these indicated a need for a strategy for innovation on woodland tourism, and to build landscape-scale planning for tourism into forestry grants [90]. FR undertook a pilot study in the West Midlands entitled "*Nature's Health Service*" [91], and has undertaken a new project on "*Barriers to woodland access for health*", for FC Scotland. The current *Activewoods* campaign is supported by FR's involvement in evaluation of five *Active England* initiatives with Sport England [68].

Access provision in woodland is well provided to most of the public state by the FC. In the private sector, the Woodland Trust provides free access to over 17,000 ha of new and established woodland across the UK. Private woodland owners have been encouraged to open up their woodlands through the Community Woodland Supplement of the WGS but only 7000 ha have been covered by this since 1994, most of this in community woodlands and the National Forest.

Many hurdles to adoption by private woodland owners remain including clashes with management, sporting activities and even competition from neighbouring FC woodlands offering superior (and free) public access provision. Despite obvious public benefits it is difficult to envisage how the private landowner can receive support linked with provision of social good.

## 6.5 Summary

Estimates provided here calculated a per hectare valuation for Great Britain equating to £365 per ha every year, or conveniently £1 per ha per day. Estimating the cost of SFM delivery across the UK through public funding proved to be impossible to ascertain in the timeframe of this research. However, one source indicated that grants to support management of England's SSSI woodlands cost £45 per hectare every year. What is the true balance of public expenditure for public good delivery through forestry, and how does this balance with conservation returns?

Climate change is both an opportunity and threat to UK woodlands and the forestry sector. Afforestation to meet carbon sequestration targets is not tenable at UK level but has been adopted in Scotland due to comparatively lower population density and higher forested land areas. The 'low emissions' scenario now appears to be unachievable. Direct impact on forests is likely to be slow to be realised although it is the extreme years that are likely to have greatest impact, rather than the change to 'mean climate'. A key emerging message is that robust woodlands are required, comprising a mixture of genetic origin and species. This has led to a re-evaluation of "local provenance" policies by some organisations. Furthermore, the acceptability of non-native species may need to be reconsidered in order to deliver robust woodlands, ensure landscape integrity and meet any increased demands for domestic supply of wood and woodfuel products. Increased risk of damage from wind, fire and pest incidence require the attention of the research community and should be embedded in forest and woodland conservation strategies.

Any new plantings will take perhaps 50 years to deliver ecological niches and therein provide an effective link at landscape scale. More work to model this should be undertaken and research into effective management techniques to expedite the delivery of 'good' habitat. The role of forests in protecting the environment, particularly flood management, atmospheric pollution, and soil management, is likely to become increasingly important in the future.

A growing wealth of evidence is emerging in support of the social and welfare benefits of green space and forests. Access provision is well provided by the public estate and by some NGOs but low uptake of the Community Woodland Supplement in England is symptomatic of the hurdles affecting the private sector.

The thesis that an economically viable industry should be able to deliver public good outputs with less public spending, but perhaps within a new legislative framework, is fundamental to the concept of sustainable forest management. Forestry clearly provides high value public benefits but remuneration that woodland owners receive seems to bear little relation to value provided.

### **Box 4: Socio-economic accounting - issues for further study.**

- Models which quantify the private and public benefits of forestry (and agroforestry) in comparison to conventional agriculture on different land types, with and without subsidies. These would consider 'protected' and non-protected' areas.
- Studies on the 'conservation return' on public subsidies for agriculture and forestry, including agri-environment and forest-environment schemes?
- Research and modelling of the role of non-native species in providing robust woodlands to deliver various elements of SFM under a changing climate. This would include provision of landscape, associated biodiversity, habitat, timber and woodfuel, environmental protection and social benefits.
- Studies on the role of the private sector, as distinct from the public (FC) woodland resource in delivering public good?
- Research and modelling on the effect of different silvicultural techniques on the delivery of habitats with high environmental and landscape value. This would include techniques to integrate forestry with agriculture.
- Cost benefit analyses of carbon sequestration, bio-energy, and life-cycle energy analysis, where forestry is valued in terms of its carbon footprint. Import substitution benefits should be included in this context.
- Studies on production and environmental impacts of urban and semi-urban forestry, particularly in regard to the valuation of recreation.
- Studies on the use on the mutual impact of forests and climate change include use of non-native species, pest problems, fire-risk, trees for flood management, and silvicultural change.

## 7 Improving forestry's contribution to energy supply and emissions reduction

### 7.1 Biomass energy in Europe

The under-exploitation of forest resources in Europe and UK (Section 3.1) has stimulated interest in generation of electricity, heating, and transport fuels from forests and woodlands.

The EU has ambitious targets to increase the share of renewable energies in total energy consumption from 5.4 % in 1997 to 12.0 % by 2010 [92] and 20 % by 2020<sup>46</sup>. Various legislative actions have been undertaken, but the main Regulations enacted are:

- promotion of **renewable electricity generation** by its proportion from 14.0 % in 1997 to 21,0 % by 2010 for EU 25 – which corresponds to 22.1 % for EU 15 [93];
- promotion of **biofuels for transport** by removing taxation, such that biofuels comprise 5.75 % of fuel used by 2010 [94], and 10 % by 2020.

The Community Biomass Action Plan, and Biofuels Strategy [95, 96] assume that biomass' contribution to the 12 % renewable energy target will be met by a combination bio-heating and electricity from biomass and co-generation [97]. The EU assumed that use of ligno-cellulose for production of ethanol or methanol is not yet sufficiently economic and looked to bioethanol and biodiesel to meet the 19 Mtoe target for transport fuel by 2010. Forest production, wastes and coppice energy-crops are therefore assumed to be converted using traditional technologies to provide the 62 Mtoe<sup>47</sup> of renewable electricity and heat (Table 10)<sup>48</sup>.

Table 10 Scenarios to increase EU25 biomass use in the EU Biomass Action Plan, using existing technologies[96] and measured in Million tonnes oil equivalent (Mtoe)

<i>mtoe</i>	Current (2003)	Future (2010)	Difference
<b>Electricity</b>	20	55	35
<b>Heat</b>	48	75	27
<b>Transport</b>	1	19	18
<b>TOTAL</b>	69	149	80

Biofuels provide 25 % of Sweden's energy and the majority of its heating. Countries such as Sweden and Austria have effective regional solutions for utilization of renewable energies based on forest biomass [99], at a time that the UK struggles to achieve planning permission for its first tentative steps.

Several reports have examined the overall potential for woody biomass energy in Europe [100, 101]. Recently, an excellent study was undertaken on the 'environmentally sustainable' potential for biofuel production in Europe from agriculture, forestry and wastes. The forestry chapter [102], combines data from

<sup>46</sup> Agreed at the EU Heads of Government meeting on 9<sup>th</sup> March 2007.

<sup>47</sup> The calorific content of Brent Crude is 41.9 GJ/tonne. Oven dry wood contains 18-21 GJ/tonne. Thus Mtoe figures should be multiplied by around 2.15 to obtain Mt dry wood.

<sup>48</sup> Actually, ethanol production from wood is making rapid progress: several pulp companies are working on converting pulp mills into biorefineries. In Quebec, Tembec sells 17 million litres of ethanol a year from its Temiscaming dissolving pulp mill. Domsjö Fabriker recently spent about US\$35 million to convert its dissolving pulp mill at Örnsköldsvik in Sweden into a biorefinery. Two years ago, Etek opened a 10,000 tonnes a year pilot plant in Örnsköldsvik to produce ethanol from wood residues. Next year, the company plans to start work on three more plants which will produce a total of four million litres of ethanol a year. In 2008, a pilot plant at the Växjö Värnamo Gasification Centre in Sweden will start producing syngas (a mixture of carbon monoxide and hydrogen) from fermented wood chips. A commercially viable fuel is likely within five to ten years. Meanwhile, Royal Dutch Shell, is working on a new process to produce ethanol from wood chips. In Norway, Norske Skog and energy company Hydro have set up a joint venture to look at the feasibility of producing biodiesel from wood. They hope to build a biodiesel plant in southeast Norway by 2012. In France, a consortium including Genencor International, Tembec and the University of Bordeaux's Pine Institute is working on a three-year study to develop ethanol from paper pulp (98. Lang, G., *The pulp industry and the biofuels boom*. World Rainforest Bulletin, 1996. 112.)

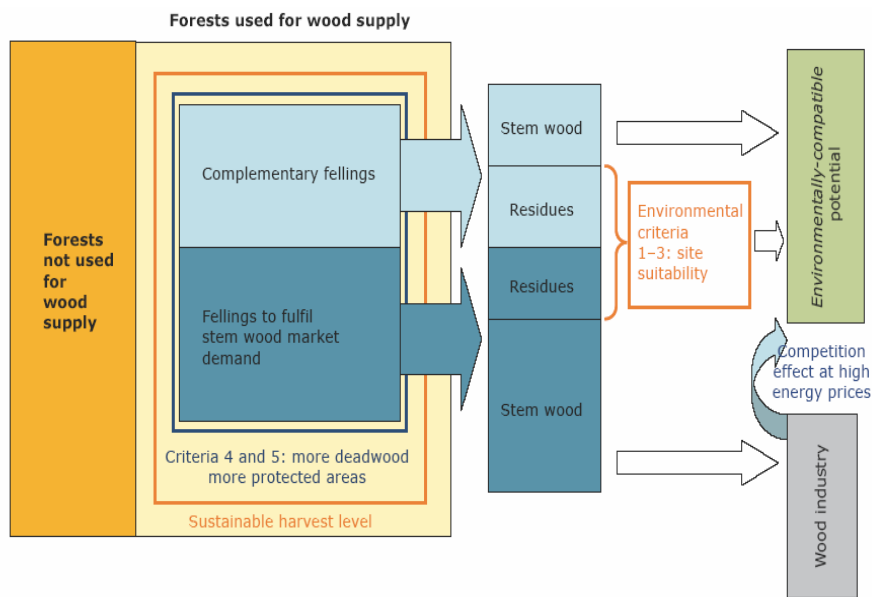
national forest inventories with databases of soil type, slope, elevation and derived soil-fertility to estimate (Figure 22):

- local suitability for residue extraction based on fertility and erodability;
- regional resource potential from forest residues;
- regional unharvested or underharvested forest stocks
- ‘environmentally-compatible’ residue extraction potentials;
- ‘environmentally-compatible’ complementary extraction potentials; and
- potential reorientation of harvest from the timber sector as bioenergy prices increase.

Environmental constraints are introduced to reduce the area of forest exploitable for energy. Potential positive environmental effects are not considered: these include reducing nitrate leaching and acidification, fire control, stimulation of pre-commercial thinnings, more conditions for natural regeneration and more diverse structures for the benefit of biodiversity

The study excludes protected areas from the potential resource, and makes allowances for retention of old-growth and buffer areas. Then it calculates the potential extraction of residues and complementary felling, and reduces these based on the environmental ability of different soil types and slopes to sustain intensive harvesting.

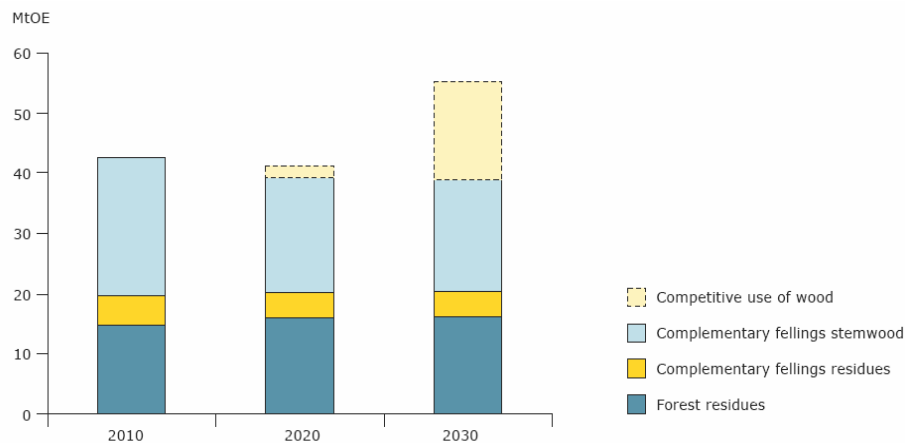
Figure 22 Schematic representation to calculation of ‘environmentally-compatible’ wood biomass in Europe [102]



The model thus predicts that 42 Mt of oil equivalent (90 Mt wood) can be produced without undue environmental impact, and without reducing the supply conventional wood-products. However, as energy prices rise, energy forestry will become increasingly competitive with conventional wood-products (Figure 23), and will certainly drive up the value of roundwood and residues.

There is considerable concern however that bioethanol needs in the developed world will be met by further destruction of tropical forest resources, either through their conversion to industrial plantations of sugarcane, bamboo or oil palm, or by direct conversion in the third world of woodpulp to methanol [103]. There is pressure for Europe to ensure that its current bioenergy targets are matched by a commitment to use its own biomass resources [104].

Figure 23 Environmentally-compatible bioenergy potential from forests<sup>49</sup>



Note: Calculations cover EU-25 Member States without Cyprus, Greece, Luxembourg and Malta

A recent press release from the UN Economic Committee for Europe [36] recognises that: ‘the increases in energy prices, along with policies that favour sustainable development and increasingly promote renewable energy, are continuing to drive demand for wood energy upwards, sharply in some countries. Processed woodfuels, such as pellets in Europe have seen strong growth and there is now a well developed international trade in biofuels. High transport costs tend to favour processed fuels which need less volume or weight for a given energy content. Transport costs may well influence the location of new large scale investment in wood energy capacity, with coastal areas likely to be favoured, where fuel can be imported readily, as has been the experience in the Netherlands and Sweden. China’s ambitious goal to increase bioenergy’s share of its overall energy markets, coupled with its limited indigenous forest may result in demand for woodfuel well beyond China’s boundaries’.

## 7.2 Biomass energy in the UK

Biomass energy currently provides about 2 % of the UK’s electricity generation (the total for all renewables being around 4 %). Based on a recent study, biomass energy provided around 1 % of the UK’s heat generation in 2003: whereas in most northern European countries it is at least 10 % [101]. This study also includes an assessment of competing markets between woodfuel and forestry, and assesses potential for complementary harvesting of forest increment which is not being removed for conventional purposes.

We are not aware of a similar study in the UK, but the ‘Woodfuel Resource in Britain Project’ [105] did make an assessment of the total annual biomass production of GB forestry (>2 ha), once site constraints are accounted for, of 5.63 Mt (dry matter). Of this 3.62 Mt was produced in the private sector and 2.02 Mt in the public sector. Poor quality stems, branches, stem tips and small roundwood contribute 1.76 Mt. A more conservative assumption includes only poor stems and lop and top available – giving 760,000 t (Table 11).

<sup>49</sup> The energy value of wood chips was assumed to be 64 €/m<sup>3</sup> in 2020 and 94 €/m<sup>3</sup> in 2030. No new planting is assumed in this calculation – between 1990 and 2000 360,000 ha was established per year – and this trend can be expected to continue. 42 Mt oil equivalent is around 90 Mt of wood or approx 200 Mm<sup>3</sup>. This compares to the forestry consumption of timber in Western Europe in 2000 of 525 Mt (see Table 5).

## World timber trade and implementing sustainable forest management in the United Kingdom

### 7. Improving forestry's contribution to energy supply and emissions reduction

Table 11 Potential 'operationally available' woodfuel resource in GB, in the absence of competing markets ('000 oven dry tonnes [105]).

Product	England	Scotland	Wales	Britain
Stemwood 7-14cm diameter	298	607	128	1032
Poor quality stemwood	95	113	71	279
Stem tips	14	12	5	31
Branches	225	116	69	410
Sawmill conversion products	290	404	166	859
Arboricultural arisings	456	22	14	492
Short rotation coppice	16	0.6	0.2	17
Total	1,394	1,275	453	3,119

The total operationally available resource (3.1 Mt/yr), if used for electricity equates to 3.6 terra-watt hours/yr or 0.44 GW. The Government's current target is to meet 20 % of our energy requirements from renewables. This is around 6 GW, of which at 1-2 GW is expected to come from biomass. The Biomass Task Force made four recommendations on wood-energy [106]:

- Recommendation 28 *“To facilitate rapid initial development of supply chains we recommend a second round of the Bio-energy Infrastructure Scheme be run with grant funding of £3.5 million.”*
- Recommendation 29 *“Each RDA should analyse the infrastructure needs in its region and seek to facilitate supply chain development. Each RDA should submit, to the Ministers given responsibility for biomass energy, a plan on how they intend to do this by October 2006.”*
- Recommendation 30 *“As a first step the Forestry Commission should urgently undertake and publish a full assessment of, and set out a strategic plan for, the development and use of short rotation forestry, forestry waste, farm and other woodlands, local authority trees and commercial forestry. This should be delivered by September 2006.”*
- Recommendation 31 *“The Government should then consider the development of an integrated plan to optimise the use of the full range of biomass feed stocks including wastes.”*

The Government response to this made a number of recommendations regarding forestry[107]:

- The Forestry Commission should prepare a **wood bioenergy strategy and implementation plan**, working closely with the private sector and the RDAs to identify the measures needed to deliver progressively an additional 2 million tonnes per annum (0.4 Mt carbon saved) from existing woodlands, with a focus on currently under-managed woodland. This will include a full cost benefit appraisal and: a) assessment of the resource available at regional level (including arboricultural arisings and sawmill co-products); b) costed proposals for further analysis of resource availability where needed; d) assessment of the barriers to increased woodfuel use; e) a costed plan for the development of the woodfuel resource including resources required for research and development, outreach (including demonstration, advice and communications), market development, and skills and training.
- The plan will be regionally based, summarised at national level with an assessment of the environmental impact; and recommendations on how a strategic plan for woodland creation options can be developed to fit alongside the strategic plan for woodfuel from existing sources. This work will take account of the existing Regional Forestry Frameworks and the contribution of the Regional Biomass Implementation Groups that are in place in all regions, and the Woodland Initiatives.

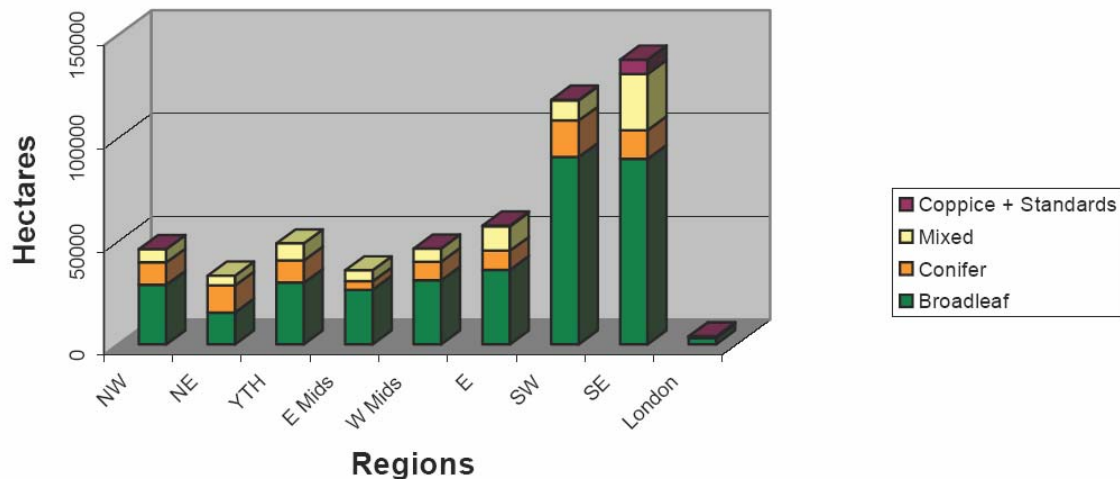
## World timber trade and implementing sustainable forest management in the United Kingdom

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- The Forestry Commission will create a 'one stop shop' called the Biomass Energy Centre (BEC)<sup>50</sup> to provide advice on a wide range of biomass fuels and conversion technologies. This complements work of the National Non-Food Crops Centre (NNFCC)<sup>51</sup> which promotes and advises on the whole range of non-food uses of crops. The NNFCC has particular expertise in development of markets for farm crops which include their use for fuel and energy. A steering group comprised of representatives from the biomass industry and related sectors oversee the development of the BEC.

Using information from the National Inventory of Woodland and Trees 2001, and knowledge of the woodland area covered by grant schemes and felling licences or managed by Forest Enterprise, the FC Woodfuel Team have identified around 600,000 ha of under-managed woodland<sup>52</sup> in England (Figure 24).

Figure 24 Unmanaged woodland in England [108]



Barriers to implementation likely to include lack of easy to access information for both industry and landowners, skills training and workforce retention, local planning permission for conversion facilities, set-up costs and the need for long-term supply agreements. Creation of the Biomass Energy Centre by the FC England and Forest Research will address several of these constraints and a useful newsletter and brochure are available [109].

The Forestry Commission's England Woodfuel Strategy is not yet available, but conclusions from a woodfuel stakeholder workshop in July 2006 [110] indicate likely priorities:

- the objective of Government intervention is to support the development of a substantial and sustainable market for woodfuel, maximising fossil fuel substitution;
- Government interventions are addressing market failure: when a viable industry is in place Government support should no longer be required;
- in developing the woodfuel market we will also seek to enhance environmental outputs from woodlands,
- increasing community engagement in renewable energy and woodland management will create employment and help alleviate fuel poverty;
- if we are to achieve a target of 2 Mt within a reasonable timescale it will be necessary to provide support to develop supply, strengthen the supply chain and develop the market;
- we will aim to avoid disruption of existing wood using industries;
- we will seek to develop woodland use locally through encouraging clusters of end users and suppliers to develop, rather than scattering support; we will identify 'Pathfinder' projects/areas and direct early support towards them;

<sup>50</sup> <http://www.biomassenergycentre.org.uk>

<sup>51</sup> <http://www.nnfcc.co.uk/>

<sup>52</sup> this assumes that woodlands not covered by a grant scheme or licence agreement are 'under-managed'

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- we will ensure that current high environmental standards in all woodland management activities are maintained;
- we will not rule out support to any development but the priority is local heat; followed by CHP; followed by large scale co-firing and electricity generation;
- there will be a national core of research and development, communications advice, outreach and advocacy; with delivery at regional and sub-regional level;
- capital and infrastructure support grants and/or soft loans will be an important component of the strategy;
- in developing the strategy we must take into account the emergence of other biomass energy supply streams.

#### 7.2.1 The boom in electricity generation using UK small roundwood and wood-residues

Co-firing of wood and coal is rapidly expanding technology in the UK, and consumed 164,000 tonnes of wood pellets in 2005 (Table 12), although a large proportion of this feedstock is imported [111]

Table 12 Examples of materials currently or recently co-fired at UK power stations [112]

Company	Power Station	Installed Capacity (MW)	Primary Fuel	Co-firing Fuel
AES	Kilroot	520	Coal/ oil	Trialling olive pellets
Alcan	Lynemouth	420	Coal	Trialling wood
British Energy	Eggborough	1,960	Coal	Palm oil, PKE. Previously olive pellets and pulp, shea pellets and meal
Drax Power Ltd	Drax	3,870	Coal	Timber, <i>Miscanthus</i> , SRC. Previously olive cake, PKE, wood pellets
EDF Energy	Cottam	2,008	Coal	Wood pellets, olive cake
EDF Energy	West Burton	1,972	Coal	Wood pellets, olive cake
E.On UK	Kingsnorth	1,940	Coal/ oil	Wood chips, tall oil, PKE
E.On UK	Ironbridge	970	Coal	Wood chip, PKE
E.On UK	Ratcliffe	2,000	Coal	Wood chips, tall oil, PKE
International Power	Rugeley	1,006	Coal	
RWE NPower Plc	Aberthaw B	1,455	Coal	Palm oil, sawdust
RWE NPower Plc	Tilbury B	1,029	Coal/ oil	PKE. Previously sawdust
RWE NPower Plc	Didcot A	1,940	Coal/ gas	PKE. Previously sawdust
Scottish and Southern Energy	Ferrybridge C	1,955	Coal	
Scottish and Southern Energy	Fiddler's Ferry	1,961	Coal	
Scottish Power	Cockenzie	1,152	Coal	Wood pellets
Scottish Power	Longannet	2,304	Coal	Wood pellets
Uskmouth Power Company Ltd	Uskmouth	393	Coal	Shea meal

Co-firing is set to expand, but so too is the generation of electricity from wood-only generating plants. Four of these have been completed, or are nearing completion, with a total intake in excess of 1.5 Mt of roundwood and residues. A fifth has been given planning permission. Owners of the Shotton plant are even experimenting with whole tree harvesting and baling of lop and top. The schemes are:

- the Shotton Phoenix project opened in November 2006 with a capacity of 270,000 green tonnes of biomass. Input is mainly small-roundwood with a purchase price in excess of £20 per tonne delivered.
- the Sembcorp £60 M plant at Middlesbrough (Wilton) will create 15 full-time jobs, generate 30 MW of electricity, powering 30,000 homes and taking 300,00 t/yr. Completion is expected in mid-2007.

- the E.On £90 M plant at Lockerbie, is scheduled to create more than 300 jobs, produce enough electricity for 70,000 homes, cut carbon emissions by 140,000 tonnes and take around 500,000 green tonnes of sawmill residues and small roundwood. It will open by the end of 2007.
- the Eco2 and Western Log Group £33 M plant in Port Talbot should be fully operational in June 2008 and will provide electricity for 31,000 homes and take around 300,000 t/yr.
- the Tullis-Russell 50 MW combined head and power plant at Markinch in Fife has achieved planning permission, and construction is expected to start soon.

There is also a large market in smaller scale electricity production, especially combined heat and power schemes. No figures have been located for the current size of this market in the UK, but exciting large-scale 'wood-stations' are being developed for chipping and recovery of wood waste. The BioRegional Development Group is an excellent example where the Bioregional company has set up a large-scale chipping plant in Croydon to utilise local prunings and residues from woodland, parks and urban trees. The company's surveys indicate a potential annual supply of 500,000 fresh tonnes in the London area<sup>53</sup>, and big savings in landfill tax.

In Scotland, by the end of 2006 there were 49 non-domestic, operational wood fuel using projects, using around 180 K green tonnes/year of Scottish wood. FC Scotland is administering the new Biomass Support Scheme on behalf of Enterprise Transport and Lifelong Learning Department for which around 100 applications have been received for combined heat and power installations, district heating schemes, other biomass heat installations, supply-chain developments and training (Beattie, *pers. comm.*).

#### **7.2.2 Woodfuel and biodiversity**

Development of the woodfuel market could significantly benefit woodland biodiversity. A market would be created for thinning and managing existing woodlands (including restoration of planted ancient woodlands, re-introduction of ancient/traditional coppicing, diversification of structure of even-aged high forest) and new energy plantings (on arable land and as 'green-veins' between existing semi-natural habitats). However, new energy crop establishment may be a disbenefit if sited on semi-natural habitat, on existing permanent set-aside or pasture. Woodland in the future may conceivably be managed too intensively for biodiversity optimisation if all residues are removed for firewood, and no deadwood remains to support detritus feeders.

Short rotation coppice (SRC) is option currently supported by planting grants, but harvesting fuelwood from longer-rotation farm woodlands may be preferable for biodiversity (*e.g.* arthropods, lichens). Modified conventional forestry, where residue production is maximised, or traditional coppice-with-standards systems, may prove more energetically or financially efficient than SRC. It may therefore be unwise to give grants to SRC without considering the cost-benefits of alternative types of farm forestry. Short rotation forestry (as opposed to coppice) was identified in a recent report as having no serious issues relating to biodiversity, environment or landscape, providing that further guidance can be developed for potential growers by the FC [113].

#### **7.3 Energy accounting**

As the world moves towards energy deficit, it makes more sense to compare alternative types of economic activity using their energy costs rather than their more ephemeral financial costs. The concept of energy-accounting as a supplement to cost-accounting has been around since the first oil-crisis: both in agriculture [114, 115] and forestry ([116, 117]). The UK commitment to 100% zero-emission new housing by 2013, and to seriously emissions control in all private and public sectors, means that energy accounting must now be taken very seriously.

In Life Cycle Analysis (LCA) is an extension of energy accounting, where all material and energy inputs are traced back to their extraction from their sources and all releases into the environment are taken into account (Figure 25). LCA can be used:

- to assist in the decision process within a firm to reach environmental improvements in industrial production,

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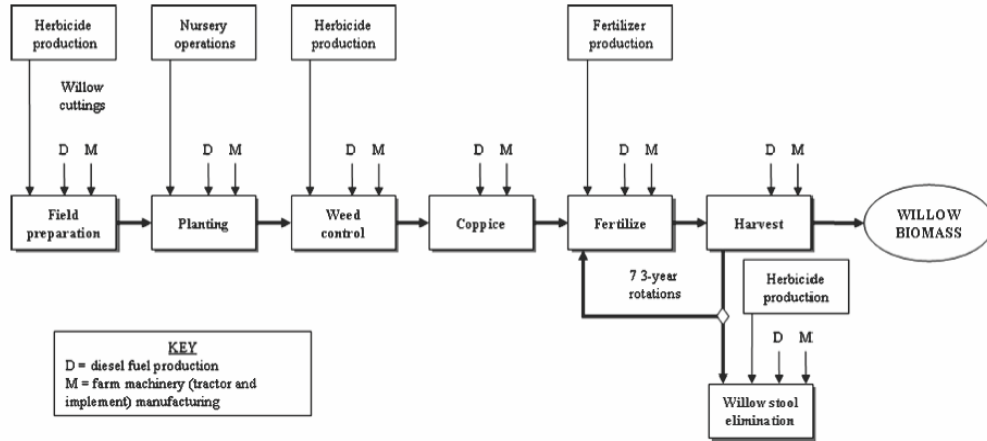
<sup>53</sup> [http://www.bioregional.com/programme\\_projects/forestry\\_prog/urban\\_forestry/urbfor\\_woodchip.htm](http://www.bioregional.com/programme_projects/forestry_prog/urban_forestry/urbfor_woodchip.htm)

# World timber trade and implementing sustainable forest management in the United Kingdom

## 7. Improving forestry's contribution to energy supply and emissions reduction

- to support marketing activities of enterprises by bringing into prominence the environmental improvements or benefits of a product,
- to advise in the process of public decision making.

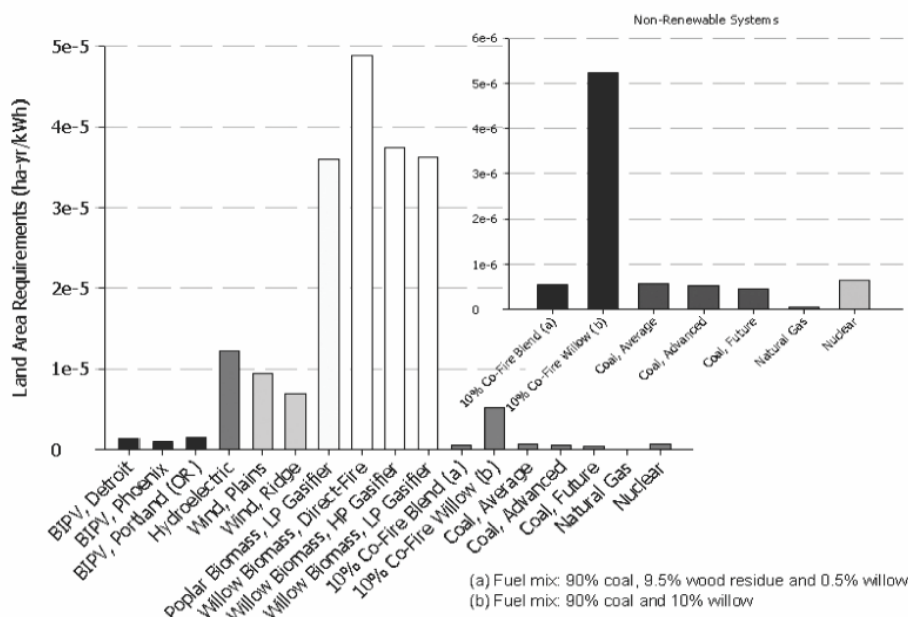
Figure 25 Lifecycle analysis of a short-rotation energy plantation [118]



We are not aware of full-scale studies in the UK comparing the energy and ecological footprints of bioenergy from forest residues compared with other types of power plant, but an interesting study in the US of the energy, environmental, and economic performance of willow biomass production and conversion to electricity using life-cycle-analysis found:

- net energy ratio (electricity generated/life cycle fossil fuel consumed) for willow ranges from 10 to 13 for direct firing and gasification processes.
- reductions of 70 to 98 % (compared to U.S. grid generated electricity) in greenhouse gas emissions as well as NO<sub>x</sub>, SO<sub>2</sub>, and particulate emissions.
- a very large land requirement per kWh ( $4.9 \times 10^{-5}$  ha-yr/kWh) compared to other renewables like wind and hydro (Figure 26).

Figure 26 Total life cycle land area requirements for electricity generating technologies [119]



If the energy used in the manufacture of different building materials is considered, wood comes out a clear winner (Table 13).

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Table 13 Energy used in the manufacture of equal volumes of building material [120]

Material	Carbon released (kg/m <sup>3</sup> )	Carbon stored (kg/m <sup>3</sup> )
Sawn timber	15	250
Steel	5320	0
Concrete	120	0
Aluminum	22000	0

Moving from these energy costs in per unit volume of building material to look at the embodied energy used in manufacturing and constructing different components of a house, it is clear that wood is still the least energy intensive building material (Table 14), and should become cheaper in comparative terms as energy costs increase. Already

Table 14 Embodied energy in different building materials [121]

	MJ/m <sup>2</sup>
<b>Flooring</b>	
Timber suspended, timber sub-floor enclosure	740
Timber suspended, brick sub-floor wall	1050
Concrete slab on ground	1235
<b>Walls</b>	
Weather board, timber frame	410
Brick veneer, timber frame	1060
Double brick	1975
<b>Windows</b>	
Timber frame	880
Aluminum frame	1595
<b>Roofs</b>	
Concrete tile, timber frame	755
Concrete tile, steel frame	870
Metal cladding, timber frame	1080
Clay tile, timber frame	1465

Taking the comparison further, life-cycle analyses (LCA) can be used to compare the energy and environmental footprint of different types of building. A comprehensive FAO study did this 'cradle to grave' analysis, including, energy, CO<sub>2</sub> emissions, other pollution and transport and maintenance impacts [122]. The total embodied energy in a timber-frame house was 250 kWh compared with 100 kWh for a brick house, and Table 15 shows that the timber-frame house has a smaller environmental footprint measured in terms of four indices of atmospheric or water pollution.

A recent study in Scotland estimated that there could be a reduction of up to 86 % in the greenhouse gas emissions associated with the embodied energy of building materials of timber internal and external structural elements and fittings are specified wherever possible rather than current practice [123].

Table 15 Life-cycle analysis of environmental impact of brick versus timber-frame houses [122]

	Unit	Timber Frame	Brick
Greenhouse Warming Potential	Kg CO <sub>2</sub> equivalent	79 248	108 400
Acidification Potential	Kg SO <sub>2</sub> equivalent	177	242
Eutrophication Potential	Kg phosphate equiv.	15	21
Photochemical Ozone Creation Potential	Kg Ethylene equiv.	5	6

Another study in Scotland looked at the carbon footprint of different types of timber transport. Marine transport can have enormous fuel-efficiency advantages over road and rail when many thousands of tonnes are being conveyed in a single vessel. With typical payloads of 1,000 tonnes or less, marine timber transport is more fuel-efficient than road haulage, but appears to be much less fuel-efficient than rail, by a factor of two or three [55]. When the need for road legs (and associated handling) at each end of the sea transit are factored in, then coastwise marine transport appears to have only a marginal fuel-efficiency advantage over road. Further detailed technical and economic analysis of this issue may be required.

## 7.4 Carbon sequestration

Initial estimates of carbon sequestration in GB forests in 1995 were in the region of 1.5 to 1.7 million tC<sup>54</sup>/yr in trees, 0.3–0.5 tC/yr in litter and 0.5 MtC/yr in wood products, totalling about 2.5 million tC, equivalent to about 1.5 % of the carbon currently emitted by burning fossil fuels in the UK. It was estimated that, in order to maintain this level of forest carbon sink, the forest area needed to expand at around 25 000 ha/yr of upland conifers or 10 000 ha/yr of poplars on good land [124]. Clearly planting rates since 1995 have not been at this level.

Since 1995 the level of reporting of fluxes of greenhouse gases and changes in stocks of carbon has become more intensive, and is a statutory requirement of UNFCCC and Kyoto Convention reporting [125]. Some of the techniques and assumptions have changed [125]. Latest estimates, now including Northern Ireland, suggest that in UK forest land there was a net removal of -12.20 Mt CO<sub>2</sub> in 1990, rising to -16.30 Mt CO<sub>2</sub> in 2004 (21.7 % for England, 64.2 % for Scotland, 9.7 % for Wales and 4.3 % for Northern Ireland). Removals to forest products fell from -1.46 Mt CO<sub>2</sub> in 1990 to -0.63 Mt CO<sub>2</sub> in 1994. Net fluxes due to changes in stocks of wood products varied around -1.10 Mt CO<sub>2</sub> from 1996 to 2000 before a change to a source of 0.62 Mt CO<sub>2</sub> in 2004.

Forest carbon sequestration of around 1.5 % rate of industrial carbon emissions may not seem a great deal, but carbon is now traded on world markets like any other commodity. Thus, taking the current price of carbon<sup>55</sup> as €13.20/tonne CO<sub>2</sub> (Feb 2007), the value of carbon sequestered in UK forests in 2004 is in the region of €15 million.

The section above deals with the UK submission to the Land Use, Land Use Change and Forestry section of UNFCCC. Carbon sequestration in wood and forest soils counts against a country's emissions reduction target with respect to the base years of 1991-93. However afforestation schemes in developed countries are not eligible for inclusion in the 'Clean Development Mechanisms' (Article 6) or 'Joint Implementation Projects' (Article 12) of the Kyoto Protocol.

However it is anticipated that this will change post 2013, in recognition of the major 20% contribution that deforestation worldwide makes to global warming. This is more than the world's transport systems according to IPCC and the Stern Report<sup>56</sup>, and the inclusion of aviation in the ETS from 2011<sup>57</sup>. Indeed in March 2006 the UNFCCC agreed to explore a proposal by Brazil for schemes to arrest deforestation in developing countries to be eligible for carbon offset credits, and mechanisms to monitor this are being researched in the UK<sup>58</sup>.

The European Union Emissions Trading Scheme also precludes companies investing in carbon offset schemes involving forestry till at least 2008<sup>59</sup>, largely because of difficulties in implementing effective monitoring, but the EU Parliament has mandated the European Commission to find ways of including forestry in the ETS thereafter<sup>60</sup>.

<sup>54</sup> 1 Gg CO<sub>2</sub> = 0.273 Gg Carbon = 273 tonnes carbon.

<sup>55</sup> [www.pointcarbon.com](http://www.pointcarbon.com)

<sup>56</sup> [http://www.hm-treasury.gov.uk/independent\\_reviews/stern\\_review\\_economics\\_climate\\_change/sternreview\\_index.cfm](http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm)

<sup>57</sup> [http://ec.europa.eu/environment/climat/aviation\\_en.htm](http://ec.europa.eu/environment/climat/aviation_en.htm)

<sup>58</sup> Ian Pearson (Minister of State (Climate Change and the Environment), Department for Environment, Food and Rural Affairs) | Hansard 6<sup>th</sup> March 2007: The Natural Environmental Research Council is currently considering proposals for work under its Quantifying and Understanding the Earth System (QUEST) programme that deal with the practicalities of biosphere management including emissions reduction from deforestation. One £350,000 study will explicitly address methodologies for avoided deforestation (along with forest management and bioenergy production) under the Kyoto Protocol. The other planned study (£500,000) will investigate the mitigation potential of avoided deforestation compared with other activities, in a context of optimal sustainability.

<sup>59</sup> <http://www.europarl.org.uk/NEWS/textonly/infocus/txNEWSETSdecember2004.htm>

<sup>60</sup> <http://www.euractiv.com/en/sustainability/forest-sector-seeks-inclusion-emissions-trading/article-160133>

## 7.5 Summary

This section has presented the EU's ambitious targets for 12 % of total energy to be comprised of renewables and 5.75% of transport fuel to be composed of biofuel by 2010. The EU assumes that wood energy will provide 55 Mtoe for electricity generation and 75 Mtoe for heating by 2010, and is pressing member states to meet individual targets. A study of the 'environmentally compatible bioenergy potential of existing forests predicts that only a further 42 Mtoe can be produced without significant environmental impact, or without disrupting existing timber markets. The numbers don't add up, and seem to point to a shortage of wood resource.

In GB a study in 2003 estimated up the total available wood resource was 3.1 Mt/annum, reducing to 1.76 Mt (dry weight) if no competition with conventional forestry were assumed. Constraints of accessibility and landowner interest will reduce this figure significantly however.

The stimulation of biomass is a very high priority for the Government, the Biomass Task Force and the Forestry Commission, and an English Woodfuel Strategy is awaited very soon. Use of wood-chips and pellets in co-generation power plants is at least 164,000 dry tonnes annually, and four wood-only power plants are under construction with a total planned intake of 1.3 Mt (green). This suggests that the UK may also experience a shortage of fuel supply for bioenergy purposes in the medium-term future.

Energy accounting, embodied energy calculations and life-cycle environmental impact analyses are introduced as methods of comparing the energy and environmental impacts of different types of building material. Timber housing has clear advantages using these accounting methods, and this should be stressed to policy makers, particularly given their worries over energy supplies and climate change.

The value of forests, forest vegetation and forest soils as an increasing pool of carbon is stressed using the latest UNFCCC returns. Carbon is now a traded commodity, and taking current prices, the sequestration in UK forest land of 16.30 Mt CO<sub>2</sub> in 2004 is worth €160 million annually, with 64% coming from Scotland.

Forest plantations are currently excluded from the EU emissions trading scheme, but parliament has asked the commission to consider their inclusion in the near future. Forest plantations in developing countries are included in carbon offset schemes covered by the two Articles of the Kyoto Convention.

Deforestation worldwide accounts for 20% of greenhouse gas emissions. It is likely that carbon conserved in forest protection schemes will be added to the Convention in 2009, or certainly in its successor starting in 2013.

### **Box 5: Energy accounting - issues for further study.**

- There is an assumption that 2 M green tonnes of biomass can be harvested from 'undermanaged' woodland in England, but who owns the resource, and will they be willing to have their woods managed in this way? What limitations will there be from difficult terrain or access to roads?
- What will be the biodiversity implications if the woodfuel market develops sufficiently to stimulate the industry?
- Can methanol production from wood be made economic in the UK in time to contribute significantly to Government's target of 10 % biofuels in transport fuel by 2020.
- Objective and transparent monitoring and reporting methods need to be developed for the likely inclusion of plantations in the European Emissions Scheme, and forest protection in the Kyoto Convention, or its successor.

## 8 Changes in UK forest policy & research

### 8.1 Overview

#### 8.1.1 Current status of the UK forestry sector

The complexity of the UK forestry sector, where multi-purpose forestry can include numerous activities beyond timber production, presents management problems and makes future yields difficult to predict. The private sector is responsible only for 40 % of timber produced, despite owning 82 % of the resource [11]. The sector in England may be only harvesting 39 % of the forest's annual increment [59]. The mean production from broadleaved forests in the GB is currently very low, at 0.57 m<sup>3</sup>/ha/yr [126], despite the average potential yield being over seven times higher: typically greater than 4 m<sup>3</sup>/ha/yr [127]. This implies that currently only 165,000 ha (14 % of the total [11]) of GB broadleaved woodland is harvested for timber [126].

The English Forestry Industry Partnership (EFIP<sup>61</sup>) recently commissioned a mapping study to review the sector as a whole [59]. It concluded that the forestry sector in England had not taken full advantage of its potential, with a key need to strengthen connection between home-grown wood and markets. The majority broadleaved resource remained disconnected from any market, with owners having little supplier power or organisation. An empowered leadership group was recommended to secure greater benefit for the sector, aiming to increase its participation in the domestic market and to connect better with the wood industry as a whole, including the import-based elements to help grow the whole sector. EFIP and ConFor<sup>62</sup> are currently working to implement these findings, including a regional response across England.

The forest industry in the UK is seen as lacking commercial drive with no clear central point from which timber can be procured. One illustration of the problem (Bruce Inker<sup>63</sup>, *pers. comm.*) was the purchase of 43 m<sup>3</sup> of certified oak for a contract where, after a UK source could not be found, a single phone call to one central contact point in France organised the procurement from three different owners, and the delivery of the timber in one wagon load. Some activities and initiatives are coming together to counter this. For example, the Wales Forest Business Partnership<sup>64</sup> recently held a workshop "Prospects for the Timber Market in Wales – woodland owners' supply opportunity", in recognition that the forestry and wood processing industry and all involved in the supply chain need to work in a more integrated manner to build stronger linkages and gain a better understanding of the key issues facing the industry.

A key issue appears to be the lack of communication and co-operation across the woodchain: from the resource (people and timber), its procurement, marketing and finally, to end-use. Although circumstances are 'chicken and egg', the sector will never be able to market its timber if it does not know who owns it and how much/what timber there is and when it may be available. Two key activities may support these needs:

- a national survey of woodland owners;
- regional timber inventories.

Another constraint on the ability of the forest sector to respond professionally to future challenges may be the diminishing numbers of students studying forestry or closely related studies at undergraduate and postgraduate level. This has led to the closure of a number of courses in UK tertiary educational establishments offering forestry [128]. There is another view that the forestry sector would be best served by acquiring best quality graduates from a variety of disciplines, and therefore be more capable of servicing the

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61 England Forest Industries Partnership - works at a strategic level to strengthen the competitiveness of the forest industry sector in England. [www.efip.org.uk](http://www.efip.org.uk)

62 Confederation of Forest Industries. [www.confor.org.uk](http://www.confor.org.uk)

63 National Accounts Director of Arnold Laver Timber World - one of the largest timber importers and merchants in the UK. ([www.laver.co.uk](http://www.laver.co.uk))  
63 National Accounts Director of Arnold Laver Timber World - one of the largest timber importers and merchants in the UK. ([www.laver.co.uk](http://www.laver.co.uk))

64 64 [www.wfbp.org](http://www.wfbp.org)  
[www.wfbp.org](http://www.wfbp.org)

broad requirements of the sector. This issue was discussed by the Forestry Commission Advisory Panel in 2004, following a presentation by Richard Howe<sup>65</sup>, concluding:

- Forestry is part of the whole rural agenda and vision of courses relevant to the forestry sector needs to reflect this, both in generic and specific content of courses.
- Engagement is needed at the highest level in the relevant university and further education establishments.
- The Panel strongly endorsed the recommendation for a one-stop-shop UK forestry careers web site.
- Concern was expressed about the image of the sector. The potential of Forestry Education Initiative (FEI) should be maximised and the Panel recommended checking that FEI has the right message about forestry's role in the wider sustainable development and rural agendas.
- Support for a student bursary or similar competitive award was thought a positive way forward.

Potentially, the sector may find it increasingly difficult in the medium term to offer high quality technical advice to woodland owners, a service that may be increasingly important with the rising phenomena of hobby woodland ownership (Chris Starr<sup>66</sup>, *pers. comm.*). Furthermore, the change in patterns of ownership will increasingly reflect a willingness to invest without the need for a return, and potentially lead to a loss of 'control' for policy makers (Chris Starr, *pers. comm.*). This gap in forestry expertise might be filled by immigrants from elsewhere in the EU but these may not be attuned to the social and environmental benefits of UK forestry. Alternatively "environmental advisors" may step in, and it seems that the new generation of hobby woodland owners are more likely to contact local wildlife trust officers than a forestry consultant [126]. The risk here is that opportunities for production are missed and the costs of management correspondingly increased.

Another recent phenomenon is woodland 'lotting', particularly in the south east of England. Woodlands are bought by investors and then divided and sold to a number of individual owners. Increased public interest in woodland ownership and connection with the woodland environment is generally perceived as beneficial. However, lots bought for investment purposes are often left unmanaged, or incorporated into rear gardens where the wood directly abuts a built up area. One estimate predicted 3.7 % of Kent's woodlands were lotted to probably thousands of owners<sup>67</sup>. Lots may be bought with the aim of obtaining planning permission to build a home, owners of lots may erect tool sheds and other similar structures, or keep livestock in the wood lot; leading to loss of nature conservation interest. Lot owners are often unaware of statutory controls e.g. Tree Preservation Orders (TPOs).

### Who decides how the woodland resource is treated?

Landowners ultimately decide how a given piece of land is managed but dialogue between landowners and other stakeholders is needed so that:

- social and environmental benefits to society are recognised;
- the needs and concerns of the landowners are heard and addressed;
- forest users recognise that sustainable management means operations which limit their access and convenience, and;
- Government can better plan for the efficient delivery of targets.

However, little is known about the owner-base, although further research has been called for to determine motivations of ownership and management [129]. EFIP's sector mapping study stated that the "*private forest owner base...remained elusive during the course of this mapping work. It is difficult to implement*

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65 Item 3 on the FCAP minutes: [http://www.forestry.gov.uk/pdf/FCAPMinutes-October2004.pdf/\\$FILE/FCAPMinutes-October2004.pdf](http://www.forestry.gov.uk/pdf/FCAPMinutes-October2004.pdf/$FILE/FCAPMinutes-October2004.pdf)

66 Principal Lecturer, National School of Forestry, UCLAN and author Woodland management: a practical guide.

67 [http://www.forestry.gov.uk/pdf/see-nick-johannsen-leisure-plots.pdf/\\$FILE/see-nick-johannsen-leisure-plots.pdf](http://www.forestry.gov.uk/pdf/see-nick-johannsen-leisure-plots.pdf/$FILE/see-nick-johannsen-leisure-plots.pdf)

*improvement and develop new structures until this [identification] is done” [59].* In south-east England, the woodland resource is owned by more than 10,000 woodlands owners [130], of which little is known. One small parish-based survey highlighted that lack of knowledge was hampering management of small woodlands leading to ineffective delivery of public good outputs, and reluctance to produce timber [131]. Clearly, improving delivery of public good outputs and efforts to improve the woodchain, both require better information of the private woodland ownerbase.

### **How much timber is there?**

At a strategic level the sector will remain unable to develop an effective woodchain if the amount and quality of timber available for conversion remains unknown. Future needs will remain unaccountable and economic forecasts ineffective. Barriers due to ‘top-down’ market promotion will remain with end-users and specifiers unaware of the regional/local resource. At individual landowner level, lack of knowledge of the resource owned and potential value will fail to inspire the resurgence of interest in woodland management required to stimulate the woodchain from the ‘bottom-up’.

The precision level of any inventory would need to be high enough to support timber sales or appraisals relating to timber value. The current National Inventory of Woods and Trees (NIWT) offers national [e.g: 132], regional [e.g: 133] and county [e.g:134] summaries of the woodland resource, including woodland area, size class distribution, principal species, ownership type and planting year class. However, the level of detail provided is insufficient for the industry seeking to market the resource. To build on a previous example, to provide a domestically-sourced parcel of oak timber, the sector must know, for any region, how much standing oak exists, its quality, availability, quantity etc. Fundamentally, who owns the resource and do they want to sell it? The NIWT does not set out to provide such information.

Individual inventories must follow a standard and be recorded centrally in order to service any regional timber procurement and promotion activities. The inventory must provide, on a site by site basis, an estimate of the:

- location and access issues;
- total number of trees;
- species;
- sizes (harvesting window);
- quality of trees.

The information gained could be used by landowners to estimate the monetary value of their timber resources. Understanding the value of the product they are trying to sell will help ensure they get a fair price for it. An inventory is also a good starting point for developing a management plan to help landowners reach forest management objectives (note potential connection with FC Wales’ BWW). In turn, these may tie in with certification which may need to be promoted further to landowners as specifiers increasingly demand a certified product.

### *How might an inventory be run?*

A complete region-wide forest and timber inventory would be ideal but unrealistic. A possible viable model may be to develop regional extension services to promote management plans, certification and an inventory on a rolling basis across a region. Advice could be provided by extension services with assessment provided by the Forestry Commission and/or independent professional private consultants (NB not timber brokers). The new Better Woodlands for Wales grant scheme, discussed in the [Wales section](#) might be another effective delivery model. Some new form of funding may be required to encourage landowners to employ private services.

### **Certification and woodland management**

Bringing more woodlands into management is the main aim of FC England’s Woodland Management Grant (WMG) but take-up has been disappointing, particularly in the South East, where it is around 50 % (3,100 ha), whereas support for 6,000 ha had been budgeted. One barrier to uptake of the WMG is

certification, as it is an eligibility criterion, although there may well be others including lack of market for any product. The principal issues in relation to certification (Andrew Smith<sup>68</sup>, *pers. comm.*) are:

- Cost/benefit especially for small/medium size woodlands in the range 30 to 100/150 ha. Above this size current certification options become much more cost effective. Also larger woodlands start producing such volumes of timber that are likely to dictate that certification is required to be able to place it all into the market. (Woodlands below 30ha do not need to be certified to be eligible for WMG);
- Owners not wishing to be subjected to another layer of audit scrutiny and/or not wishing to address some issues that certification may ask them to at least consider (if not deliver on) such as PAWS restoration and public access;
- Perceived complexity, probably linked to previous two issues.

Other WMG eligibility criteria include designations (native woodland, PAWS, SSSI) and a more tightly defined demand for public access. These criteria are somewhat different to the previous 'Annual Management Grant', and have not been as well understood as they could be. Some owners have assumed that because their woodland is conifer it is ineligible, forgetting that it is actually on eligible ancient woodland sites (Andrew Smith, *pers. comm.*). Most properties contain a mix of woodland some that fit these criteria and some that do not. Depending on the granularity of this mix it can be more or less challenging to submit a coherent application for eligible areas.

Overall the lack of uptake is probably affected by a combination of the certification and 'other eligibility' factors listed above. Overall this does not necessarily mean certification is failing as there will be many certified areas not entering WMG (e.g. secondary conifer woodlands with a marker driver for certification).

At a strategic level the absence of spatial data for certified areas makes it difficult to analyse their distribution (Andrew Smith, *pers. comm.*). Thus it is not easy to predict the effect of (or response to) different sets of eligibility criteria. e.g. how much certified woodland is there in South East England? How much of that area is ancient woodland? Establishing a simple framework for woodland owners/wood users to meet CPET category B requirements offers some potential for achieving 'legal and sustainable' without having to go via the certification route.

### 8.2 England

As 72 % of woodlands in England are owned by private individuals and a range of organisations other than the Forestry Commission<sup>69</sup>, their engagement is vital for the effective implementation of forestry policy across England. A new forestry strategy for England is due for publication in 2007, following a public consultation during the summer of 2006 [54]. Defra received 221 responses [135], a key message being that a stronger long term vision was needed for the sustainable management of woodlands and forestry. This vision should react to changing economic, environmental and social conditions, and be sufficiently flexible to accommodate new opportunities and constraints. The draft EFS was criticised for its short term vision, with support voiced for a longer timescale than just ten years, since the average forestry cycle is often closer to fifty years [135]. Other key messages from the consultation responses were:

- Greater creation of new woodlands was needed for future generations, with the setting of quantitative objectives to restore and enhance the forestry resource,
- Higher priority should be given to ensuring the long term economic viability though restored emphasis on the production aspects of forestry
- Delivery and implementation mechanisms of forest strategy were not currently adequate, and could be strengthened by adopting a more integrated, but less regulated, approach across Government departments and partnerships involved in forestry delivery. Closer synergy was needed between agricultural and forestry departments.

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<sup>68</sup> Head of Grants and Licensing, Forestry Commission England.

<sup>69</sup> National Inventory of Woodland and Trees 95-99. <http://www.forestry.gov.uk/website/ForestStats2006.nsf/byunique/woodland.html#four>

- Government was seen to have a central role in publicising the benefits of wood as a construction material, and as a biofuel. Greater capacity building, information supply and skills training were also requested.
- External market forces and further globalisation of wood processing were beyond the direct influence of woodland managers, but FC timber supply forecasts should become more sophisticated to take these factors into account.
- There were mixed views on whether all government support for woodland planting and management should be focused on delivering the environmental, social and other public benefits of forestry management. Those who disagreed considered that truly sustainable forest management required a viable wood-chain. They felt that Government should raise the profile of the woodland culture in the UK to the public, and highlight the connection between well managed woodland and wood-based products.

Once the EFS is published in May or June 2007, the implementation plan will be drafted by the Forestry Commission. The scale of success of the EFS is difficult to predict and will be partly but not entirely reliant on the level of RDP funding.

England have adopted a strong standpoint concerning support for 'production forestry' where the case for support for forestry in England clearly must relate only to 'non-market outputs', and where the sector itself is not prevented from being economically driven (Sandy Shattock<sup>70</sup>, *pers. comm.*). In contrast, policies in Scotland support 'public good forestry' (note a subtle difference from 'non-market' forestry) and as such embrace economic forestry. Perhaps lessons can be learnt from progress made in Scotland given flexibility in approach and definitions as to why and how timber production can be supported by public funds [136].

A further dimension in England is the internal restructuring in Defra ongoing during 2007, with the changes in the Forestry Policy Unit imminent (post EFS publication) (Sandy Shattock, *pers. comm.*). Teams will be based in future around projects, with specialists or experts moving in and out to provide advice. The impacts on forestry's profile in Government may be difficult to predict as, although the sector will be represented widely, expertise is likely to be spread widely.

In summary, the key features of English forest policy (Annex III) are: a strong emphasis on biodiversity, landscapes, recreation and environmental services, with less importance given to timber production and rural wood-working industries, although there is a growing interest in biofuels.

### **8.3 Northern Ireland**

Current forest and woodland cover in Northern Ireland is approximately 6.4 % of land area (86,000 ha) with almost 75 % of this owned by the state and being mainly in upland areas and the west of NI. A recent review of forestry policy in NI recognised the need for growth in forest and woodland cover and also recognised the economic, environmental and social benefits that additional forests would bring [137]. The strategy sets in progress a programme of legislative change, business improvement and service delivery [137]. This commits to the sustainable management of existing forests and woodlands, and to a steady expansion of tree cover to increase the diverse benefits that forests and woodlands provide. Specifically, the forest area will be increased by 1500 ha by 2008 at a rate of 500 ha/yr (including 100ha of SRC willow) and will double in the long term (probably 50 years), with the majority of this on private land.

Farmers, as the largest land owning group, will be encouraged to take the lead in planting and managing forests, although afforestation of agricultural land owned by public authorities should also be supported. To enable this, the Woodland Grant Scheme (administered by Forest Service) has been revised and simplified (February 2007). Sustainable management of farm woodlands is supported through NI agri-environment schemes. Following the introduction of Single Farm Payment, stacking of up to 50 % of entitlements, from 2006 scheme year, is possible when new woodland (including SRC) is created under the Woodland Grant Scheme.

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<sup>70</sup> Head of Forestry Policy Unit, Defra.

As part of the broader DARD Strategic Plan 2006-11<sup>71</sup>, a rural strategy<sup>72</sup> has been developed; a significant part of which will be delivered through the NIRDP. The Rural Strategy seeks to provide a broad strategic direction and framework for rural development policy in NI with the overall theme of “*diversifying the rural economy, protecting the rural environment and sustaining rural communities.*” In relation to forestry, encouragement will be given to various activities. These include expanding forest cover through alternative land use and conversion of agricultural land to woodland; supporting increased value-added activities and market development for agricultural, food and forestry products; conserving and upgrading the rural heritage; encouraging sustainable tourism; and exploiting the environmental/economic interface.

The rural development plan seeks to conserve the natural and built environment and landscape character across much of NI; in particular the character of farming and farmed landscapes where this is consistent with a competitive industry and desirable structural change. This could be aided by further development of farm woodlands, with the attendant gains in biodiversity and amenity, as well as realising the economic opportunities through building on existing initiatives such as Natural Resource Rural Tourism.

The NIRDP includes the following measures with relevance to forestry:

- Measure 1.2 Adding value to agricultural and forestry products and improving marketing capability.
- Measure 2.3 Agri-environment programme will encompass farm woodlands and there will be support for special environmental projects which may include public access.
- Measure 2.5 First afforestation of agricultural land will encourage planting of new woodlands.
- Measure 2.6 Forest environment payments will support the enhancement of the biodiversity and public amenity value of existing forests.
- Measure 3.1 Diversification into non-agricultural activities offers some opportunities for the development of forest-based micro businesses.
- Measure 3.5 Encouraging rural tourism built on sustainable development of natural resources, cultural and natural heritage could be relevant to forestry.
- Measure 3.6 Conservation and upgrading of the rural heritage can also provide support to projects providing public access and/or creating public amenity sites.

The NIRDP refers to Government’s Renewable Energy Policy and how it should contribute to those objectives (see Forestry Measures 2.4 and 2.5). Links have also been developed between the Forestry Measures and Measures within Axes 1 and 3 in relation to renewable energy.

DARD has also produced a separate Renewable Energy Action Plan<sup>73</sup> for the rural sector which should realise the potential of renewable energy and contribute to its development and delivery in a balanced and sustainable way. It is intended that best practice in this area should be encouraged through Focus Farms Scheme under Measure 1.1.

Regarding agri-environment schemes in NI, no Entry-Level Scheme is put forward, but the scope and participation in CMS will be broadened to encompass many of the principles of the proposed ELS.

It should also be noted that NI is currently undergoing a review of environmental governance and a review of public administration along with a new Assembly election, so further changes are likely.

### **8.4 Scotland**

Conifers dominate (78 %) the overall forest resource in Scotland, with broadleaves only accounting for 6 % of the public (FC) resource [11]. The private sector therefore plays an influential role in any matters relating to broadleaves. The FC owns 43 % of total forest land.

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71 DARD (2006) DARD Strategic Plan 2006-2011 Department of Agriculture and Rural Development 05/06 ISBN 1 85527 845 6

72 DARD (2006) DARD Rural Strategy 2007-2013 Department of Agriculture and Rural Development 10/06 ISBN 1855278863

73 DARD (2007) Renewable Energy Action Plan Department of Agriculture and Rural Development 06/07 ISBN 978-1855279711

New forestry grants will be introduced in Scotland in 2007 as part of the new Scottish Rural Development Programme (SRDP) for 2007-2013. This programme will bring together a number of rural schemes, including forestry grants, into an integrated system for rural support called Land Management Contracts. The proposed scheme aims to support the following activities:

- creation of new woodlands;
- management of existing woodlands;
- woodland improvement activities;
- activities which help to improve forestry business performance and competitiveness.

Woodland Improvement Grants for Scotland will be in the form of a range of generic land management support grants to include support for activities such as provision of access, management of priority habitats and business support measures.

Support for active management in Scotland is likely to be in relation to the following (Simon Hodge<sup>74</sup>, *pers. comm.*):

- managing grazed woodlands (i.e. wood pasture) prominent in unenclosed regions of the highlands. Management to promote regeneration would be advantageous and interest in emerging woodfuel markets may encourage more landowners to manage;
- support of silvicultural systems in coniferous plantations delivering greater structural diversity;
- promoting thinning as a means of increasing ecological and aesthetic values, although interest will be dependent on market values.

The impact of any increased level of increased management should be planned for to minimise negative effects. For example, there is a potential danger that the woodfuel market may develop sufficiently to lead to removal of deadwood by landowners seeking to maximise productivity (Simon Hodge, *pers. comm.*). FC Scotland is promoting 'minimal intervention reserves' targeted at biodiversity hotspots or taking advantage of natural processes. *e.g.* by leaving windblow pockets uncleared. Further policy levers may be required in the future to control management levels. The UK Forestry Standard may need to be amended to include a clearer set of cross compliance standards<sup>75</sup> (Simon Hodge, *pers. comm.*).

In summary, the Scottish Forestry Strategy, published in October 2006 [138] focused on climate change, timber, business development, community development, access and health, environment and biodiversity (Annex III). Scotland is unique in mentioning agroforestry in its strategy, is very active in promoting woodfuel schemes, and has an effective planting target of 15,000ha – being the annual rate needed to achieve its goal of 25% forest cover by 2050.

### 8.5 Wales

In 2005 there were an estimated 285,000 hectares of woodland in Wales, with non-FC woodland comprising 62 % (22 % conifers, 40 % broadleaves), and the FC estate heavily dominated by conifers (34 % conifers, 4 % broadleaves) [11].

In recognition of the need to balance social, environmental and economic functionality, FC Wales has stated in its corporate plan that it aims for: "an acceptable balance today, between the competing demands on our forests and woodlands", importantly adding the phrase "and to understand that the balance might change in the future" [139].

Following devolution of forestry matters to the Welsh Assembly Government in 1999 a strategy for Trees and Woodlands was produced in 2001 [140]. This prioritised had 5 priorities (Annex III):

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<sup>74</sup> Head of Policy, Forestry Commission Scotland.

<sup>75</sup> In order to retain eligibility for the Single Farm Payment farmers must guarantee to conform to the national implementation of a long list of agricultural regulations relating to animal welfare etc. They must also keep their land in 'Good Agricultural and Environmental Condition' (GAEC). One condition of GAEC is that there should be no encroachment of woody vegetation. This is a real problem in many upland parts of Europe where rural depopulation is changing the traditional balance between agriculture and forestry. Scotland has the reverse problem – but is potentially held to the same rule.

- woodlands for the people - using communally managed woodlands as social and cultural assets
- a new emphasis on woodland management - where management of neglecting forest and new sites for trees and woodland were stressed
- a location for world-class forest industries - with an emphasis for rural industry, farm woodlands and rural energy;
- a diverse and healthy environment - emphasising biodiversity, landscape and integration of woodlands with other land uses;
- tourism and recreation - to enhance woodlands for tourism and exercise).

In 2006, in response to Action 32 of the Wales Environment Strategy (2006), the Wales Woodland Strategy was updated to align it with the Environment Strategy and to take account of emerging themes such as Climate Change (Chris Edwards, *pers. comm.*<sup>76</sup>). Through the Woodland Strategy Advisory Panel, FC Wales are developing an Action Plan which sets out how the Strategy will address the issues.

To implement the Strategy, FC Wales developed and launched a new grant scheme in 2006. Better Woodlands for Wales (BWW) has a key characteristic that woodland management is based on a sound, long-term management plan, with grant-aid based on these plans. Aid is also provided to help write the management plan. The BWW scheme is designed to fulfil many of the requirements of the UKWAS standard so should make it much easier and cheaper for owners to secure certification if they choose to do so.

The Wales Forestry sector is compact in comparison to England and Scotland and in 2005, FC Wales and the then Wales Development Agency [WDA] supported the establishment of a Wales Forest Business Partnership. The Partnership (WFBP) is a voluntary grouping of businesses and organisations drawn from across the whole forestry sector in Wales. Its members believe that collaborative activities undertaken by the Partnership will strengthen the competitiveness of their businesses and the forestry sector as a whole (Chris Edwards, *pers. comm.*). The partnership is managed through an industry led Leadership Group with delivery through a knowledge hub - Woodknowledge Wales<sup>77</sup> and a marketing hub - Woodsource Wales<sup>78</sup>.

The NGO sector is particularly strong in Wales, and Coed Cymru is a beacon of good practice. It is a partnership of organisations dedicated to bringing Welsh broadleaf woodlands into sustainable management, following a century of neglect which left Welsh broadleaf woodlands in a state of serious decline. Coed Cymru provides help and advice on the sensitive management of woodlands and the sustainable use of woodland products, ranging from new plantations, to development of engineered wood products. Over 6148 woodland management and tree planting projects have been instigated, in all, just over 24,773 hectares. More than 400 businesses now regularly use Welsh hardwoods, including many recent converts<sup>79</sup>.

The Welsh agri-environmental scheme 'Tir Gofal' includes support for management of broadleaf woodlands, traditional orchards, parklands and hedgerows. By summer 2006 16,000 ha of semi-natural woodland was being managed under agreement<sup>80</sup>.

There is optimism in the forest sector in Wales, and a recent report concluded that a thriving and world class Welsh Industry could emerge, and retain added value within the Welsh wood-chain by progressively extending the use of local materials, and strengthening the primary processing sector (*e.g.* sawmilling and panels) [141]. Wood, as a fuel is an emerging theme (Chris Edwards, *pers. comm.*) in Wales. In the absence of a major wood energy crop programme, with timber production forecasts indicating virgin fibre demand exceeding supply and taking into account the size and geographical spread of the woodland resource, wood as a local heat source rather than as feedstock for centralised power generation is currently favoured. This route has the potential to maximise the energy recovery from wood as well as make a bigger contribution to local economic activity.

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<sup>76</sup> Head of Policy and Programme Development, FC Wales.

<sup>77</sup> <http://www.woodknowledgewales.co.uk/index.jsp>

<sup>78</sup> <http://www.woodsourcewales.co.uk>

<sup>79</sup> <http://www.coedcymru.org.uk/origins.htm>

<sup>80</sup> <http://www.ccw.gov.uk/News/index.cfm?Action=News&NewsArticleID=494>

In summary, whilst Welsh forest strategy has much in common with other UK nations, its emphasis is greater on: farm forestry and land-use integration, local wood-fuel production and marketing systems, rural wood-working and artisanal industries, establishment of new woodlands, rural employment, restoration of effective silviculture of broadleaves and maintenance of cultural heritage (Annex III).

## 8.6 Forest research activities

The Forestry Commission consulted each of the four countries in production of its Science and Innovation Strategy [142] and has established a Research Strategy Management Board to oversee the implementation of the Strategy. This Board has senior stakeholder representation from each of Scotland, England, Wales and Northern Ireland and is responsible for the research provided by both the FC's own Research Agency (Forest Research) and from other providers. Forest Research has staff based in England, Scotland and Wales and its primary aim is 'To support and enhance forestry and its role in sustainable development, by providing high-quality research and development in a well-run organisation' [143].

Forest Research undertakes a regular quinquennial review process the last of which in 2002<sup>81</sup> highlighted the quality of its research, but suggested scope for improvement through:

- more stakeholder input into research priorities;
- more emphasis on environmental and (especially) social aspects of forestry;
- more speculative research;
- better dissemination of research results.

As indicated by trends in forestry research keyword analysis [144] Socio-Economics, Marketing, Economics, Agroforestry and Tree Breeding have recently disappeared from the top ten, being replaced by Water quality/quantity, Molecular Genetics, Sustainability/Soils, Landscape Ecology and Ecology. Clearly the connection between productive management and delivery of public good outputs is not of current interest for either the public or private research sectors.

Table 16 Forestry research keyword analyses: costs by keyword (£000s in £s, 03/04, 04/05 and 05/06) [144]

Keyword	2003/04	Keyword	2004/05	Keyword	2005/06
Habitats	3310	Dissemination	3575	Dissemination	3370
Socio-economics	2863	Socio-economics	3366	Water quality/quantity	3019
Biodiversity	2306	Biodiversity	2132	Biodiversity	2245
Landscape ecology	2243	Marketing	1830	Climate Change	2032
Water Quality/Quantity	1508	Economics	1531	Molecular Genetics	1908
Agroforestry	1472	Climate change	1516	Habitats	1646
Soils	1351	Tree breeding	1469	Entomology	1457
Dissemination	1397	Agroforestry	1326	Sustainability/soils	1436
Climate Change	1262	Habitats	1296	Landscape Ecology	1335
Timber Prop/Pulp	1189	Entomology	1276	Ecology	1227

Under the theme of *sustainable management of the forest-industry woodchain* Forest Research is aiming to continue support to improve the competitiveness and sustainability of Britain's forest industries. In particular, this will include research on both the quality and quantity of wood production for purposes such as construction. The FR research strategy [68] highlights that tree breeding efforts with Sitka spruce has demonstrated improved volumes without loss of timber quality, and that these results should be transferable to other species.

There is an interesting lag-effect in tree-related research given the long generation times of the crop, and therefore time required to conclude research programmes, or the 'sunset period' required. This can leave a legacy of outdated research priorities, particularly when fashions and policies change relatively quickly (i.e. less than a tree generation), and given understandable reluctance to halt research projects early after

81 <http://www.forestresearch.gov.uk/website/forestresearch.nsf>

considerable input of resources. A key issue is the lack of investment in broadleaved tree improvement, and concern that this has confounded the inability of the sector to become sustainable. The British & Irish Hardwoods Improvement Programme ([www.BIHIP.com](http://www.BIHIP.com)) arose in the early 1990s as a private/public partnership to counter this. Despite welcome public funding (c. £13 k per year from FC GB: Peter Savill<sup>82</sup>, *pers. comm.*), good progress has been made by BIHIP in the testing and selection of the major tree broadleaved species [145]. It appears difficult to fully justify the continued focus on Sitka spruce, particularly since devolution, given that 68 % the woodland resource in England is broadleaved [11]. Indeed, spending forecasts for 2006/07 show that 83 % of FR tree improvement expenditure has been on conifer work (£300 k on breeding and production, and £477 k on selection and testing), with only £150 k expenditure on broadleaves (Steve Gregory<sup>83</sup>, *pers. comm.*).

Forest Research maintain that Sitka spruce remains the most important tree species in the UK, both on the basis of area planted and value to the processing industry. This is certainly true, and Sitka spruce represents a much larger percentage of planting in the second rotation than it did in the first. However the issues covered in this report (climate change, bioenergy, emissions trading, national emissions balances, CAP reform, certification, substitution for illegal imports, energy-accounting, sustainable housing etc.) give future opportunities for multi-purpose commercial farm-forestry to be exploited throughout the UK. A wider choice of species should clearly be retained for research and improvement. Greater support for economic broadleaved forestry would bring wider benefits, particularly in delivering cost effective public good across the majority woodland resource (i.e. broadleaves), particularly in England and Wales. The FC's Science and Innovation Strategy aims to support the needs of all four countries (England, Scotland, Wales and Northern Ireland) and under these circumstances some programmes will inevitably address the needs of one of the countries more than others.

Recent CAP changes and introduction of Rural Development Plans in each of the UK countries provides an opportunity to stimulate farm woodland research. It is therefore unfortunate that Defra has ended support of its farm woodland research programme<sup>84</sup>, with the closure of the last five year (2002-07) and £474,000 k research programme with East Malling Research<sup>85</sup> in March 2007. This research programme succeeded in taking forestry research forward using the most advanced technologies, in combination with strong stakeholder engagement. Agricultural crop breeding has received long-term support from public funds. Tree-breeding has particular problems caused by long forest rotations and payback times. It is very unlikely that the private sector will be able to fill gaps caused by withdrawal of public support.

**The European Forest-Based Sector Technology Platform [1] has the following objectives:**

- Meeting the multifunctional demands on forest resources and their sustainable management
- Enhancing availability and use of forest biomass for products and energy
- Developing intelligent and efficient manufacturing processes, including reduced energy consumption
- Developing innovative products for changing markets and customer needs
- Establishing a more efficient innovation system, including a better-structured research community
- Deepening the sector's scientific basis, including taking advantage of emerging sciences
- Establishing education and training schemes that meet high requirements
- Improving communication with the public and policy makers.

<sup>82</sup> Chair, British & Irish Hardwoods Improvement Programme.

<sup>83</sup> Research and Purchasing Manager, Forestry Commission, Edinburgh.

<sup>84</sup> E.g. Local provenance and native stock for farm woodlands – Contract WD0502.  
[http://www2.defra.gov.uk/research/Project\\_Data/More.asp?I=WD0502&M=CFO&V=HRI](http://www2.defra.gov.uk/research/Project_Data/More.asp?I=WD0502&M=CFO&V=HRI)

<sup>85</sup> <http://www.emr.ac.uk/>

### **8.7 Future policy drivers**

Significant changes in the development and delivery of policy over the next five years are anticipated (e.g.[68]):

- revision of devolved country forestry strategies delivered by FC;
- Natural England's new knowledge and research strategy;
- changing UK land use policies, focused on public service delivery and regeneration;
- carbon trading and energy policies (UK, EU and post Kyoto) that support biomass;
- policies (UK and EU) to harness knowledge and innovation for economic growth;
- agricultural policies (UK and EU) following CAP reform;
- EU Forest Strategy (2006)
- EU 6th Environmental Action Programme & EU environmental Directives;
- industry-led Technology Platforms shaping EU Framework [1].
- Trade 'restraining' policies such as incentives to favour certified timber or producers
- Possible higher tariffs or quotas on 'illegal timber (e.g. FLEGT – Forest Law Enforcement Initiative).

## 8.8 Summary

The nations differ widely, both in terms of their forest resource (type, ownership etc.), and the policy instruments and interests at play. The forestry strategy review (EFS) currently underway for England offers a new opportunity for Defra, as policy developers, to draw together the myriad of issues for the good of forestry. It will be interesting to note how the published EFS addresses the concerns of the sector, and even more so, how the FC and NE draw together the implementation plans. Wales and Scotland clearly have different approaches to England, apparently being more flexible and benefiting from closer and more positive working relationships with the private sector. The influence of political expediency, and relationships between scientific evidence, professional expertise and/or stakeholder acceptability might need to be reviewed in the sector.

Forest Research has laudable ambitions in becoming a world-renowned centre of excellence. FR is as keen now as it has always been to provide practical research of value to forestry, and is committed to practical delivery. Given the increasing level of challenges facing the sector as a whole, and the significant role to be played by the private sector, balancing academic excellence with provision of practical research outputs will continue to be important. The diverging country strategic directions, post devolution, present FR with an opportunity to diversify its research programme in line with changing stakeholder requirements.

### Box 6: UK Forest Policy - issues for further study.

- Are there legitimate levers that can be used to encourage more use of home-grown material? Which of these levers, or others, should be promoted and how?
- What barriers exist limiting the degree of management in UK woodlands?
- Does the 'strategic timber reserve' policy need to be revisited with the aim of encouraging bioenergy production, and increased use of low-energy building materials? What are the timescale implications (delay between planning and delivery)?
- How can the public support for forestry be focused more precisely at generating the public goods and services expected by society rather than contributing to private profit?
- The need for a cost-benefit analysis of likely benefits/disbenefits from increased investment in broadleaved tree improvement.
- How can grants be used innovatively and in a manner that enforcement regulations don't stifle silvicultural or agroforestry experimentation?
- The role of the FE in providing an extension service for the private sector.
- How can haulage costs to chip mills be reduced, and what is the carbon footprint of the woodfuel supply chain?
- What will be the implications of climate change on average forestry yields and the impact of extreme events such as drought or storms?
- Do we now have the socio-economic tools (valuation of the environmental and social impacts of forestry) to undertake the next step in marrying these impacts with policy and delivery?
- Ensuring that certification does not act as a barrier to woodland management. Establishing a simple framework for woodland owners/wood users to meet CPET category B requirements may offer some potential for achieving 'legal and sustainable' without having to go via the certification route.
- A large proportion of the UK private woodland estate has no management grant – would an inventory of these woodlands, together with information on ownership and future management plans, assist in linking the woodchain and encouraging management?

## 9 Conclusions

This section follows the main themes identified in the analysis of UK national forestry strategies ([Annex III](#)). It considers trends in international timber trade, and potential impacts on the UK timber and wood-chain. It also considers international factors such as climate change, certification and bio-energy and the implications these may have for forest communities, for environment and amenity and for biodiversity.

### 9.1 Timber

- Wood is the ultimate sustainable raw material. Lifecycle greenhouse gas emissions in timber-construction can be as low as 20 % of conventional materials, and wood will play an important part in delivering the Governments' recent pledge of zero emission new housing by 2011. Further research on lifecycle energy analysis is needed in UK conditions, together with support for research on engineered-wood products, and wood-chain integration.
- The UK nations have different emphases on production forestry: Scotland and Northern Ireland have ambitious new-planting targets; Wales has an emphasis on managing existing woodlands to increase timber production and supporting local use of timber; England remains focused on the environmental and social benefits of existing woodlands, with most new planting in community woodlands, and a growing emphasis on encouraging woodfuel production. Parts of England have very low forest cover, however, and species and silvicultural priorities vary greatly between regions. The trend to regionalisation of forest strategies could be matched by greater flexibility in allocation of forestry budgets to allow each region to respond appropriately to opportunities arising from climate change, the bio-energy revolution, land-use change, and differential access to import and export markets. Increasing emphasis on reducing energy-costs and 'wood-miles' will favour local procurement and planning. Regionalisation also encourages innovation and the celebration of diversity.
- Globalisation has increased world trade in timber, with the volume of exports trebling between from 38.3 Mm<sup>3</sup> in 1961 to 114.3 Mm<sup>3</sup> in 2000, although the major flows are within continents. Surpluses from Russia and Eastern Europe have fuelled over-supply in Western Europe during the past 15 years, and helped deflate prices. Economically sustainable annual yield in Russia may be as much as 250 Mm<sup>3</sup>, or 90 % more than is currently harvested, but two factors will prevent much of this potential increase in roundwood being exported to Western Europe. One factor is the approximate 4Mm<sup>3</sup>/annum increase in roundwood imports to China, with more than 80 % coming from Russia. The second factor, announced in February 2007, is a massive increase in taxes on timber exports, rising to from 5 % now to 80 % by the end of 2008.
- Europe's forest resource will continue to expand through a combination of increasing yields (climate change, atmospheric fertilisation, silviculture) and increasing area (planting or natural regeneration of farmland). Fellings are currently only 45% of annual increment in Western Europe, but this is expected to rise as markets strengthen.
- Total consumption of wood raw materials in Western Europe will increase from 525 to 771 million tonnes in 2020. Production and consumption of softwood sawlogs are likely to be in balance at 90 Mm<sup>3</sup> by 2020, whereas the annual need for hardwood sawlog imports will rise from 6 Mm<sup>3</sup> to 8.4 Mm<sup>3</sup>. Forest products trade will intensify further, both within Europe and with the rest of the world.
- The role of domestic timber needs to be promoted in the UK (and its nations/regions) so that revenue flow to woodland owners is increased, and with the aim of expanding the total wood sector (i.e. grow wood use).
- Climate change, emerging biofuel markets, and CAP reforms offer opportunities for new silviculture like 'agro-energy-forestry' or revival of older techniques such as coppice-with-standards. Mechanisms to reduce 'perverse' disincentives to expansion of forestry (e.g. ineligibility for sparse farm woodlands for payment of the single farm payment) should be investigated, opportunities to optimise silviculture for co-production of quality timber and bio-energy explored, and new hardwood and softwood varieties developed which are suited to future climates.

## 9.2 Business Development

- Procurement is a key factor and involvement of the public sector and the construction sector with the UK forest sector needs to be strengthened. The EU Rural Development Regulation includes measures to support rural wood and energy processors. Hopefully these options will be implemented in the UK Nations
- UK procurement policies are also linked to UK and European attempts to avoid the import of illegally logged timber or timber products from 3<sup>rd</sup> countries. The EU FLEGT initiative and certification schemes such as PEFC and FSC are crucial in this regard. Successful control of illegally imported timber and products is likely to significantly increase wood prices, particularly for quality hardwoods.
- Life-cycle energy analysis, carbon accounting, environmental footprints, and wood-miles are all tools for analysis of energy, emission and environmental costs involved with alternative construction methods or land uses. Simple financial comparisons will not be enough, as 'zero-emissions' housing standards and product certification become more widespread. Timber as a construction material must benefit from these new evaluation tools and policy instruments.
- Private and public woodland owners need to work together with owners of wood processing units to ensure continuity of supply. Potential growth in demand will require renewed effort on inventories of private woodlands, and modelling of resource availability under different economic and environmental scenarios.
- Continued investment in hardwood sawmills and processing plants will be necessary to support this depressed sector, particularly after closure of the Sudbrook mill, to support thinning costs incurred in woodland management.
- Socio-economic studies of the whole wood-chain are needed to identify pinch points where financial assistance can be optimised – e.g. comparing the efficiency of funds devoted to local processing of timber with similar funds devoted to woodland management grants.
- Public procurement policies and Government incentive schemes should be further encouraged to support the use of local and sustainable woodland products and services.
- Planning applications for wood processing industry could be simplified, together with support for regional databases of timber inventory and potential future supply modelling. This would ensure the economic sustainability of forestry industries and to encourage the rural economy.
- There is a continuing need for traditional coniferous and broadleaved plantations as well as new energy plantations, and a preference for new plantations to consolidate existing ones.
- Support of the forestry sector in the form of relevant research and development is crucially important and needs to be regularly reviewed and flexible. It also needs to be more participatory, and exploit the opportunity to work with private owners and farmers. The diverging UK country strategic directions post devolution present research with an opportunity to diversify in line with changing stakeholder requirements.
- Financial viability of forest management is currently marginal, and possibilities to increase profitability may be several years away. Support for forest management, or forest-environment payments should generate upstream benefits, and socio-economic studies of value for money are needed. These studies should include valuation of non-market benefits and energy accounting.
- The ability of European forest owners to respond to the predicted upturn in markets and timber prices is potentially worsened by a diminishing skilled workforce, together with regional studies of the number of workers directly or indirectly dependent on the forest sector. Improvements in employment quality such as wages, training and career prospects, as well as working environment and safety, will be critical to maintain adequate levels of new workers, in particular women.
- An economically viable industry (e.g. through an increased share of domestic timber consumption or development of woodfuel) is likely to require new legislative frameworks to deliver social and environmental outputs.
- The sector is poorly organised and the woodchain disjointed. More information on the identity and motivations of private woodland owners and the resource is required, hand-in-hand with improved product development, and co-ordinated procurement and marketing initiatives.

- Regional and local marketing advantages need to be explored and promoted, with lessons potentially to be learnt from continental European working practises.
- Forest certification is increasing in importance in the woodchain. Strategies for supporting owners in achieving a required status should be explored (e.g. group certification, incorporation in grant schemes), in collaboration with policy makers.
- Arguments that support domestic timber production, procurement and marketing need to be developed and communicated, to attract public funding towards innovation and business development. Forestry and sustainable woodland management clearly provides high value public benefits but further studies are required to quantify the public benefit and compared with the modest remuneration provided to woodland owners.

### 9.3 *Climate Change*

- Locally sourced timber will clearly use less energy and carbon in transportation: methodologies need to be developed to compare both energy and financial costs of different sizes and locations of wood-processing and biofuel plants.
- Promotion of the use of timber as a renewable, versatile raw material and should increase the efficiency of the timber supply chain to improve sector competitiveness, and minimise the social and environmental impacts of timber transport.
- Another major factor increasing demand for wood is the biofuel revolution. Whilst this report in preparation the EU raised its renewable energy target from 12.5 % to 20 %, and the proportion of transport fuel to be met from biofuels from 7.5 % to 10 %. Methanol or heavy fuel oil produced from timber are key to achieving the latter target. Studies in both the UK and Europe have demonstrated that the available wood resource is much less than potential demand, and that significant competition with other timber markets are likely to develop. Environmental constraints on production will accentuate this competition.
- In the UK there are 5 power-stations in the planning or construction stage with capacities in excess of 30 MW, and a total annual intake in excess of 1.5 million green tonnes. Added to this are several hundred non-domestic heating or combined heat and power plants. The UK wood bioenergy strategy is therefore seeking to identify measures to progressively deliver 2 M green tonnes of wood biofuel per annum. This compares to the current home-grown delivery of 8.1 M green tonnes to the UK wood processing industry, and cannot fail in the medium term to increase average prices available for UK roundwood.
- Public pressure for carbon accounting, carbon offsetting schemes, and certified timber may allow local suppliers to compete better with imports, particularly as the latter rises in price. Timber quality will remain important however, and the hope is that biofuel markets for thinnings will make thinnings and management economic again.
- Recycling and residue use will continue to expand, but energy costs of these need to be considered.
- Climate change offers both opportunities (mitigation and adaptation roles) and threats to the forest sector and the UK woodlands. It may make some species less suitable in certain areas, and open opportunities for others. The provenance of planting material becomes more important, and insistence on local origin less so. Concerns over pest outbreaks are real and require continuing research.
- Increasing winter storm frequency, and risk of summer fires require silviculture to be re-evaluated in certain areas. Woodlands have a significant role in flood control, and can be used to channel flows safely. They're valuable in controlling nitrate leaching to water courses in sensitive areas.
- Woodlands have a role in adsorption of gaseous emissions, and can be sited around livestock and poultry units for this reason.
- Land use policy and incentives should be linked to opportunities for bioenergy use (carbon substitution) and expansion of the woodland estate (carbon sequestration). Calculations of public benefits should include these factors, and be made at a regional scale to encourage public appreciation of the services provided by forests.
- Need to consider how climate change will directly and indirectly affect other woodland benefits such as natural resource protection.

- Control of imports of illegally logged tropical hardwoods (or perhaps softwoods created on plantations which were originally species-rich rainforests) may be justified by calculation of large their energy and environmental footprints.

#### **9.4 Community Development**

- Closer working relations between interests representing social, environmental and economic elements of the sector must be developed to counter polarisation of strategies and vision.
- The emerging energy revolution provides great opportunities for the sector, but the implications for biodiversity and landscape must be considered and planned for locally. As with climate-change above, regional solutions for regional problems should be encouraged – with opportunities provided for local planners and landowners to experiment and innovate.
- Woodlands offer an attractive outdoor setting for community activities such as education and volunteering, as well as contributing to mental and spiritual well-being. In addition to these social and environmental benefits, urban woodland can generate economic benefits, for instance by improving the attractiveness of an area to inward investment. Management of urban woodland will be particularly stimulated by the development of bioenergy markets for woodchips
- Developing the social outputs from green infrastructure is as important as managing the physical resource itself. Increasingly people are becoming involved in the management and use of their local woodland, often through community forestry projects. Its role in education and lifelong learning will be greater realisation of the role of local forestry in substituting for emissions elsewhere.
- Afforestation programmes, such as those in Scotland and Northern Ireland, are likely to use regional strategies, or indicative plans, to decide on suitable areas, designs and species choice. The emphasis is on increased local involvement decision-making.

#### **9.5 Access & Health**

- As international travel is increasingly taxed, and the carbon-saving benefits of woodland-based tourism and recreation can be emphasised. Priorities will remain: using woodlands to help create a high-quality visitor experience; and to promote physical and mental health through access to woodlands for all. Forests also have the potential to filter gaseous and particulate pollutants, to reduce the entry of nitrates to watercourses, to counteract erosion, and provide landscape shelter. But large forest blocks are not the only solution: parkland trees, timber-belts and grazed woodlands are particularly appreciated landscape features.
- Quantification in financial and energy terms of the environmental and social benefits of forests and forestry remains important.

#### **9.6 Environment**

- Areas available for wood supply may decrease, due to increasing demands to set-aside forests for other functions, such as: biodiversity conservation; recreation; and protective functions. These constraints need to be included in bio-physical or socio-economic models of potential wood supply wood supply.
- Increasing bioenergy and wood markets provide the opportunity to expand conventional forestry, but also to diversify their environmental impact: timber-belts, parklands, riparian buffers, hedgerow-trees, urban planting, wood-pastures, pasture woodlands, silvo-arable systems, coppice-with-standards, greater use of mixtures, are all potential responses which offer opportunities for greater integration of farming with forestry..
- Whole-tree harvesting, and complete removal of harvesting residues has potential to reduce growth in following rotations and cause erosion or soil compaction.
- More habitats for wildlife are needed in and around our towns and cities to secure future biodiversity and bring the benefits of the natural environment closer to people. Increased biofuel markets will stimulate this.

### 9.7 Biodiversity

- Given the very wide delivery of public good delivery outputs, a stronger cross-sectoral approach (Government departments/agencies, all stakeholders) is required. Stakeholders in the forest sector should intensify the policy dialogue, proactively drawing the attention of other policy areas (such as agriculture, trade, environment and energy) to the social and environmental benefits of sustainable forest management, as one component of the overall sustainable development of society. For example, this should be a major challenge for forestry experts and policy influencers in the restructured Defra, and for its delivery agents Natural England and the Forestry Commission England.
- Research strategies need to retain flexibility to address sector needs and to cross-sectoral approaches. Forestry and farming need to be considered together, and increasingly be seen as providing solutions to climate change, carbon accounting and biofuel harvesting. Harvesting may become more intensive in many areas, including removal of habitats important for biodiversity. This will need study and recognition that retention of old wood and residues may need to be obligatory in certain areas.
- Different attitudes to the balance of production and conservation in the UK Nations, and in English regions are inevitable and empowering. In a changing physical and economic climate, regulations for what is permitted as 'good forest management' in grant schemes may require local rather than national decision. Innovation can be encouraged, but arrangements made to record results wherever possible.
- Evidence on the efficiency of public spend on woodland conservation, termed 'conservation returns', should be strengthened and disseminated. The challenge is to improve habitat quality by bringing more woodland into sensitive management, whilst continuing to enhance the biodiversity in good quality woodlands and protecting all woodlands from pests and other damage.
- Managing for biodiversity is important, not just within the woodlands, but also in the wider countryside, in order to create a mosaic of semi-natural habitats which provide corridors for wildlife and help to buffer valuable sites, particularly ancient woodlands, from external impacts such as pesticide drift. Coppice and other bio-energy plantation can be included in this planning.

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## 11 Annex I: Authors

**Gerry Lawson** is a forest scientist and a science programme manager. He has worked on a range of ecological, agricultural, forestry and economic consultancies in four continents and has around 90 publications. In the 80s he published extensively on biofuel crops, including economic analyses. He has researched on silviculture and plantation economics in West Africa, and was a Coordinating Lead Author for a chapter in the IPPC Handbook on 'Land Use, Land Use Change and Forestry'. He has been European Liaison Officer for the Natural Environment Research Council, and a Director of the Partnership for European Environmental Research (PEER) and the Edinburgh Centre for Tropical Forests (ECTF). He has recently completed components of two EU projects dealing with the policy aspects and non-market services of farm woodlands in Europe and Central America. He is currently leading parts of an EU ERA-Net to coordinate national biodiversity research programmes (including forest biodiversity), and is a member of the Forest Research Coordinating Committee and the European Platform for Biodiversity Research Strategy. Gerry is Chair of the UK Farm Woodland Forum and a member of the Institute of Chartered Foresters, the Institute of Biology, the Royal Scottish Forestry Society and the Commonwealth Forestry Society.



**Gabriel Hemery** is Director of an independent forestry think-tank, Forestry Horizons. He is a forest scientist, environmental programme manager and forestry policy-thinker. Gabriel has practical hands-on experience in land management, extensive knowledge of the forest sector and is a specialist in hardwood forestry research. He has conducted a range of consultancies for Government, NGOs and the private forestry sector and worked widely in collaborative international research programmes. The author of 35 papers and articles, he has acted as editor for an international forestry journal, and is a member of the international editorial board of the CABI Forest Science Database. Gabriel has held several senior positions in the UK environmental sector including Head of Land Science and Director of Land Operations for the Northmoor Trust in Oxfordshire and Director of Development for the Botanical Society of the British Isles. He has been responsible for creating a new 30 hectare woodland in Oxfordshire, England, personally planting over 25,000 trees, establishing and co-ordinating more than 25 field trials across the UK and Ireland, developing Britain's first research centre dedicated to hardwood trees. Gabriel was secretary of an international forestry science group, BIHIP, and collaborated widely with scientists from Europe and North America in tree research and agroforestry programmes. He is a trustee for Woodland Heritage and a committee member of the Forestry Commission's Regional Assembly for the South East. Gabriel is a Chartered Forester (and professional examiner for the ICF), a member of the Institute of Ecology and Environmental Management and a Chartered Environmentalist.



Dr Gabriel E Hemery CEnv MICFor  
 Director, Forestry Horizons  
 Manor House  
 Little Wittenham  
 Oxon OX14 4RA England  
 +44(0)1865 408016  
[g.hemery@forestryhorizons.eu](mailto:g.hemery@forestryhorizons.eu)  
[www.ForestryHorizons.eu](http://www.ForestryHorizons.eu)

## 12 Annex II: Glossary of terms

<i>afforestation</i>	The establishment of trees by sowing, planting or natural regeneration on areas from which trees have always or very long been absent.
<i>agroforestry</i>	Agroforestry is a dynamic, ecologically based, natural resources management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels. See <a href="http://www.icraf.cgiar.org/">http://www.icraf.cgiar.org/</a>
<i>biodiversity</i>	The variability among living organisms from all sources including, <i>inter alia</i> , terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
<i>CBD</i>	see Convention on Biological Diversity
<i>certification</i>	A process of labelling wood that has been harvested from a well-managed forest. Examples include FSC <a href="http://www.fsc-uk.org/">http://www.fsc-uk.org/</a> and PEFC <a href="http://www.pefc.co.uk">www.pefc.co.uk</a> .
<i>ConFor</i>	Confederation of Forest Industries. It was established to help build the market for timber and timber products, create a supportive policy environment for the forest industries and to help our members become more competitive and successful. More information: <a href="http://www.confor.org.uk">http://www.confor.org.uk</a> .
<i>Convention on Biological Diversity</i>	Signed by 150 government leaders at the 1992 Rio Earth Summit, the Convention on Biological Diversity is dedicated to promoting sustainable development. Conceived as a practical tool for translating the principles of Agenda 21 into reality, the Convention recognizes that biological diversity is about more than plants, animals and micro organisms and their ecosystems – it is about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live. (Further information: <a href="http://www.biodiv.org">http://www.biodiv.org</a> )
<i>ecosystem services</i>	<p><b>Purification and Detoxification:</b> filtration, purification and detoxification of air, water and soils</p> <p><b>Cycling Processes:</b> nutrient cycling, nitrogen fixation, carbon sequestration, soil formation.</p> <p><b>Regulation and Stabilisation:</b> pest and disease control, climate regulation, mitigation of storms and floods, erosion control, regulation of rainfall and water supply.</p> <p><b>Habitat Provision:</b> refuge for animals and plants, storehouse for genetic material.</p> <p><b>Regeneration and Production:</b> production of biomass providing raw materials and food, pollination and seed dispersal.</p> <p><b>Information/Life-fulfilling:</b> aesthetic, recreational, cultural and spiritual role, education and research.</p>

	Further reading: <a href="http://www.ecosystems-services.org.uk/">http://www.ecosystems-services.org.uk/</a>
<i>FAO</i>	The Food and Agriculture Organization of the United Nations. More information: <a href="http://www.fao.org/unfao/about/index_en.html">http://www.fao.org/unfao/about/index_en.html</a> .
<i>FLEGT</i>	The Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan was adopted by the European Commission in May 2003 as part of the EU's response to the call for action at the World Summit on Sustainable Development. The Action Plan sets out a new and innovative approach to tackling illegal logging, linking good governance in developing countries with the legal trade instruments and leverage offered by the EU's internal market. More information: <a href="http://www.dfid.gov.uk/eupresidency2005/flegt.asp#FLEGT">http://www.dfid.gov.uk/eupresidency2005/flegt.asp#FLEGT</a>
<i>forest ecosystem</i>	An ecological system composed of interacting biotic and abiotic components of the environment in which trees are a major constituent, such that their canopies cover 20 percent or more of the area. (from www.FAO.org)
<i>forestry</i>	Activities related to the management of forests and other wooded land for the production and supply of wood and/or other goods and services.
<i>IPCC</i>	The Intergovernmental Panel on Climate Change (IPCC) has been established by WMO and UNEP to assess scientific, technical and socio-economic information relevant for the understanding of climate change, its potential impacts and options for adaptation and mitigation. It is currently finalizing its Fourth Assessment Report "Climate Change 2007". The reports by the three Working Groups provide a comprehensive and up-to-date assessment of the current state of knowledge on climate change. Further information: <a href="http://www.IPCC.ch">www.IPCC.ch</a> .
<i>Land Use Policy Group</i>	The Land Use Policy Group (LUPG) comprises these GB statutory conservation, countryside and environment agencies. The LUPG aims to advise on policy matters of common concern related to agriculture, woodlands and other rural land uses. It seeks to improve understanding of the pros and cons of policy mechanisms related to land use, particularly farming and forestry; to develop a common view of desirable reforms to existing policies; and to promote these views. Further information: <a href="http://www.lupg.org.uk">http://www.lupg.org.uk</a> .
<i>LUPG</i>	see Land Use Policy Group
<i>Pan-European Biological and Landscape Diversity Strategy</i>	PEBLDS is an innovative and proactive approach to stop and reverse the degradation of biological and landscape diversity values in Europe. Innovative, because it addresses all biological and landscape initiatives under one European approach. It is proactive, because it promotes the integration of biological and landscape diversity considerations into social and economic sectors. PEBLDS reinforces the implementation of existing measures and identifies additional actions that need to be taken over the next two decades. It also provides a framework to promote a consistent approach and common objectives for national and regional action to implement the Convention on Biological Diversity.
<i>PAWS</i>	Planted Ancient Woodland Sites
<i>PEBLS</i>	see Pan-European Biological and Landscape Diversity Strategy

<i>PSA</i>	see Public Service Agreement
<i>public service agreement</i>	The PSA target for SSSIs is “Bringing into favourable condition 95 per cent of all nationally important wildlife sites (Sites of Special Scientific Interest) by 2010.”
<i>protected area</i>	A protected area is an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, managed through legal or other effective means. (from <a href="http://www.iucn.org">www.iucn.org</a> )
<i>SFM</i>	see Sustainable Forest Management
<i>short rotation forestry</i>	Short-rotation forestry is the practice of cultivating fast-growing trees that reach their economically optimum size between eight and 20 years old. Conventional forestry rotations in Britain vary between 40 and 150 years, depending on species. When felled, SRF trees are replaced by new planting or, more usually, allowed to regenerate from the stumps as coppice. It is a very old system of woodland management that has received recent attention because of the potential new market for its products.
<i>sustainable forest management</i>	The stewardship and use of forests and forest lands in a way, an at a rate, that maintains their biological diversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological economic and social functions, at local, national and global levels, and that does not cause damage on other ecosystems. (from <a href="http://www.FAO.org">www.FAO.org</a> )
<i>sustainable development</i>	The management and conservation of the natural resources base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in agriculture, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally viable and socially acceptable. (from <a href="http://www.FAO.org">www.FAO.org</a> )
<i>UKWAS</i>	see UK Woodland Assurance Standard
<i>UK Woodland Assurance Standard</i>	The UK Woodland Assurance Standard (UKWAS) is an independent certification standard for verifying sustainable woodland management in the United Kingdom.
<i>UNFCCC</i>	see United Nations Framework Convention on Climate Change
<i>United Nations Framework Convention on Climate Change</i>	The United Nations Framework Convention on Climate Change (UNFCCC) has the goal of preventing "dangerous" human interference with the climate system. 189 countries around the world have joined an international treaty that sets general goals and rules for confronting climate change. More information: <a href="http://unfccc.int">http://unfccc.int</a>

<i>Woodland Policy Group</i>	The Woodland Policy Group (WPG) is a subgroup of the LUPG. Members represent Countryside Council for Wales, Environmental and Heritage Service, Joint Nature Conservation Committee, Natural England, and Scottish Natural Heritage. It provides advocacy and advice to national forestry departments where there is a joint GB interest, and input into European and other international policy-making.
<i>WPG</i>	see Woodland Policy Group

### 13 Annex III: Comparison of UK nations’ forest strategies

This section provides a comparison of key issues and themes in Forest Strategies of the UK Nations, based on the seven ‘Key Themes’ in the Scottish Forestry Strategy, mapped against relevant comments within the other Strategies ([138, 140, 146, 147]).

Issue	England	Scotland	Wales	N. Ireland
<b>1. Planting Target</b>	None (except in national forests). ( <i>Habitat Action Plan target is restoration of 375,000 ha of ancient woodlands from 535,000 to ‘condition’ by 2015</i> )	Increase forest cover from 17.1 % to 25 % by 2050 – equivalent to 15,000 ha/year.	None	Double forest area by 2050 – i.e. 6% to 12% - equivalent to 85,000 ha or 1,900 ha/year
<b>2. Climate Change</b>	The need to reduce greenhouse gas emissions and manage water resources more effectively will have a major impact on woodland policy. Need to consider how climate change will directly and indirectly affect other woodland benefits such as natural resource protection. Woodland managers and land owners need help in predicting the effects of climate change and advice on how to alter their management. The contribution of woodland creation to carbon savings is worthwhile but limited: carbon sequestration alone is not a reason for supporting afforestation, but fuelwood is a justification for bringing woodlands back into management.	Increase awareness of how the forestry sector can help to tackle the threats of climate change Ensure that Scotland’s woodlands and the forestry sector meet their full potential in facilitating ecological, economic and social adaptation to climate change Capture opportunities for forestry to help mitigate climate change through the use of wood resources and habitat enhancement. Increase the amount of carbon locked up by Scottish forestry.	Interest in the destruction of the tropical forests and their interaction with global climate, links back to the local environment and woodland as part of the local heritage. Incremental changes in climate and increases in populations of some insects and mammals, raise concerns for the future management of some woodland habitats and species. A vibrant renewable-energy sector is part of our responsibility to respond to global climate change.	We will also ensure that policies developed by different Departments are joined up, so that, for example, Department of Enterprise Trade and Investment policies on developing renewable energy capability will create a demand for wood based energy and forest design and management will support Department of the Environment policies on conserving biodiversity
<b>3. Timber</b>	Wood is a sustainable material, especially in the construction industry. Locally sourced timber will use less energy in transportation. Public procurement policies and Government incentive schemes might be used to encourage the use of local and sustainable woodland products and services; as exemplified by the woodland and timber led initiatives Naturally Wood and the UK Woodland Assurance Scheme for timber certification.	Maximise the economic potential of Scotland’s timber resources. Encourage continued investment in timber processing by sustaining a predictable and stable supply of good quality timber. Promote the use of timber as a renewable, versatile raw material. Increase the efficiency of the timber supply chain to improve sector competitiveness, and minimise the social and environmental impacts of timber transport Encourage continuing development of the hardwood timber sector in Scotland.	The 2nd priority in Wales is ‘a new emphasis on woodland management’ aiming to provide increasing benefits to owners and the public. This would learn from current best practice and provide support to owners and managers <ul style="list-style-type: none"> <li>• to promote best practice in woodland management;</li> <li>• to move to a greater use of continuous-cover systems; and</li> <li>• to find appropriate sites for new trees and woodland.</li> </ul>	The 2 <sup>nd</sup> priority is ‘to continue a steady supply of timber to ensure the economic sustainability of forestry industries and to encourage the rural economy’. The 6 <sup>th</sup> priority is to ‘improve the sustainable management of the forestry resource in NI’. While economic development through timber production will still be a major objective, in the long term it need not initially be the dominant objective. Thus, there is a continuing need for traditional coniferous and broadleaved plantations as well as new energy plantations, and a preference for new plantations to consolidate existing ones.
<b>4. Business Development</b>	The English strategy has a ‘public benefit focus’, i.e. funds for the forest sector are focused on identifiable public benefits where there is evidence that these are needed and would not happen otherwise. Developing capacity in the forest sector is part of this.  One aim is to improve the overall competitiveness	Help to enhance the sustainable economic basis for forestry and develop the economic potential of Scotland and its regions. Support rural diversification and help sustain fragile rural communities. Help add value to the Scottish tourism industry and increase the benefits of it to woodland owners and local communities.	The 3 <sup>rd</sup> Welsh priority is to ‘create a location for world-class forest industries’. To utilize timber production it is vital that wood processors are helped to develop their businesses and retain skilled jobs. Linkages to other businesses in agriculture, tourism and the rest of the economy will be created to:	Forestry policy in Northern Ireland has priorities of: <ul style="list-style-type: none"> <li>• The sustainable management of existing woods and forests, and</li> <li>• A steady expansion of tree cover to increase</li> </ul>

## World timber trade and implementing sustainable forest management in the United Kingdom

13.

Annex III – Comparison of UK nations' forest strategies

	of the forest sector and the wood supply chain so that businesses can access new markets – for example, for renewable energy. This could include training, promoting co-operation between forest owners and also along the supply chain, and improving dissemination of information, more efficient use of resources, and environmental best practice. Assistance may come through the Rural Development Programme for England 2007-13, targeted through Regional Development Agencies.	Provide opportunities for acquiring new skills and experience through forestry and improve the skills base of the forestry sector.	<ul style="list-style-type: none"> <li>• develop the wood supply chain for product development and marketing;</li> <li>• provide support for farm woodlands and the wider rural economy; and</li> <li>• foster the development of renewable energy based on wood.</li> </ul>	<p>the many diverse benefits that forests provide.</p> <p>The 1<sup>st</sup> priority is to 'provide those owning land with the information and the means to consider afforestation as a realistic alternative land use'.</p>
<b>5. Community Development</b>	<p>Woodlands offer an attractive outdoor setting for community activities such as education and volunteering, as well as contributing to mental and spiritual well-being. In addition to these social and environmental benefits, urban woodland can generate economic benefits, for instance by improving the attractiveness of an area to inward investment.</p> <p>Developing the social outputs from green infrastructure is as important as managing the physical resource itself. Increasingly people are becoming involved in the management and use of their local woodland, often through community forestry projects.</p>	<ul style="list-style-type: none"> <li>• Help to improve the quality of life and well-being of people across Scotland.</li> <li>• Develop forestry's role in education and lifelong learning.</li> <li>• Enhance forestry's engagement with communities.</li> <li>• Support community ownership and management on the national forest estate, where this will bring increased benefits.</li> </ul>	<p>The 5<sup>th</sup> Welsh priority is to enhance 'tourism, recreation and health'. With woodlands provide a landscape structure and a setting for many tourist enterprises. Priorities are: a) to use woodlands to help create a high-quality visitor experience; and b) to promote health through access to woodlands for all communities.</p>	<p>The 4<sup>th</sup> priority is to 'provide a statutory basis for realising the vision'</p> <p>An afforestation programme will a) use the new Rural Development Regulation to encourage the development of new afforestation and target areas for action; b) availability of opportunities for public sector afforestation; c) publish maps showing where afforestation is to be encouraged.</p>
<b>6. Access &amp; Health</b>	<p>Emphasis on the effective use of existing woodlands where they are available and where access and biodiversity objectives can be balanced.</p> <p>In places with little existing woodland close to where people live, and a lack of other high quality green space, support for woodland creation will be appropriate.</p> <p>The priority will be to identify areas of significant social disadvantage where people would benefit from better access to a quality environment and the opportunities for activity that woodland offers.</p>	<p>Make access to woodlands easier for all sectors of society.</p> <p>Use woodland access to help improve physical and mental health in Scotland.</p> <p>Provide a greater range of ways for people to enjoy woodlands.</p>	<p>The 1<sup>st</sup> priority in Wales is to 'provide environmental and social benefits to local communities, supporting opportunities for learning and contributing to local sustainability', by:</p> <ul style="list-style-type: none"> <li>• using woodlands as a social and cultural asset for some of our most disadvantaged communities;</li> <li>• maximising the use of woodlands for learning; and</li> <li>• providing opportunities for communities to have their say in the management of woods close to where they live.</li> </ul>	<p>The 3<sup>rd</sup> priority is to 'provide access to forests and to realise their potential for recreation'.</p> <p>A balance of public benefits from forests will be secured to:</p> <ul style="list-style-type: none"> <li>• Obtain better value from the public forest estate</li> <li>• Support policy through the introduction of Regulations</li> <li>• Focus on recreational issues</li> </ul>
<b>7. Environment &amp; Health</b>	<p>We need to ensure that the 'environmental' services woodland provides are protected and enhanced through ecosystem-based approaches like sustainable forest management.</p> <p>We need to continue to adapt our approach to the conservation and enhancement of woodlands to reflect the changing pressures to which our wildlife is subjected e.g. urban development; eutrophication and other environmental factors; and damage caused by introduced and other</p>	<p>Help to protect Scotland's water, soil and air resource, and:</p> <ul style="list-style-type: none"> <li>• contribute to Scotland's diverse and attractive landscapes.</li> <li>• help to manage Scotland's historic environment and its interpretation and enjoyment.</li> </ul>	<p>The 4<sup>th</sup> Welsh priority is to create 'a diverse and healthy environment' In order to achieve true sustainability, the physical and biological resources within woodlands, such as the water, soil, flora and fauna, must be maintained or improved. Priorities are: a) to conserve and enhance the biodiversity of our woodlands; b) to conserve and enhance the landscapes of Wales; and c) to better integrate woodlands with other countryside management.</p>	<p>The 5<sup>th</sup> priority is to 'encourage forest growth to provide timber, biodiversity and access opportunities and further develop the quality of the NI landscape'</p>

World timber trade and implementing sustainable forest management in the United Kingdom

13.

Annex III – Comparison of UK nations' forest strategies

	<p>species. More habitats for wildlife are needed in and around our towns and cities to secure future biodiversity and bring the benefits of the natural environment closer to people. One objective for intervention is: to protect the environmental resources of water, soil and air, and to protect and enhance biodiversity and landscapes, (both woodland and non-woodland), and cultural values;</p>			
<p><b>8. Biodiversity</b></p>	<p>Challenge is to improve habitat quality by bringing more woodland into sensitive management, whilst continuing to enhance the biodiversity in good quality woodlands and protecting all woodlands from pests and other damage. Managing for biodiversity is important, not just within the woodlands, but also in the wider countryside, in order to create a mosaic of semi-natural habitats which provide corridors for wildlife and help to buffer valuable sites, particularly ancient woodlands, from external impacts such as pesticide drift. Priorities are: a) bring woodland SSSIs into favourable condition; b) implement the UK Biodiversity Action Plans (BAP) for woodland habitats and priority species; c) improve the landscape context of woodland; and d) protect woodland biodiversity from damage – for example from deer, densely shading non-native trees, farm livestock, and invasive plants and animals.</p>	<p>Help to halt the loss of biodiversity, and continue to reverse previous losses, by:</p> <ul style="list-style-type: none"> <li>targeted action for woodland and woodland related priority species and habitats; and</li> <li>increase awareness and public enjoyment of biodiversity, especially close to where people live or visit.</li> <li>improve the knowledge of, and evidence base for, biodiversity and ensure biodiversity considerations are integrated into decision-making.</li> </ul>	<p>We will increase the quality of native woodlands for wildlife and implement the Biodiversity Action Plan targets for their restoration and extension, creating links between fragmented woodlands. We will increase the area of woodland achieving independent environmental certification to internationally recognised standards. We will increase the area of native woodlands, targeting extension and connection of existing woods and incorporating the concept of increasing the core area of native woodland habitats. We will encourage owners to incorporate different habitats, such as heath and bog, within woodlands, to maximise the connections between similar habitat types. We will increase the biodiversity of coniferous woodlands through the use of continuous cover systems, developing multi-aged structures through natural regeneration and the incorporation of native species.</p>	<p>The Forest Service will ensure the sustainability of forests between generations, increase tree cover where it is affordable to do so, and manage forestry in a way that increases biodiversity, enhances the landscape and assists in improving water quality.</p>