WOODLAND WEALTH APPRAISAL FOR THE EAST OF ENGLAND

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REPORT TO THE FORESTRY COMMISSION (EAST OF ENGLAND CONSERVANCY) AND EAST OF ENGLAND DEVELOPMENT AGENCY

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EXECUTIVE SUMMARY

E1 Introduction

E1.1 This Report provides an analysis of the status of, and wealth associated with, the woodlands of the East of England. Woodland is a key resource which not only supports a significant economic sector in its own right, but also makes a major contribution to the quality of life of the Region. Our Report responds to a research brief which can be summarised as requiring:

- an analysis of jobs and economic assets in the woodland and timber sectors;
- an evaluation of the social and environmental roles of woodland, both actual and potential;
- an interpretation of the barriers and opportunities to future development of the Region's woodland resource; and
- an indication of the 'hard' and 'soft' infrastructure supporting the timber industry and woodland resource, both actual and potential.

These research objectives relate essentially to the ways in which woodland can most effectively contribute to the *Regional Economic Strategy* for the East of England.

E1.2 Although much of the woodland wealth cannot readily be quantified, we have attempted to demonstrate its importance to the Region by placing realistic values on its market and non-market benefits. These are summarised in the Table below and explained more fully in the following paragraphs.

E.2 The Regional Setting

E2.1 The East of England is a prosperous Region with a high quality of life overall. Broadly speaking, it has a rural character, although parts of it are strongly influenced by London and other urban concentrations. The East of England Development Agency reports that people who live and work in the Region rate the natural and built environment as highly important, seeing it as a good business location with an open and unpolluted environment, close to the countryside and coast. The Region, however, is not without its challenges, particularly in relation to the restructuring of the rural economy, urban development pressures, pockets of relative disadvantage, and some bleak or industrialised landscapes. Woodland cover can make an important contribution in responding to these and other issues. Indeed, the woodland and timber sector can contribute to EEDA's *Regional Economic Strategy* in a number of key ways, notably through wealth creation, opening up access to opportunity, safeguarding and enhancing the environment, and sustainable development.

E2.2 In broad terms, we consider that the Region's woodland wealth makes an important contribution to the rural economy, through an annual gross output of around £26m in forestry and £61m in processing. Together with indirect and induced effects, the total annual economic worth of timber production and processing is some £220m in the Region. This is particularly important in a context of rural diversification and restructuring. Significant though this figure is, the 'real wealth' of woodlands is substantially higher. We estimate that the annual value of woodlands to the Region's quality of life and wider economy – as reflected, for example, in terms of tourism, health, recreation and environment – is about a further £327m. In addition, the potential annual value could rise significantly if targeted expansion of the Region's woodlands occurred,

with major gains being possible in relation to the social and health benefits of well-designed accessible woodlands, provision of specialist recreational and tourist facilities, and development of timber as an alternative energy source.

E2.3 This sum, though extremely significant, is probably an under-estimate. For example, in view of the difficulties of accurately pricing non-market goods, we have deliberately erred on the side of caution in calculating benefits, and some researchers have proposed much higher values. Also, the figures in paragraph E2.2 do not include the indirect and induced income which is undoubtedly generated by activities such as forest-related tourism, recreation, field sports and local firewood sales. It is realistic to suggest that this would increase the value of these activities by around a further 50%. Finally, the figures do not include certain industries peripheral to, but cognate with, the main woodland and timber sector. These include the sales of wood products and crafts, which we know from a study by Intermark are worth £24m annually within the Region (plus their multiplier effect), and the many arboriculture/ tree surgery businesses associated mainly with amenity and urban trees, which we believe could have a turnover of around £20m (plus multiplier). In total, a justifiable estimate for the current annual wealth associated with woodland in the East of England is around £700m. As previously noted, this could rise substantially if additional assets are developed in the future.

E3 The Nature of Woodland Wealth

E3.1 Woodland wealth has conventionally been measured principally in terms of the actual market value of timber products and timber-related employment. Increasingly, however, emphasis has been placed on the range of goods and services for which there is no market. Thus, on the one hand, woodland wealth relates to the quantity, composition, age and condition of trees, as a resource to be processed for a variety of uses, and as a contributor to direct and downstream employment. On the other hand, 'non-market' or 'public' benefits comprise the social and environmental roles of trees, as well as certain diffuse economic benefits, such as the provision of attractive settings for inward investment.

E3.2 Thus, the *economic* benefits of woodland, in addition to employment and the value of timber, include positive influences on inward investment, increased property values, reduced energy costs, regeneration of derelict and damaged land, and tourism. *Social* benefits relate to improved physical and mental health, increased community pride, recreation, education, and social inclusion. *Environmental* benefits chiefly comprise pollution abatement, biodiversity, landscape, soil conservation and the protection of archaeological and historic artefacts. These benefits vary in magnitude and generally have no apparent market value. Nevertheless, they are well attested in the literature and are increasingly susceptible to valuation using a variety of economic techniques.

E4 The Forestry Policy Framework

E4.1 For the past century, forestry policy in Britain has been driven by economic and strategic arguments. This has led to a policy emphasis on plantation forestry and a large-scale processing industry, involving both the public and private sectors. From the 1960s onwards, policy attention started to turn to the multiple benefits of woodlands, with an increasing sensitivity towards the use of native broadleaved species and the provision of community benefits. Most recently, there has been a significant shift towards sustainable forestry, particularly the role that woodland can play in relation to rural development,

economic regeneration, environment and conservation, and recreation, access and tourism. The Forestry Commission has just published a suite of sustainability indicators, and these affirm the purpose of the British woodland estate as that of achieving multiple benefits through the adoption of sustainable development priorities.

E5 Undertaking the Research

E5.1 This Report is wide-ranging in its coverage and has been compiled on the basis of a number of sources of evidence. First, we have undertaken a desk study of literature and previous reports relating to woodland wealth and the timber industry. Second, we have drawn upon recent statistical sources and specially provided information, particularly the National Inventory of Woodlands and estimates of timber availability for the Region. Third, we have attributed values to numerous aspects of woodland wealth, on the basis of previous economic studies and current assessments being undertaken in other English regions. Fourth, we have undertaken a postal questionnaire survey of woodland owners and woodland-related businesses in the Region to gather supplementary information on the characteristics of the sector, flows of expenditure, local employment provision, and perceived barriers to the future expansion of woodland wealth. Finally, we conducted a number of interviews with public and private operators, to provide greater insight into current patterns and trends. In all this, we have been supported by a steering group which has provided guidance on the scope and direction of the study.

E6 Woodland and Timber in the East of England

E6.1 The National Inventory of Woodland and Trees reveals an uneven pattern of woodland cover in the Region, ranging from 3.6% in Cambridgeshire to 9.8% in Norfolk, and averaging 7.3% (close to the English average). Overall, the pattern is one of relatively small woodlands, mainly broadleaved and predominantly in private ownership, but with a number of large conifer-dominated Forestry Commission holdings making a major contribution both to timber resources and the regional landscape. According to the England Rural Development Programme, over half of non-Forestry Commission woodlands are unmanaged or undermanaged. This is attributed to the limited availability of local timber processing facilities, and the disproportionate costs associated with small and possibly isolated woods. Often, the main product from these sites will be low-grade roundwood, which is most economic when it can be transported to relatively local large-scale bulk users. Despite a current scarcity of such end-users in the Region, the East of England chapter in the Rural Development Programme notes a considerable potential for improving the existing woodland resource.

E6.2 The Region contains a number of distinctive areas of woodland which make highly significant contributions to landscape character, recreational opportunity and economic prosperity. Key assets include:

- major areas of multi-purpose Forestry Commission holdings, such as Thetford Forest and the Sandlings;
- the mixed ancient woodlands, plantations and parklands of the Greensand Ridge;
- remnant ancient hunting forests, such as Epping, Hainault and Hatfield;
- the old oakwoods, with their associated rare species, of Suffolk's Staverton Thicks;
- a number of notable estates, both in private and voluntary sector ownership, containing important woodlands and woodpasture; and

- parts of Thames Chase, Watling Chase and Marston Vale Community Forests, all of which are creating new multi-purpose woodlands, but whose core funding ceases in 2005, and whose future development will consequently become an important issue for the Region.

E6.3 The National Inventory of Woodlands records that the Region contains just under 140,000ha of woodland, of which just over three-fifths are broadleaved, just over one-fifth is coniferous, together with smaller proportions of mixed woodland, coppice or coppice-with-standards, and open space with woodlands. The main conifers are Scots and Corsican Pine. Broadleaved species are more varied, with oak comprising a quarter, but ash, sycamore, beech, birch and elm also well represented. Of the 113,00ha in woods of at least 2ha, the largest single custodian is the Forestry Commission, owning or leasing almost 26,000ha of mainly coniferous woodlands. The remaining 87,000ha of mainly broadleaved woodland is owned by private individuals (c.56,000ha), businesses (c.14,000ha), charities (c.8,000ha), local authorities (c.6,500ha), other public bodies (c.2,000ha) and communities (c.500ha). Excluding small woodlands (under 2ha), average size is 14.6ha, but Forestry Commission holdings are disproportionately in the larger size classes. Tree cover in the Region increased by over 26,000ha between 1980 and 1998, during which time the proportion of broadleaves also increased from 59% to 71%. Although private sector planting is well down on the period 1940-1970, this situation masks a significant recovery in the planting of oak in non-public woodlands, and a steady upward trend in the planting and re-planting of Corsican Pine by the Forestry Commission. The 'high forest' in the Region is predominantly of sawlog quality, albeit there is significant undermanagement in the non-FC owned broadleaved resource.

E6.4 The future production of timber in the Region has been calculated by the Forestry Commission, with the proviso that this figure will always be more than actual availability. These estimates indicate that annual harvestable coniferous roundwood in the East of England could increase from its current level (c.290,000 cu.m.) to around 370,000 cu.m. by 2040, thereafter declining quite sharply. The theoretical contributions of the private sector and Forest Enterprise will be similar until around 2035, at which point the private sector contribution could fall quite substantially, and only be partially offset by rising production in FE woodlands. Broadleaved roundwood production will remain relatively stable at around 180,00 cu.m. until around 2040, with only relatively minor fluctuations to be evened out. Thereafter there would be a sharp dip before stabilising at about 150,000 cu.m. annually. Oak would be the principal species, though a reasonable variety will be available during the whole period, with a significant quantity of poplar between about 2015 and 2050. Approximately 80% of hardwood in the private sector is likely to be of sawlog quality, leaving perhaps 20-30,000 cu.m./yr. of low grade hardwood available for other uses.

E7 The Public Benefits of Woodland

General Issues

E7.1 Within a post-industrial knowledge economy, timber production and processing is typically only a minor sector, and the importance of the woodland resource is more accurately represented in terms of its contribution to 'public' or 'non-market' benefits. We have used the term 'public benefit' to represent those woodland-related assets for which markets rarely exist and thus derive their value from the presence of woods rather

than the timber extracted from them. Some of these assets may in practice have real market values, such as specialist recreation provision, but mostly it is necessary to infer indicative values by theoretical methods.

E7.2 Various techniques have been proposed by economists for the valuation of public benefits. All of these have limitations and make differing assumptions, and it is not possible to apply them to the multiple elements of woodland wealth with great accuracy and confidence. However, we have drawn on a wide variety of sources, and also checked our estimates against those produced for other recent Regional appraisals of woodland wealth. We have tried to avoid giving a spurious sense of accuracy to our figures, but have instead sought to arrive at similar values by a range of different methods, thereby reducing the scope for arbitrary and inconsistent estimates. We thus present a set of 'convergent approximations' for the various public benefits associated with the Region's woodland wealth, and believe these to be rather cautious and as realistic as possible.

Recreation and Tourism

E7.3 The Region has a number of 'flagship' woodland recreation resources, with a particularly important focus at Thetford Forest; the re-opened Center Parks facility at Elveden Forest is an example of the scope for major leisure provision by the private sector. According to the 1998 UK Day Visits Survey, there were an estimated 308m woodland leisure trips in England, and apportionment from earlier studies suggests that upwards of 50m of these would have occurred in the East of England. The Public Opinion of Forestry survey reinforces the importance of this type of recreation, reporting that in 2001 almost three-quarters of adults in England had made a leisure visit to a woodland in recent years. Most trips are short and local, by regular visitors, but a sizeable minority are longer-duration and typically result in significant expenditure. Many woodland visits are also for more specialised activities such as horse riding, mountain biking and bird watching, and these users may inject substantial sums of money into local economies.

E7.4 It is clear that there is both a large actual demand for woodland recreation as well as a suppressed latent demand where facilities do not yet meet the needs of potential users. Many parts of the East of England appear currently to be under-provided in terms of woodland recreation, either because there is too little woodland cover, or because existing woodland cover is insufficiently welcoming to potential users. Providing for latent recreational demands has two particularly important aspects: extending opportunities for convenient, healthy exercise to local and sometimes disadvantaged communities; and catering for more specialised leisure activities which can boost rural economies.

E7.5 Tourism is a major industry in the East of England, with visitor trips generating £3.4bn in 1997. Recent leisure trends show that the traditional seaside holiday has been in decline, whereas short breaks, particularly involving countryside and heritage locations, are growing. Woodland clearly contributes significantly to the Region's tourism potential, and we estimate that about a fifth of the Region's 'out of town' visitor destinations derive at least part of their attractiveness from associated woodland. Indeed, Thetford Forest is the third most visited attraction in the Region, with the heavily wooded country parks at Fairlands Valley (Stevenage) and Thorndon (Brentwood) being fourth and fifth.

E7.6 We have considered a number of alternative methods of valuing recreation and tourism benefit, and conclude that a reasonable estimate for the East of England is £120m annually, taking into account both the intrinsic values of leisure and the actual expenditure of woodland visitors. It is likely, too, that field sports related to woodland generate approximately a further £8m of direct expenditure.

Biodiversity

E7.7 Woodlands contribute enormously to the Region's biodiversity, with county Biodiversity Action Plans and State of Environment Reports setting many targets for the extension and positive management of woodland cover. Particular attention is paid to increased woodland area generally, ancient woodlands, distinctive semi-natural woodlands, wet woodlands, woodpasture or parkland, and veteran trees. Biodiversity has enormous value to society – both as a fundamental life-support system and as a source of enjoyment and education – but is extremely difficult to price. However, drawing on a range of recent research, we consider that the biodiversity of the Region's woodlands is worth around £55m annually.

Landscape Quality

E7.8 The diverse scenic qualities of the East of England have been defined in various local authority landscape assessments and the Countryside Agency's *Countryside Character Initiative*. These identify many areas where woodlands and more isolated tree features contribute to landscape distinctiveness, such as the Brecklands, river valleys, parklands and mixed farming areas. There are also less attractive areas where additional tree cover could soften the existing bleak or industrialised vistas. Valuing landscape benefits creates various difficulties, such as their free availability, their different values to tourists and residents, and the problems of separating out the 'landscape experience' from other values in order to avoid the risk of double counting. On the basis of various reasonable assumptions, we propose a figure of £60m/ year related to landscape quality.

Physical and Mental Health

E7.9 Three major health benefits have been convincingly related to tree cover: the psychological benefits of woodlands on well-being; improved post-surgery recovery rates in hospital wards which overlook wooded settings; and the opportunities for moderate exercise which exist in well-designed, accessible woodlands. Around 3% of the cost of the National Health Service is related to physical inactivity, and this could be substantially reduced if adults maintained their fitness by taking the equivalent of a brisk 30 minute walk five times a week. The benefits of physical activity are demonstrable in relation to heart attacks, strokes, Type II diabetes, fractured femur, colon cancer, breast cancer, Alzheimer's disease, hypertension and certain mental health problems. It is estimated that increasing the numbers who are moderately active by 5% and reducing the numbers who are sedentary by 10% could reduce numbers of deaths in the UK from heart disease alone by over 500 per year. It is not possible to estimate reliably the contribution made by woodland recreation opportunities to fitness, and thus to health budget savings. However, it is important to note that the predominant characteristic of woodland recreation is that of local, short duration visits on foot – very similar to the ideal 30

minute brisk walk – thus providing an ideal opportunity for appropriate exercise regimes. A conservative estimate of the savings on the health budget associated with woodland recreation in the Region might be £18m, and there is great potential for even more savings if woodland walks were more widely available and actively promoted.

Housing and Industry

E7.10 The co-ordination of residential and industrial development with new and existing woodlands has numerous benefits such as increasing house values, reducing loss of privacy, screening disamenities, providing recreation and access links, moderating winds and temperatures, alleviating urban flooding, decreasing pollution impact, attracting and retaining inward investment, and creating attractive workplace settings. Although all of these are virtually impossible to place a price on, we provide a reasoned basis for a combined, but almost certainly very conservative, annual value of £26m.

Education

E7.11 Woodlands have important educational values, particularly in relation to school visits, lifelong learning, skills training and, potentially, school location. The Forestry Commission has created specific educational facilities such as Forest Classrooms, and leads on the Forest Education Initiative. However, research now points to more fundamental contributions of woodlands to children's intellectual, physical and emotional development, and some countries have consequently set schools within woodlands. There is little evidence on how such benefits can be costed, but we are able to suggest a possible current value of around £5m.

Physical Environment

E7.12 An increasingly important role of woodlands is as a sink for anthropogenic atmospheric carbon. We have estimated that trees and their associated soils in the East of England sequester over 16m tonnes of carbon per year in net terms. Using a mid-range estimate for the value of sequestered carbon, we propose that this is worth around £14m annually. There is also widespread evidence of the role of woodlands in trapping air pollutants, including the assimilation and decomposition of ozone, sulphur dioxide and nitrogen oxides. It is also probable that well designed planting adjacent to high risk industrial facilities can mitigate possible pollution incidents. A realistic estimate of the pollution mitigation value of trees in the Region is £18-19m. Woodlands will also have additional benefits in terms of soil and water conservation, as well as lowering nitrate inputs into aquifers, though we have not been able to attribute values to these. Overall, it appears reasonable to suppose that the collective benefit of woodlands to the physical environment is perhaps £35m annually.

E8 The Market Benefits of Woodland

General Issues

E8.1 Whilst the direct economic and employment benefits only reflect a minority of the Region's woodland wealth, the timber industry is an important generator of jobs in its own right, and drives the wise management of woodlands on which many wider

benefits depend. Thus, rural development issues form an important strand in a future strategy.

E8.2 There is a widespread view that a significant part of the Region's woodlands are undermanaged, particularly privately owned broadleaved woodlands, and that this requires changes to incentives, business support and markets. High quality hardwood is relatively price inelastic, which suggests directing effort towards improving the actual and perceived quality of the Region's timber. However, it is also sensible to further develop the supply of and demand for low grade hardwood, which is well suited to firewood, chipwood, pulpwood and horticultural woodchips. There is a prevalent view that small and medium scale woodfuel heating schemes deserve further investigation, as they can provide stable markets embedded in the local economy.

The Woodland and Timber Economy

E8.3 The core woodland industry comprises establishment, maintenance and harvesting. Backward linkages include suppliers of forestry goods (seeds, fertilisers, etc.), whilst forward linkages comprise various processing facilities. In regions with large woodland and timber industries, these linkages can often be provided internally, but elsewhere there is likely to be significant leakage. With regard to employment, a very high proportion of labour is drawn from a local catchment.

E8.4 In general terms, the regional woodland economy comprises four industry 'chains', entailing the production, processing and end use stages of: domestically grown softwood, domestically grown hardwood, imported softwood and imported hardwood. Very broadly speaking, these may be represented as the Region's conifer plantations (mainly managed by Forest Enterprise) supplying a number of UK processing mills; a diverse broadleaved resource, mainly in the private sector, and supplying a wide range of end uses; highly competitively priced and reliably supplied softwoods, mainly from Scandinavia and Eastern Europe, through regional ports such as Harwich and Felixstowe; and a variety of hardwood supplies, including tropical timbers that cannot be produced locally. These are each associated with particular opportunities in the Region.

E8.5 We estimate that in the East of England, some 825 jobs are associated with woodland and timber production, and around 560 with timber processing. These are predominantly in rural areas and thus particularly important within the context of a diversified rural economic base. In addition, there are likely to be around 1,170 full-time equivalent jobs arising from the indirect and induced effects of timber production. The total gross impact of forestry is about £62.5m, and of processing about £158m, annually in the Region.

E8.6 The character of Forest Enterprise activity varies across the Region, which includes the whole of the East Anglia District and parts of the Northamptonshire and South-East Districts. The East Anglia District's estate is dominated by commercial softwood plantations but, whilst all the estate is managed for timber production, multiple use is a high priority. The Northamptonshire District estate, by contrast, has a strong emphasis on restoration to coppice-with-standards. Although the District has a legacy of softwood plantations and coniferisation of native woodlands, this is gradually being reversed, and commercial production is viewed as a by-product. The South-East District

extends only into Hertfordshire, and supports only a small amount of activity in the Region.

E8.7 The private woodlands of the Region are very varied in ownership and scale. According to surveys in East Anglia, which are likely to be representative of the wider Region, over 60% of farm woodlands, and just under half of estate woodlands, experience at least some degree of under-management, normally related to environmental and sporting constraints, high working costs for small areas, fragmented ownership, inaccessibility, and conflicting management interests. The landowner sample in our survey was based on WGS recipients and was thus unlikely to reveal the extent of undermanagement; however, it confirmed that management objectives were as likely to be related to sporting or even conservation interest, as to commercial production.

E8.8 Intermark have also found that around £24m of timber products are sold regionally through the main types of retail outlet, although the major growth in these appears to be in tropical hardwood goods. The factors likely to lead to market growth, especially products made from regional timber, are environmental labelling (especially FSC certification) and, for farm shops, the attraction of 'buying local'. Purchasers' expectations seem likely to increase, thus requiring products of higher and more consistent quality, supported by reliable supplies. Local producers are being affected by aggressive marketing, consistent supply and competitive pricing, and there is a move towards industrialised processes and away from cottage industries producing rustic items. However, there seems to be good scope for local producers to increase sales of split logs for fuel, kindling and charcoal, especially through garage forecourts.

E8.9 There are substantial numbers of forest industry businesses in the Region, with production concentrated in a few large businesses and most businesses being small or very small (often one person) in size. Highest employment densities appear to exist in management companies, processing and contracting, as well as high 'value added' businesses such as timber merchants, furniture makers and joiners. Most woodland employment appears to be associated with conservation, pest control, scrub clearance and sporting management, rather than in the more specific forestry operations of planting, fencing, access and timber work. However, planting, harvesting and thinning operations represent the major opportunities for contractors.

E8.10 Skill levels in the industry are broadly adequate although there are some emergent issues. Whilst Forest Enterprise reported satisfaction with current skill availability, attributable to their internal training programme, they did anticipate potential problems in filling future vacancies, reflecting a combination of low wages and high housing costs. Throughout the private sector there is greater concern about the rising average age of skilled workers, combined with growing requirements for operator certification and safety, and younger workers' expectations of comfort. Areas in which businesses reported skill deficits were in marketing and market intelligence, computer use, and machine operation. Moreover, in very small enterprises, particular skills may only be 'one deep'.

E8.11 With regard to FE, regional output is dominated by the East Anglia District, where annual production is about 180,000 cu.m.. Most of this is committed to four sawn fencing mills in the Region and one in South Yorkshire on the basis of five-year contracts. Low grade wood suitable for products such as MDF and chipboard is sent to a processing plant in North Wales, and thus is associated with disproportionately high

haulage costs. Our survey of private timber businesses in the Region points to a number of general factors. With regard to timber purchases and sales, there is a negative trade balance, partly occasioned by a regional supply that is perceived to be of poor quality and uncertain continuity. Most inputs are sourced locally, though the lack of a large specialist tree nursery in the Region results in high imports of forestry goods, and specialist machinery is frequently purchased outside the Region. Those businesses most likely to source materials and goods from outside the Region comprise nursery owners, timber merchants, contractors and tree surgeons. Those retaining most of their expenditure within the Region are management companies, manufacturers and processors of timber products, and woodland owners. Sales of timber within the Region by private woodland owners were predominantly low grade, whereas the lower proportion of exported timber was mainly high grade.

E8.12 Figures relating to the woodland economy need to be moderated by estimates of the 'informal' economy. There is particular scope for informal activity in the woodland and timber industries: certain activities such as felling and maintenance are characterised by part-time and self-employed workers, work can be seasonal, some transactions (e.g. firewood purchases) are commonly made in cash, whilst some (such as casual workers taking fuelwood in return for forestry work) are essentially based on barter. In general, those with a long-term commitment to the sector noted that under-reporting of income was self-defeating as it tended to reduce the sale value of their business. Overall, we conjecture, based on pertinent research in developed countries, that informal economic activities could add around a further 10% to the value of the regional industry.

Timber as Fuel

E8.13 We report separately on the actual and potential woodfuel industry for three main reasons: first, interviewees and questionnaire respondents repeatedly referred to this as the pre-eminent opportunity to revitalise the small roundwood sector (and thus private woodlands generally); second, sales of firewood are peculiarly important in local economies and are very beneficial in terms of expenditure recirculation and job diversification; and third, scenarios of future energy use in the Region favour wood as a key alternative to fossil fuels.

E8.14 Charcoal production is frequently cited as a major opportunity for rural diversification. Currently an extremely high proportion of charcoal, especially for the barbecue market, is sourced from overseas. Much of this is from unsustainable sources, such as mangroves and rainforests. Some observers thus see significant potential for increasing charcoal production from UK woodland, and adding substantially to our 200 or so charcoal producing enterprises. However, views about this potential are mixed, as investment costs are high, the demand seasonal, and problems of marketing considerable. The largest firewood producer in the Region also distributes considerable quantities of charcoal, but has expressed concern about reliability of small roundwood supply if they were to extend into charcoal production.

E8.15 With regard to fuel for electricity production, we heard a number of knowledgeable representations for a major new timber-burning power station in the Region. The principal sources of material for this would be low grade roundwood and wood waste, and specially grown short rotation willow coppice. There are currently three,

and in the future perhaps four, stations which do or could with some conversion, take an amount of wood waste/ woodchip; however, they do not yet create a major demand. Currently less than half a percent of the East of England's electricity demand is met from renewable energy sources, well below official targets. Energy crops are seen as one of the likeliest means of making a rapid contribution to these targets. Presently, development of wood energy is hampered by lack of market incentives, though DEFRA's *Energy Crop Scheme* provides some assistance. However, there is also some reluctance to promote over-dependence on a single large wood-fired electricity station, and a more diversified fuel economy based on community heating schemes may be preferable.

E8.16 In view of the importance of firewood in local rural economies, we undertook a separate study based on a sample of small-scale operators in North East Suffolk and North West Norfolk. Although these businesses each employed 2-3 people, the mean FTE associated with the firewood element was less than one. Typically, they required part-time year round labour, supplemented by seasonal assistance, and generally used firewood production as a means of keeping employees busy during slack periods. Whilst major items of equipment (apart from chain saws) tended to be purchased from outside the Region, most other purchases were relatively local, especially fuel and oil. Almost all the wood utilised is from the Region, though some came from surprisingly far afield. Most of the log sales are to households, where wood is predominantly used for supplementary heating, and only about 5% of sales were to households using wood as their major source of heat. By contrast, kindling was sold almost entirely to commercial outlets. Most sales are quite local, with an average delivery distance of 16km for firewood. Income is very variable (typically £4-10,000/yr for a supplementary enterprise and £20-25,000/yr for a main enterprise), and sales are heavily seasonal. Based on operators' knowledge of local firewood enterprises, about 90% of the sector operated on a small scale, part-time basis, and this included farmers, sawmills, fencing specialists and tree surgeons.

E8.17 Overall, we estimate that, annually, over 60,000t of firewood are produced for commercial sale in the Region, involving an expenditure by producers of c.£1.5m in the Region and a further c.£0.5m outside the Region, generating an income of around £5m from sales of regionally produced firewood, supplemented by some £3.5m from wood produced outside the Region. A proportion of this activity will, however, be in the 'informal' economy. Also, the total tonnage excludes a significant quantity extracted by farmers and landowners for their own consumption.

E9 Looking to the Future

Introduction

E9.1 This section considers the current prospects of the woodland and timber industries in the Region, their sources of business intelligence, overcoming barriers to future development, and the kinds of support which could be provided in order to help them contribute more effectively to the *Regional Economic Strategy*. We recognise that a developmental strategy for the sector must address both the business needs of timber growers and processors, and the non-commercial but hugely significant public benefits which can be reaped from increased tree cover.

Business Prospects

E9.2 Latterly, the domestic timber industry has faltered due to low raw material prices and the availability of cheap imports. Considering this unfavourable context, most of the businesses we surveyed were surprisingly optimistic, with only private woodland owners typically anticipating static or deteriorating prospects, and generally suggesting that it was not possible to make a significant profit from woodlands. The view from Forest Enterprise was that the growing policy importance of multiple-benefit woodland, and the long-term supply contracts that had been set up with current customers, would provide an economic cushion. Overall, just under two-thirds of respondents to our survey expressed the view that their business performance would remain about the same during the next three years, with about one-fifth expecting an improvement and one-sixth a deterioration.

E9.3 However, there was seen to be little scope for investing in major new processing facilities in view of current timber prices and existing over-capacity, even though it was economically dubious to be paying high transport costs to send low grade timber outside the Region for processing. Short- and medium-term development of the sector was seen to lie in consolidating markets and producer-processor linkages, extending recreation provision, and establishing replacement markets for small roundwood. Generally, there was felt to be scope for capitalising on public awareness of local goods and environmental issues, creating a more efficient and diversified domestic timber market, securing payments related to conservation and 'green business', ensuring timber meets FSC standards where possible, and exploiting promising niche markets such as coppice and Christmas trees.

Supporting the Regional Economic Strategy

E9.4 We consider that future support to the woodland and timber industries in the East of England should be two-fold. First, there is a need to promote expansion and improved management in the commercial sector. We see important opportunities in relation to:

- practical, affordable training courses with effective follow-up, with de-centralised delivery where possible;
- providing preferential loans and improved business advice for both major operators and microbusinesses;
- supporting substantial new market opportunities for small roundwood;
- better promotion, including certification, of regional timber;
- improving the image of the industry amongst school/college leavers;
- improving the reliability of supplies from local producers; and
- greater assistance in understanding and exploiting markets.

E9.5 Second, there is a need to optimise the contribution of woodland to the general wealth and quality of life of the Region, and this challenge will require both private sector initiatives and a wide range of commitments from public sector organisations. The opportunities in these areas are sometimes fairly clear, but generally they require further research and feasibility testing. However, we feel that the most promising issues for medium-term attention are:

- targeting urban fringe areas for new, well-designed woodlands with a community emphasis;
- investigating the scope for more sophisticated types of woodland recreation, entertainment and tourism;
- promoting woodland walks as a healthy activity for all sections of the population;
- supporting design and management measures that increase the biodiversity and landscape values of woodlands;
- developing the carbon sequestration potential of woodlands;
- cultivating close links with local authorities and others to explore opportunities for development-related woodland, and for educational links to woodlands;
- undertaking a feasibility study of the economics, logistics and technology of wood-burning power stations.

E9.6 In support of these issues, we advocate the establishment of a core-funded networking organisation to assist woodland and timber industries with the co-ordination of production and supply chains, promote the Region's timber as a high quality and reliable resource, investigate emerging market opportunities, and advocate the benefits of woodland to a wide range of organisations. In addition, we believe that a more strategic partnership should be facilitated by the Forestry Commission to assist policy targeting, so that the non-market benefits of woodland can more effectively be realised for the sustainable development of the Region. We suggest that progress in relation to these issues should be monitored against a 'balanced scorecard' of accomplishments in relation to the full range of market and non-market benefits.

Summary of Attributed Values	**£M**	See Paragraph
Timber Production and Processing	£87	E2.2
Indirect and Induced Effect	£133	E2.2
Recreation and Tourism	£128	E7.6
Biodiversity	£55	E7.7
Landscape Quality	£60	E7.8
Physical and Mental Health	£18	E7.9
Housing and Industry	£26	E7.10
Education	£5	E7.11
Physical Environment	£35	E7.12
Indirect and Induced Effect	£67	E2.3
Retail Wood Products and Crafts	£24	E8.11
Arboriculture	£20	E2.3
Indirect and Induced Effect	£22	E2.3
Current Annual Wealth Estimate	£680	

PART 1: THE GENERAL NATURE AND SIGNIFICANCE OF WOODLAND RESOURCES IN THE EAST OF ENGLAND

1.1 Introduction

1.1.1 This report provides an analysis of the status of, and wealth associated with, the woodlands of the East of England. Woodland is recognised as a key resource which not only supports an employment sector in its own right, but also contributes more widely to the quality of life, natural environment and economy of the Region. The report thus addresses two major aspects. First, it describes and evaluates the importance of woodland wealth to the Region in broad terms, emphasising the significance of public benefits which are often not reflected in market terms. Second, it assesses the economy of woodlands and forests, addressing both the regional timber production and processing industry, and the more local but very significant role played by woodlands in the rural economy.

1.1.2 This brief for this study required an:

- identification of how woodland can contribute to the Regional Economic Strategy of the East of England;
- analysis of job maintenance and job creation potential, spatially and by type of employment;
- evaluation of the economic assets in the woodland sector;
- evaluation of the main social and environmental roles of woodland and identification of the factors that can strengthen the long-term sustainable benefits of these linkages;
- assessment of qualitative information on non-financial benefits;
- analysis of key barriers to achieving the potential contribution of the woodland sector to the Regional Economic Strategy; and
- indication of the infrastructure (i.e. transport/roads, business support, skills development, capital availability).

The brief also required that the outcomes of the study should be related to proposals for regional development priorities for the broadly defined woodland sector through which, by carefully targeted investment, advisory and other support, partners can maximise contributions to EEDA's *Regional Economic Strategy* objectives.

1.2 Regional Setting

1.2.1 The East of England Region comprises the County Council geographical areas of Cambridgeshire, Bedfordshire, Norfolk, Suffolk, Essex and Hertfordshire and the Unitary Authority areas of Luton, Peterborough, Southend-on-Sea and Thurrock (Map 1). The general picture is one of considerable prosperity, possessing an £82 billion economy, which is 10.6% of the UK GDP despite having only 9.2% of the UK population. The region's economy is also highly diverse. It has a significant manufacturing base as well as established service, high-tech, research and development, and rural industries, with particular importance attached to specific clusters of industrial enterprise. One of the consequences of this economic buoyancy is the demand for housing, and RPG (Regional Planning Guidance) for East Anglia and parts of the South East (Bedfordshire, Essex and Hertfordshire) state a need to build 20,830 new houses per year. Whilst up to half of this could be from previously used land or building conversions it still points to the need to accommodate major new developments.

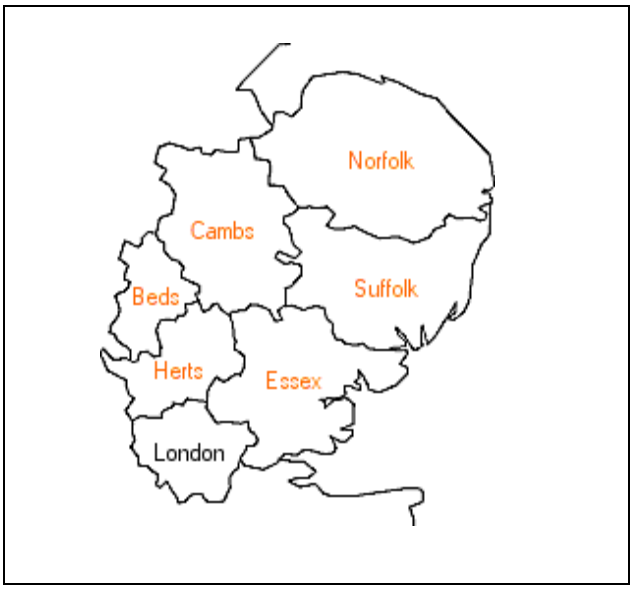


Figure 1 The East of England Region

1.2.2 The Region's environment is diverse and generally of high quality, contributing to a high quality of life and a tourism industry which sustains around 50,000 jobs. Broadly speaking, the region has a relatively 'rural' character, with approximately 45% of its population residing in rural areas, and an appearance which has been fashioned by centuries of agriculture. It contains some renowned landscape features, including the Norfolk Broads (national park equivalent status), and Areas of Outstanding Natural Beauty, such as parts of the Norfolk and Suffolk coast, Dedham Vale and the Chiltern

Hills. Not surprisingly, the East of England Development Agency (EEDA) states that people who live and work in the East of England rate the natural and built environment as a key aspect of the region's image and identity, seeing the region as a good business location with an open and unpolluted environment, which is close to countryside and the coast.

1.2.3 Whilst acknowledging the importance of the urban forest and the significance of arboricultural businesses, this report has a primary interest in 'rural' woodlands as the domain of principal concern to the Forestry Commission and as a extensive land user. It is thus important to have regard to the range of rural policy issues in the Region requiring attention. Thus, the Countryside Agency (2001) has noted that intensive agriculture and the fragmented network of semi-natural habitats in the region make sustainable land management a key issue, whilst any future land use strategy must have careful regard to climate change, given that the region is already the driest in England and yet faces particular risks of flooding due to coastal erosion and low-lying land. The rural economy is characterised by small enterprises, such that the stock of rural businesses in the region is dominated by micro-businesses, with 91% of all business sites (including farm businesses) in rural East of England employing less than 10 people, whilst only 1.3% employ more than 50. Moreover, whilst the economic activity rate is higher and unemployment claimant rates are lower in the rural areas, many people have been affected by the loss of jobs in the agricultural sector, and diversification measures are needed.

1.2.4 The economic sector of 'Agriculture, Hunting, Forestry and Fishing' is still a significant employer in the region, and accounted for 2% of all male employees in 2000 (in some districts of Norfolk and Suffolk this rose to as much as 25%). In 1995 it contributed 2.4% of the region's GDP, or just over £1.5bn (relative to UK figures of 1.9% and £11.7bn), though by 1998 this had declined to 1.7% and £1.29bn (relative to 1.3% and £9.73bn). The Forestry Commission's survey (1998/9) of Regional Employment in Forestry and Primary Wood Processing in GB (FC, 2001a) reported that the East of England had an employment density of 113.5 ha per employee, resulting in 1,249 FTE employees in forestry and the forest industry, this being 8.5% of the English total. This figure, of course, only reflects the employment associated with the production

side of the industry rather than employment directly or indirectly linked to the wider spectrum of woodland and timber related economic activities.

1.2.5 Ward and Lowe (2001) have looked more generally at the challenges facing Regional Development Agencies in relation to the rural economy. They identified three key issues which the Agencies need to address, namely: the growing importance of leisure and tourism coupled with declining employment in land-based industries; the increasing expectation for land managers to provide environmental services such as landscape conservation; and increasing pressures to protect biodiversity and respond to climate change. In the light of these, the authors argued that regional policy priorities would need to:

- help 're-integrate' agriculture and land management into regional economies, by measures such as supporting regionally-embedded supply chains, and aligning land-based industries with regional economic priorities;
- reinvigorate the development and promotion of rural tourism;
- ensure that rural locations and businesses are integral to RDA strategies and action, including co-ordinating a systematic improvement in the provision of support, advice and skills development to all businesses in rural areas.

It is evident, therefore, that despite the general buoyancy of the Region, there are many challenges facing its rural areas, and many ways in which major rural land uses such as forestry can contribute to regional quality of life.

1.2.6 Within this general policy context, we can identify a number of issues which particularly concern the woodland and timber sector. First, are those very clear benefits of woodland brings for the Region's land and people. Second, are challenges which must be met if woodland is to make its potential contribution to the Region.

1.2.7 Thus, there is little doubt that the attractive woodland cover of much of the Region, including some flagship resources such as Thetford and Epping Forests, is a positive factor in inward investment and residential quality. It is also clear that woodlands can make a major contribution to leisure and tourism, and are major providers of 'environmental services' such as biodiversity and surface water regulation. Woodlands will play a key role in any strategic responses to climate change, as they will both help to moderate the effects of greenhouse gases, and will need to be carefully designed and

managed given their own sensitivity to changes in wetness and temperature. Well-located and designed woodland cover will also contribute to the Countryside Agency's rural policy priorities for the Region, such as the need to enhance water quality and conservation, improve habitat connectivity, offset job losses in traditional rural industries, and supplement the region's recreational and access resources. The timber industry itself is a significant generator of revenues and employment, and timber products (from high grade sawlogs to tree waste) have great potential for further 'embedding' in the supply chains of the rural economy.

1.2.8 A report prepared by SQW/Land Use Consultants (2001) for the Region's environmental organisations, EEDA and GO-East has assessed the 'environmental prosperity' of the East of England, based on an analysis of activities dependent on the region's environmental resources. Part of this prospectus actually or potentially depends on trees and woodland. Thus, the report addresses existing renewable energy schemes, and notes particularly that there are unexploited opportunities such as short rotation coppice and forestry waste, for which the regional potential is high. Within the context of enforced change in the primary production sector, the report also observes the scope for more woodland to be managed in a sustainable way for both economic and environmental benefit. The report's recommendations include developing agri-environment capacity in areas which include farm woodland management.

1.2.9 Realising woodland benefits will require linkages to regional development strategies. For example:

- EEDA has acknowledged the need for an innovative approach to infrastructure design and investment, in order to support business competitiveness while adding value to the quality of life and environment of the region. One significant infrastructural issue, noted in various appraisals, is the limited road and rail network of the Region. This is important to a regional woodland industry in which remoter sites have become increasingly inaccessible (and thus more likely to be sub-economic) as lorry size has increased, and in which key movements of timber are along the relatively poorly served east-west axis.
- The East of England Regional Observatory has noted the need to promote effective recycling of brownfield sites. Many commentators have made the case that woodland has unique advantages as a soft end-use for land remediation.

- Woodland industries both require training provision, and provide the locations for skills training for various rural enterprises (including conservation). The 'Environmental Prosperity' report identified improvements to regional training and education opportunities as a means of further developing the environmental economy. The report alludes to the level of provision of relevant NVQ level 1 and 2 qualifications, and the pressing need for skills training associated with 'regenerating the primary sector'.

In these and other respects, the role of woodland in the wider regional economy can be interpreted from EEDA's 'principles for good business practice' and Regional Economic Strategy. The 'fit' of woodlands and the timber industry to wider socio-economic planning objectives is summarised in Table 1.

Table 1 Implications of Regional Priorities for Woodland Wealth

EEDA – Principles for good business practice	**Implications for Woodland Wealth**
encourage growth and wealth creation in all communities throughout the East of England	recognise and enhance the huge 'wealth' of different kinds represented by the Region's woodlands; manage woodlands in ways which contribute to rural economic development and the Region's 'quality of life' infrastructure
social inclusion and the widest possible access to opportunity	recognise and further develop the potential of accessible and well-designed woodland to enhance landscape and recreation opportunities in disadvantaged areas, thereby redressing social, ethnic and age skews in the leisure use of woodlands
safeguarding and enhancing the region's natural and built environment	promote the environmental values of woodland in ways that sustain biodiversity, reduce water and air pollution, sequester atmospheric carbon, assist floodplain management and reinforce landscape character
using resources in ways that are sustainable in the long-term	optimise the management and harvesting of woodlands, of all sizes, and in the public, private and voluntary sectors, in order to sustain the vitality of the timber and processing industries; capitalise on the sustainable economic, social and educational spin-offs from woodland environments; optimise the use of wood as a fuel within a strategy of renewable energy generation
learning from best practice in every field of implementation	facilitate a 'soft infrastructure' which will provide practical, strategic, research and promotional support to the woodland and timber industries, in order that good practice may be developed and shared
Regional Economic Strategy (selected key themes)	
competitive businesses and organisations for a world-class region	fully acknowledge the role of woodland cover in contributing to the region's 'world class' qualities; improve the perceived quality and reliability of the region's timber to improve its market competitiveness
creativity, innovation and enterprise	explore the scope for innovation in the use of the Region's woodlands, such as specialist recreation and energy production, especially in order to contribute to diversification of the rural economy; recognising the contribution of woodlands to initial education, lifelong learning and skills training
regeneration plus – supporting our people and our communities	recognise the importance of woodland as a 'soft' end-use in reclaiming damaged land, and in improving the landscapes and lives of people
a clear identity and international profile leading-edge infrastructure and high quality environment	recognise the importance of current and future woodland as an environmental infrastructure; further improve the road network, especially east-west links; invest in facilities and training for the woodland and timber industries; optimise woodland's contribution to the recreational resource of the region, and the existing 25,000-plus kilometres of public rights of way in the Region's countryside

1.3 The Nature of Woodland Wealth

1.3.1 This section provides an initial overview of the 'Real Wealth' of the Region's woodlands – the overall market and non-market benefits of woodland and related businesses to the East of England. It summarises findings which are discussed more fully in subsequent sections of the report in order to emphasise from the outset the total contribution made by woodland assets to the Region's economy, society and environment.

1.3.2 The most obvious way in which woodland contributes to the Region is in terms of its direct economic and employment benefit. Thus, woodland retains a particular importance for the rural economy, not only because it is primarily a rural land use, but also because it key to particular types of industry which are usually located in the countryside. The Region's 'rural economy' has a limited employment market and skills base, and the Index of Employment Deprivation indicates concentrations of employment disadvantage in West Norfolk, Norfolk and Suffolk coastal fringe, and parts of Essex. The woodland/timber industry thus has an important direct role for rural communities. In addition, it is frequently the case in rural economies that many individuals earn their income from more than one source, and woodlands and their products make an important contribution to this 'pluri-activity'. Tourism is a key opportunity for rural economic diversification, and the Region's woodlands already play a crucial role in this respect.

1.3.3 In terms of the core industry in the East of England, we estimate, based on extrapolation from other regional and national figures (PACEC, 2000), that a reasonable approximation for the gross output (i.e. total sales plus change in the value of stock) of forestry and associated processing is about £81m and the total gross indirect and induced impact of the industry around £139m. There are several alternative measures of economic impact, which are discussed in a subsequent section, but the gross output is presented here as a reflection of overall economic wealth.

1.3.4 Significant though this figure is in the context of a transitional and diversifying rural economy, it is only a small part of the annual woodland wealth generated in the

Region. The presence of woodland has a more general significance for the Region's buoyant economy and high quality of life, and it contributes greatly to environmental services, social benefits and economic prosperity. Thus, the 'real wealth' of woodlands may be substantially higher than is commonly supposed. Some reasons for this include:

- woodland settings are integral to some important sectors such as tourism, and are considered by many to be influential in securing and retaining 'rising sun' industries. Whereas some industries and land uses create disadvantages, or negative externalities, for their neighbours, woodlands create positive externalities such as restful landscapes and pollution abatement.
- stocks of woodland can help meet wider policy objectives, such as the sequestration of atmospheric carbon;
- woodland contributes greatly to the health and quality of life of the Region's residents, for example by affording accessible opportunities for relaxation and exercise, and framing the settings of many residential developments.

Not much of this wealth can readily be quantified because it is not susceptible to market transactions. However one recent study (LUC/Wall, 2002), drawing on widely circulated figures for the imputed benefits of carbon-fixing, biodiversity and scenery, reckoned these to be worth £1470/ha (per year), and this would represent £204m annually if applied to the East of England. The same study indicates that regional figures for forest-related recreation (including field sports and organised sports) would amount to significantly over £200m/yr if the same assumptions were applied to the East of England. Whilst we have derived independent estimates for woodland wealth in this report, these sums provide a revealing initial indication of the magnitude of 'hidden' benefits which arise simply from the presence of extensive woodland cover.

1.3.5 According to the calculations used in this report, and bearing in mind that conservative estimates have been included for some elements, it is entirely credible to suggest that woodland wealth contributes a sum approaching £700m/year to the Region's wealth. In addition, these figures could rise significantly if targeted expansion of the Region's woodlands occurred, especially in relation to social/health benefits of well-designed accessible woodlands, provision of specialist recreational and tourist facilities, and development of timber as an alternative energy source. Our values for the Region's woodland wealth is given in Table 2.

TABLE 2 An Overview of 'Woodland Wealth' in the East of England

Summary of Attributed Values	**£M**	See Paragraph
Timber Production and Processing	£87	
Indirect and Induced Effect	£133	
Recreation and Tourism	£128	
Biodiversity	£55	
Landscape Quality	£60	
Physical and Mental Health	£18	
Housing and Industry	£26	
Education	£5	
Physical Environment	£35	
Indirect and Induced Effect	£67	
Retail Wood Products and Crafts	£24	
Arboriculture	£20	
Indirect and Induced Effect	£22	
Current Annual Wealth Estimate	£680	

1.4 A Review of the Benefits of Woodland

1.4.1 Woodland wealth has conventionally been measured principally in terms of the actual market value of timber products and timber-related employment. Increasingly, however, emphasis has been placed on the range of goods and services for which there is no market. Thus, on the one hand, woodland wealth relates to the quantity, composition, age and condition of trees, as a resource to be processed for a variety of uses, and as a contributor to direct and downstream employment. On the other hand, 'non-market' or 'public' benefits typically relate to the social and environmental roles of trees, but may also include economic and employment factors, such as the provision of attractive settings for inward investment. Thus, increasingly, woodland is valued both for its commercial and 'public' benefits. The following review provides an initial summary of the benefits of sustainable forestry that can broadly be classed as economic, social and environmental.

1.4.2 Economic benefits are most apparent where timber-related employment is generated. Of course, forestry requires a long-term investment, and so there is an inevitable delay in realising many of these. Direct economic activity effects include the forest managers, jobs created/retained in forest advice and contracting, jobs created/retained in knock-on forest activities (new wood-using businesses, arts, education, recreation), and training in skills for employment seekers. The main areas of activity are thus forest establishment and management, harvesting, processing, marketing and distribution. Indirect economic activity effects are broadly twofold in nature. First, are those indirect and induced effects related to the timber industry itself. These comprise the outputs and employment associated with suppliers to the core industry (*indirect first round effects*), the subsequent providers of goods and services to these suppliers (*indirect 2nd, etc., round effects*), and the spending of profits and wages of the forestry sector and suppliers (*induced multiplier effects*). Second, and more diffuse and difficult to quantify, are the wider impacts of woodland on net inward business investment and associated expenditure and employment, net retention of population and associated expenditure, and enhanced tourism/recreation and associated expenditure.

1.4.3 Although the dominant one, timber is not the only direct economic product of woodland. Woodland cover is critical to a number of game species, and yields a modest income from other foodstuffs. Income from the sale of deer is significantly greater, but tends to be more than offset by the 2-4% loss in growth typically caused by deer damage to trees (Deer Commission for Scotland, Annual Report 1999-2000).

1.4.4 Woodland is also known to contribute to regional economic assets in a number of other ways. Thus, woodlands have been shown to increase property values, and this generally contributes to a sense of wellbeing and neighbourhood stability, as well as increasing local tax bases. Trees also provide micro-climatic improvements (e.g. shade, wind reduction) which can significantly reduce heating and air-conditioning costs. Woodlands also provide opportunities for jobs and training, not only related to timber production/processing, but also other activities such as conservation.

1.4.5 With regard to urban and industrial land, woodland is a sustainable and cost effective option for the regeneration of brownfield sites, as its management costs are comparatively low, and there are important benefits in the form of landscape restoration

and enhancement, soil amelioration, biodiversity and public access/recreation. Thus, the Government's England Forestry Strategy (FC, 1998a) emphasises the opportunities for supporting regeneration through providing a sustainable after-use for brownfield land. Similarly, the Urban and Rural White Papers seek to bring brownfield land back into sustainable social and economic use in order to regenerate communities disadvantaged by industrial change or decline; more specifically, they note that woodland can play a valuable role in helping to make urban areas healthier and more attractive places, including the option of planting on "former derelict land" in and around towns.

1.4.6 Social benefits have also been widely attributed to trees and woodlands. Ulrich's well-known studies of recuperation rates after surgery (e.g. Ulrich, 1984) found that patients whose windows offered a view of a wooded landscape recovered faster and with less medicine than patients who could only look out on brick walls. Some health benefits are likely to accrue from the noise reduction and pollution filtering effects of woodland, although a great deal of attention has focused latterly on the preventative health benefits of regular low-intensity exercise, such as walking and cycling in readily accessible recreation areas.

1.4.7 Neighbourhoods with attractive landscapes appear to foster a sense of community and belonging; some researchers claim that community pride and social capital increase when neighbourhood residents participate in woodland-related activities; and local woodlands can provide places for neighbours to meet, and thus facilitate the development of social networks. Community participation in landscape regeneration is another social spin-off, and some authors suggest that effective community interest in woodlands can be related to 'awareness-raising', generation of local interest, and degree of participation. One study of community use of woodlands in a new town concluded that the key factors were proximity (within about a five minute walking distance), easy 'visual access', absence of physical or psychological barriers, an area of at least 2ha, preferably an open canopy, and a mixture of species (Coles and Bussey, 1999). A growing policy concern is the need to promote social inclusion, and thus try to ensure that currently disadvantaged groups can share in the country's prosperity. Some innovative projects have shown how well-designed, accessible woodland woodlands in non-traditional areas (such as on derelict land in mining communities in north-west England) can achieve widespread community involvement, attract external funding, increase rates

of participation in recreational activity among lower socio-economic groups, and gradually improve economic opportunities and residential environments.

1.4.8 Many studies have noted the *environmental* benefits of trees and woodlands. On the one hand, these fall into physical/chemical processes comprising: the trapping of airborne dirt and chemical particles, reduction of air speeds assisting the deposition of heavy airborne particles, run-off regulation, reduction of soil erosion, carbon sequestration, and reduction of demand for heating and air conditioning. On the other hand are biological and related benefits, notably the contribution to biodiversity by the provision of wildlife habitat, and environmental education opportunities. The conservation of trees and woodlands is central to many Local Biodiversity Action Plans, whilst landscape ecological studies extol the benefits of consolidating fragmented woodland patches within modern agricultural landscapes. There are some significant wildlife 'disbenefits' such as damage from squirrels and deer which are offset only slightly by the 'charismatic' value of these species to recreation and tourism.

1.4.9 Woodlands clearly have major benefits for the landscape, either through creating predominantly wooded landscapes where visitors can enjoy a 'forest experience', or through more subtle contributions to landscape character types. A recent trend in UK landscape planning has been to protect and recover the characteristic natural and cultural patterns of distinctive landscape character zones, and this very frequently involves active strategies for targeted woodland establishment. Some benefits also attach to the protection of archaeological and historic artefacts from the disturbance of mechanised agriculture. Studies are taking place to quantify this relatively small, but locally important, benefit.

1.5 The Forestry Policy Framework

1.5.1 Forestry policy in Great Britain during much of the 20th century was driven by the need to build up a domestic industry and a strategic reserve of timber. As is well known, this led to an early emphasis on establishing extensive conifer plantations on uncultivated ground, mainly through state sector enterprise, but also through the inducement of private sector planting via grants and (until the 1980s) tax benefits. This

was intended not only to boost the domestic timber production and processing industries, but also to provide benefits to rural communities such as more diversified employment prospects and relatively nucleated settlements and services. Increasingly, from the 1960s, attention was paid to the wider role of woodland in the countryside, particularly its landscape and recreational features, whilst more emphasis was placed on encouraging broadleaved species and improving levels of management in privately owned woodlands.

1.5.2 Nationally, in 1998, forest represented 7.6% of the English land area (c. 990,000ha), and tree cover is expected to grow for the next two decades. The majority (about 78%) of woodlands in England are owned by the private sector. There has been a steady decline in conifer planting over the last ten years and new planting today is more evenly split between broadleaves and conifers. Timber prices are currently low, whilst levels of roundwood production in Europe are high, suggesting that there is little prospect of real price increases in the medium term. The prospects for major expansion of the domestic roundwood market, in strictly economic terms, are further influenced by factors such as the impact of recycling and the emergence of Baltic and East European suppliers. Consequently, it is crucial that any assessment of woodland wealth looks beyond the short-term and strictly production-oriented issues.

1.5.3 Since the mid-1990s, woodland policy has been extensively re-evaluated in response to a rising 'sustainability' agenda. This has recognised that, even though the 'strategic reserve' has long been established and the narrowly-defined economics of the industry are in certain respects unfavourable, nevertheless trees and woodlands underpin sustainable development and quality of life in numerous ways. Thus, the Government's England Forestry Strategy (FC, 1998a) provides a 'new focus' for England's woodlands by operationalising the two main aims of forestry policy, namely:

- the sustainable management of existing woods and forests; and
- a continued steady expansion of woodland area to provide more benefits for society and our environment.

Thus, the Strategy sets out four key programmes. First, it promotes *forestry for rural development* as a means of contributing to the rural economy and timber and marketing opportunities. Second, it emphasises the role of *forestry for economic regeneration* within strategic land use planning, including restoring former industrial land and creating a green

setting for future urban fringe development. Third, the programme of *forestry for recreation, access and tourism* aims to promote more and better quality public access to woodlands as well as complementing and supporting the tourist industry. Finally, *forestry for the environment and conservation* addresses issues of nature conservation, biodiversity, climate change, environmental character, cultural heritage and the wider rural land use resource.

1.5.4 The promotion of good forestry practice has been supported through the *UK Forestry Standard* which sets out ways of ensuring that forestry practice meets sustainability criteria (FC, 1998b). Thus, modern forestry is expected to ensure the maintenance and enhancement of:

- forest resources and their contribution to global carbon cycles;
- forest ecosystem health, vitality and biological diversity;
- productive functions of forests (wood and non-wood);
- protective functions in forest management (notably soil and water); and
- other socio-economic functions and conditions.

The 'Standard' sets out guidelines on how these principles are to be related to general forestry practice, creating new woodland and 'new native' woodland, felling and re-stocking planted woodland, managing semi-natural woodland, and planting and managing small woods.

1.5.5 Most recently, the Forestry Commission (2002a) has developed a suite of indicators which can be used to confirm whether the Standard is being fulfilled. These indicators give a strong indication of the multiple benefits now widely associated with Britain's woodland estate and relate to:

- woodland characteristics
- biodiversity measures
- condition of forest and environment
- timber and other forest products
- people and forests
- economic aspects.

The indicators have been selected as representations of national trends and the report accepts that they may not always be well attuned, either in terms of data availability or topic, to regional priorities. Nevertheless, they confirm the direction of contemporary

forestry in the UK as being one of achieving multiple benefits through the adoption of sustainable development priorities.

1.6 Undertaking the Research

1.6.1 The brief for this research broadly required quantitative and qualitative assessments of: the economy and employment associated with the woodland sector; the main social and environmental roles of woodland; an assessment of the key barriers to the sector's potential contribution to the Regional Economic Strategy; and an indication of hard and soft infrastructure needs for the industry's future.

1.6.2 We have addressed this brief in a number of ways. First, we undertook a desk study of general literature relating to woodland wealth, providing us with a broad overview of previous experience of the multiple benefits of woodlands and the timber industry. Second, we examined recent, more technical literature relating to the sector as it affects the Region. Thus, for example, the National Inventory of Woodlands (FC, 2002b), supplemented by models of future timber availability provided by the Forestry Commission, and specially commissioned reports such as Intermark's studies (1994, 2002) of timber product sales in the Region, have been valuable sources of information. Third, we sought to attribute monetary values to many aspects of the Region's woodland wealth. This required an analysis of more specialised literature on non-market benefits, and reference to concurrent studies, notably, the *South West England Forestry and Woodland Strategic Economic Study* prepared by Land Use Consultants and others (LUC/Wall, 2002), and *Forestry Forward* (Yorkshire and Humber) undertaken by Firn Crichton Roberts and John Clegg and Co (2002). Where possible, we have experimented with alternative methods of valuation to those used in other studies, to see whether reasonably consistent and convergent estimates of woodland wealth could be derived. Fourth, we conducted a supplementary postal questionnaire survey amongst the Region's woodland owners and woodland industry businesses, which provided evidence on current management, regional retention of expenditure, employment densities, business confidence, and developmental needs. Finally, we conducted a number of interviews with public and private woodland owners, and personnel from woodland businesses, in order to provide

additional insight. In all this, we have been supported by a steering group which has been enormously helpful in shaping the broad brush and the fine detail of the final report.

1.6.3 The questionnaire/interview survey was intended as a source of primary data on broadly-defined 'timber based businesses'; however, given the lack of compulsion on recipients to reply, we recognised that it was unlikely to provide statistically reliable results on which firm estimates of the size and composition of the regional industry could be based. Consequently, the survey had the following, more limited, objectives:

- to provide an indication of the numbers, types and characteristics of forest/timber industry businesses in the East of England;
- to provide a basis for estimating levels of expenditure, and the degree to which different types of expenditure were retained within or flowed out of the Region;
- to identify missed opportunities where increased local production or processing could improve the Region's balance-of-payments;
- to ascertain the importance of timber industry businesses within local economies and employment markets;
- to identify perceived barriers to, and opportunities for, the future expansion of woodland wealth.

1.6.4 The questionnaire/interview survey was conducted on two broad categories of respondent, woodland owners and forestry contractors. However, as these categories overlap for many individual businesses, a 'broad spectrum' questionnaire was used to be generally applicable to mixed types of enterprise. The questionnaire was piloted on a face-to-face basis with a number of different types of enterprise. Our sampling frame was based on directories held by Anglia WoodNet, 'Yellow Pages', trade directories, and Woodland Grant Scheme (WGS) records kept by the Forestry Commission.

1.6.5 One of the difficulties which respondents encountered in answering the questionnaire – which we anticipated – was that it had a uniform content and so not all sections were equally relevant to all landowners and forest-related businesses. However, to have used multiple questionnaire designs would have resulted in receiving very few returns within some categories; moreover, many businesses comprised more than one type of forest-related activity, and it would have been impossible in advance to know which questionnaire/s would be most appropriate to them. Overall, the 'one size fits all'

questionnaire design has resulted in useful information on the Regional forestry business. In addition, we recognised that some of our requirements for information would be onerous if accurately completed, and we thus encouraged recipients to complete the questionnaire quickly, giving approximations where appropriate. Despite the methodological limitations, the questionnaire has yielded a range of valuable information. The survey returns have been analysed both qualitatively and quantitatively, by use of an Access database and by individually examining each of the replies. Further details of the survey are given in Appendix 1.

1.7 Woodland and Timber in the East of England

1.7.1 The woodland resource of the Region has recently been documented in the National Inventory of Woodland and Trees. This shows an uneven pattern of woodland cover distribution, ranging from 3.6% in Cambridgeshire to 9.8% in Norfolk, and averaging 7.3% for the Region. The highest proportions of conifers are in Norfolk and Suffolk, with a comparatively even spread of broadleaves, and small but important concentrations of ancient woodlands throughout the region. Overall, the pattern is one of relatively small woodlands, mainly broadleaved and predominantly in private (and other non-public) ownership, but with a number of large conifer-dominated Forestry Commission holdings making a major contribution both to the timber industry and the Region's amenities.

1.7.2 The East of England chapter in the England Rural Development Programme also draws attention to the region's woodland resource, noting the extent of woodland and patterns of ownership. It notes in particular that over half of non-Forestry Commission woodlands are unmanaged or undermanaged. Whilst acknowledging that many of these are Ancient Semi-Natural Woodlands, the document considers the main factor to be the presence of neglected (typically small and isolated) plantation woodlands. The Programme identifies the key forestry issue in the Region as the lack of any large timber processing facility (beyond 3 large sawmills in Norwich and one in Suffolk). Until recently, this has not been a major problem for commercially managed conifer plantations, for which long haulage transport has had only a comparatively limited impact but, with falling timber prices, transport costs are becoming major proportion of total

costs. Moreover, the limited distribution of local timber processing facilities is seen as a major drawback for promoting effective management of broadleaved woodlands. Often, the main product from these sites will be low-grade roundwood, which is most economic when it can be transported to relatively local large-scale bulk users (e.g. MDF mills or power stations). The ERDP chapter notes a considerable potential for improving the existing woodland resource in the region.

1.7.3 The region has been associated with two EU funded projects promoting the development of markets for lower grade timber resources. One, Anglia WoodNet, operated in the (former) Objective 5b areas of Norfolk and Suffolk but now maintains only a limited presence. The other was one of five EU Centres of 'TWIG', the Trans National Woodland Industry Group (a RECITE project), but as only one component of a Pan-European project it had only a limited impact on its project area in the Chilterns. These projects confirmed the widely-held view that finding markets for low-grade material is a key to stimulating management of the region's private broadleaved woodlands.

1.7.4 Of further regional significance, is the presence of three Community Forests – Marston Vale, Watling Chase and Thames Chase – which aim to create extensive areas of new multi-benefit woodland. The Community Forest programme was established by the Forestry Commission and Countryside Agency in the late 1980s to offer ways of providing multiple public benefits and diversifying rural land use through concerted efforts to promote tree planting within focused project areas. The main tree planting mechanism has been the WGS scheme, supported by a locational supplement. The Community Forest plans include partnership-based policies covering forestry, community involvement, landscape, agriculture, nature conservation and recreation. Other aims include education, management of existing woodlands and investigating the possibility of re-establishing traditional markets for woodland products and employment. For over a decade, the Countryside Agency and the Forestry Commission have viewed Community Forests as priority areas for receiving grant aid. However, the enduring importance of community forests has probably been their developmental work in pioneering multi-benefit woodland in non-traditional locations, and this experience is now being applied more generally across the sector. Core funding from the Countryside Agency ceases in 2005 and, although alternative sources of funding are being investigated at a national level, it is likely

that regional level initiatives will also be required if the Community Forests are to achieve their original goal of 30% woodland cover in designated project areas.

1.7.5 The departure point for a stock-take of the East of England's woodland wealth is a review of the availability of timber of different species and grades. A 'snapshot' of this is provided by the National Inventory of Woodlands and this is summarised in Table 4. An indication of the character and variety of the Region's tree cover can be obtained from Table 3, which illustrates some regionally characteristic woodland types.

Two major areas of Forestry Commission woodland are of particular significance to the Region's landscape. Thetford Forest is the largest area of continuous woodland in the Region and was designated a Forest Park by the Forestry Commission in May 1990. The Forest attracts over 1.5 million visitors each year. Although predominantly a commercial estate comprising mainly Corsican and Scots pine, it also contains extensive areas of heath and broadleaves. The Sandlings are a set of three major areas of commercial woodland near the Suffolk coast. Whilst comprising mainly conifers, they also include broadleaved areas, lowland heathland and wetland areas. They are included within the Suffolk Coastal AONB (Area of Outstanding Natural Beauty).

The Greensand Ridge in Bedfordshire consists is covered by relatively poor acidic soils, which support mainly coniferous woodlands. Alongside these, small areas of rough grazing and regenerating birch exist in the undulations of the scarp slope. In contrast to these relatively modern woods, a number of ancient woodlands, supporting important acidic plant communities, are located on the ridge which help create the distinctive wooded skyline as seen from the north. In other locations, the woods have a more mixed character, being actively managed for conservation, sport, and timber production. The parkland areas of pasture with mature trees and encircling shelter belts are a relatively small yet critical and widely distributed component of the landscape.

The south-east of the Region contains some outstanding examples of remnant ancient hunting forests, notably Epping, Hainault and Hatfield. These are noted as containing important examples of woodpasture, including pollards of great value to bryophytes, lichens, invertebrates, bats and hole nesting birds. Epping Forest is also notable for its wet dwarf shrub heath habitats.

The Staverton Thicks of Suffolk are an important example of old acidophilous oak woods in the eastern part of its range. Its ancient oaks have rich invertebrate and epiphytic lichen assemblages. Despite being in the most 'continental' part of southern Britain, the epiphytic lichen flora of this site includes rare and Atlantic species. Part of the site includes an area of old holly trees that are probably the largest in Britain. The site has a very well-documented history and good conservation of woodland structure and function.

The Region also contains a number of notable estates with extensive woodlands, both in the private and voluntary sectors. For example, the Ashridge Estate on the Hertfordshire-Buckinghamshire border on the Chiltern Hills, owned by the National Trust, comprises over 1600ha of woodlands alongside chalk downlands, and is noted for exceptional views and walks. The woods are mainly deciduous with some woodpasture, and contain support a wealth of wildlife including the lesser spotted woodpecker, wild fallow deer and badgers. The estate also maintains a study base, staffed by an education warden and volunteers, closely linked to the woodland resource.

Table 3 An Illustration of Some of the Region's Key Woodland Assets

size and composition

- The total area of woodland of 0.1 hectares and over in the East of England region is 139,112 hectares, representing 7.3% of the land area. 81.3% of this is woodlands of at least 2ha.
- Broadleaved woodland is the dominant forest type representing 60.1 % of all woodland. Conifer woodland represents 22.1 %, mixed woodland 11.1 %, coppice or coppice-with-standards 1.1%, and open space within woodlands 5.0%.
- The main conifers are Scots and Corsican Pine (79% of all conifer species), covering 30,068 hectares. The main broadleaved species is oak covering 23,509 hectares or 25.6 % of all broadleaved species; other well-represented broadleaves include ash (11.6%), sycamore (7.7%), birch (7.4%), beech (5.9%) and elm (1.5%). In small woodlands, sweet chestnut and, to a lesser extent, poplar and willow, also appear to be significant.

trees outside woodland

- Trees outside woodland are often very important landscape features, and may have important biodiversity, micro-climate amelioration and soil protection functions. It is estimated that some 13.5m trees are situated in small groups, narrow linear features or in isolation. In the region, there are approximately half a million small tree groups (mean = 8 trees) and 168,000 (± 17%) narrow linear features.

ownership

- 25,702 hectares or 23 % of woodland over 2 hectares is owned by or leased to the Forestry Commission, and 87,392 hectares or 77 % of woodland is in Other ownership. 'Other' ownership comprises 47.6% private individuals, 12.5% businesses, 7.2% charities, 5.7% local authorities, other public 1.8%, and community/common land 0.5%.
- 70% of trees in FC holdings are conifers, whilst 68% of trees in privately owned woodlands are broadleaved. The small amount of coppice and coppice-with-standards is mainly privately owned.

areas

- There is a total of 7,767 woods over 2 ha within the East of England region with a mean wood area of 14.6 hectares, and a total of 45,004 woods from 0.1 - <2.0 hectares with a mean wood area of 0.6 hectares. FC woods are disproportionately in the larger size classes (e.g. 16% of all woodland is in the eight FC forests in the 500+ ha category). However, the median group is the 'other'-owned woodlands of <10ha (23% of total woodland area in 6,026 woods); 60% of woodland cover in 'other'-owned woodland is in units of <100ha.

trends

- Tree cover increased by over 26,000 hectares from 5.8 % to 7.2 % of the land area between 1980 and 1998.
- The area of broadleaves increased by 52 % between 1980 and 1998, with the relative proportion of broadleaves to conifers increasing from 59 % to 71 %.
- The most rapid rates of planting occurred between 1951-70, and subsequent rates of planting were comparable to 1930s levels. Although private sector planting is well down on the period 1940-70, this general situation masks a significant recovery in the planting of oak in non-public woodlands, and a steady upward trend in the planting/re-planting of Corsican pine by the Forestry Commission.

commercial potential

- There are 23,893ha of FC-owned and 80,440ha of 'other'-owned high forest in the region (plus 866ha and 177ha respectively which was felled at the time of survey), which can be divided into: *Category 1*, stands which are, or could become, capable of producing wood of a size and quality suitable for sawlogs; and *Category 2*, which are of lower quality. 19, 378ha of FC and 14,220 of private conifers, and 3,575ha of FC and 53,874ha of private broadleaves fell into Category 1. For Category 2, the figures were 85ha and 672ha, and 855ha and 11,675ha respectively. Overall, therefore, the woodland stock of high forest is predominantly of sawlog quality, though there is significant undermanagement in the 'other'-owned broadleaved resource.

Table ~~xx~~ 4 Trees and Woodlands in the East of England

1.7.6 The trends identified in the National Inventory show that the pattern of planting has fluctuated during the 20th century, in terms of the balance between private and public sector, the choice of species, and quantities planted. These all have implications for the potential production from within the Region. The following discussion provides an overview of timber availability, though this always exceeds actual output, and makes no allowances for the smoothing of peaks and troughs by felling either slightly before or after the optimum date. Nationally, the annual volume of conifer timber harvested is around 60% of the gross annual increment in conifer growing stock. The volume of broadleaves harvested is only around 20% of the gross annual increment in broadleaved growing stock. Harvesting could rise above these levels, though it must remain below 100% for various reasons.

1.7.7 The theoretical availability of timber in the region has been estimated by the Forestry Commission, using the methodology used for GB forecasts (as described in Forestry & British Timber, April 2001; see also Appendix 2). The forecast was then extended to hardwoods, using the same methodology, but this needs to be seen as a more approximate forecast as predicted private sector volumes are much less likely to be close to the volume actually supplied to the market. The forecast was further extended to Class 2 and 3 woodlands in the private sector. These are woodlands identified in the National Inventory as being likely to produce lesser quality material (i.e. not sawlog standard). Overall availability is summarised in Figure 2.

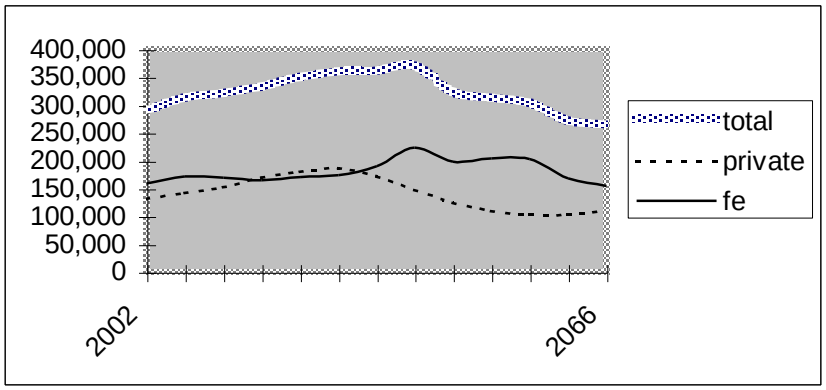


Figure 2 Production forecast, all woodland, East of England

1.7.8 Annual coniferous roundwood availability in the East of England could increase from its current level (c290,000 cu.m.) to around 370,000 cu.m. by 2040 before declining quite sharply (Figure 3). Private sector and FE theoretical availability will be similar until around 2035, at which point the private sector contribution could decline sharply and stabilise at around 100,000 cu.m./yr and FE output will rise. The dominant species will be Corsican Pine and Scots Pine, with more minor production (mainly in the private sector) of larches, Norway Spruce and Douglas Fir.

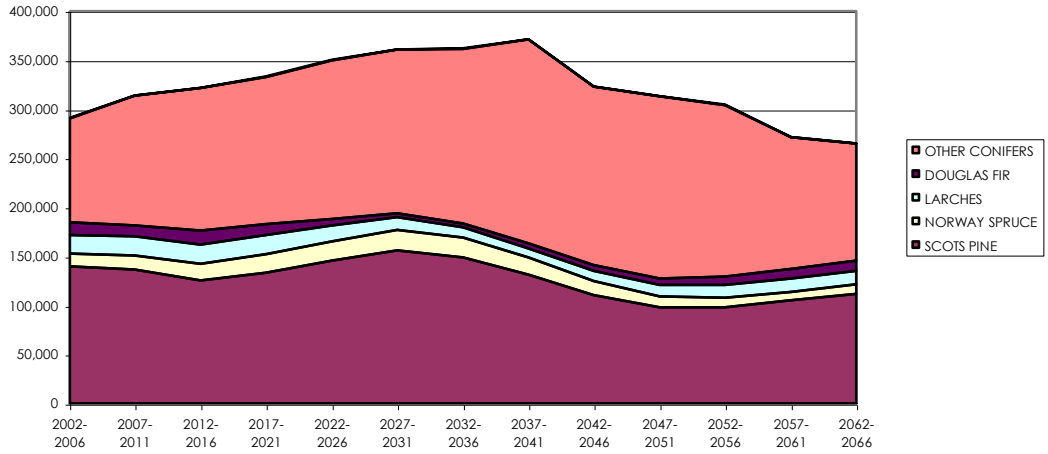


Figure 3 Forecast Conifer Production, public and private sectors combined, East of England

1.7.9 Broadleaved roundwood availability will remain relatively stable until around 2040, with only relatively minor increases and decreases to be evened out (Figures 4, 5). Thereafter, there will be a fall in annual levels of availability of around 40,000 cu.m.. Oak is the principal species, though a good variety of species will be available fairly steadily throughout the forecasting period, together with a sizeable 'window' of poplar availability between about 2015 and 2050.

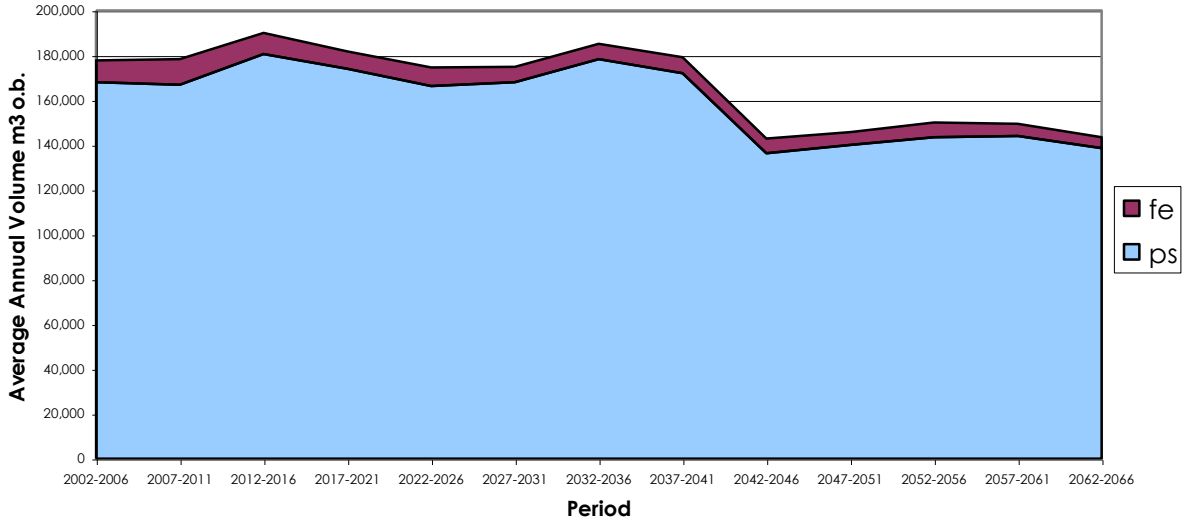


Figure 4 Forecast of hardwood (Class 1) availability, public and private sectors combined, East of England

1.7.10 Availability of hardwood species is predominantly in the private sector, and this may lead to issues of quality and reliability of supply (Figures 4, 5). Approximately 80% of hardwood in the private sector is likely to be Class 1, so there could be around 20-30,000 cu.m./yr. of low grade hardwood available. Actual availability, especially in the private sector, will depend on access, timber prices and the scale of operations.

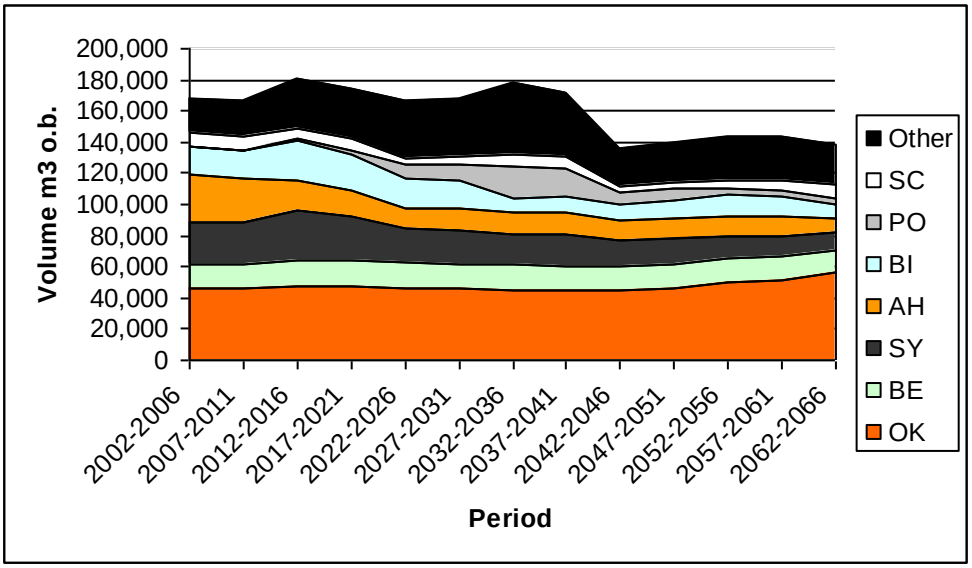


Figure 5 Forecast of Class 1 Private Sector Hardwood Availability by Species, East of England

PART 2: THE PUBLIC BENEFITS OF WOODLAND

2.1 Introduction

2.1.1 Within a post-industrial knowledge economy, timber production and processing is typically only a minor sector, and its importance is more accurately represented in terms of its flow of 'public' or 'non-market' benefits. This is particularly true of a region like the East of England which, overall, is highly prosperous, yet where quality of life is unevenly distributed and locations are not uniformly attractive to inward investors. This section of the report is organised according to what we consider to be the key public benefits of woodland, namely:

- the value of woodlands for recreation and tourism
- the biodiversity values of woodland
- the contribution of woodlands to landscape quality
- the contribution of woodland landscapes to physical and mental health
- woodland as a framework for housing and industry
- the educational role of woodland
- the physical environmental benefits of woodland, namely, its role in maintaining air, soil and water quality.

These values are likely to be substantially higher than the market benefits of timber production and processing.

2.1.2 This section of the report uses the term 'public benefit' to represent those woodland-related sectors for which markets rarely exist and thus derive their value from the presence of woods *per se* rather than timber extracted from them. In reality, the degree to which a market is absent varies: for example, some direct charges may be made for woodland recreation, indirect economic benefits arise from local expenditure by woodland visitors, future markets may exist in 'credits' for the atmospheric carbon sequestered by trees, whilst no market exists for the role of lowland woodlands in moderating floods. The terms 'public' and 'non-market' benefits or values are thus used somewhat flexibly.

2.2 Estimating Non-market Values

2.2.1 The estimation of values for environmental goods and services has become an increasingly important topic for economists in recent years. The problem – that of placing a monetary value on priceless assets for which there is no reliable market mechanism to reflect full costs and benefits – is essentially insoluble, and all the available methods have been subject to criticism. Nevertheless, numerous refinements have been made to the various techniques and decision-makers are placing increasing confidence in their results. Broadly speaking, there are four main ways of estimating non-market values of environmental assets:

- travel-cost or revealed preference methods, which estimate people's expenditure on their use of a resource (e.g. expenses incurred in reaching a destination) as a proxy for its perceived worth;
- hedonic pricing methods, which use statistical data to determine the amount people appear to be willing to pay for their 'enjoyment' of a resource (e.g. the associations between house prices and local amenities);
- simulation of imaginary (contingent) markets, by asking respondents to a questionnaire how much they would be willing to pay for the creation/ maintenance of an environmental asset (or how much compensation they would be willing to accept before agreeing to its loss); and
- benefit transfer methods, which take valuations made for one area, and transfer these assumptions to another area, making specific allowances for variations in demographic composition and environmental characteristics.

2.2.2 The current study has considered various available sources of information on non-market woodland benefits. As might be expected, it is rarely possible to take a single reliable figure and apply it directly to the woodland resource of the East of England. In practice, economic studies of environmental resources have been specific to the original research context, and are highly sensitive to the type of question being asked. For example, questions typically relate to very particular circumstances related to woodland extensions, coniferous or deciduous woodlands, accessible or remote sites, replacement of particular habitat types with woodland, local and overnight visitors, and so forth. Equally, perceived values may variously be attributed to individuals or households, allocated on a per visit or annual basis, and applied on a whole woodland or per hectare

basis. Consequently, we have deliberately not made precise estimates, in order to avoid a false sense of accuracy. We have looked at a range of measures, where available, and also checked our estimates against those in other recent studies, notably the recent regional woodland reports prepared for South-West England and Yorkshire and Humber. In considering the results of other studies, we have also tried to adopt a contrasting methodology where practicable as a further check on consistency. Moreover, in some instances, we have not been able to establish a plausible basis for the magnitude of regional benefits, even where it appears highly probable that some benefit exists. In these cases, we have indicated the potential scale of benefit by supposing that woodland cover makes 'a percentage point' contribution: that is, we have stated the scale of benefit if woodland were to contribute one per cent of the total regional worth of a particular feature. This is a random and probably highly conservative assumption, but it is at least a starting point.

2.2.3 We have deliberately not used misleadingly precise figures or confidence limits, in order not to convey a false sense of accuracy. Rather, we have used rounded figures to yield broadly credible estimates in the light of available evidence, and have especially tried to reassure ourselves by seeing if differently derived estimates tend to converge. Consequently, we offer our estimates of non-market 'wealth' as **convergent approximations**.

2.3 Recreation and Tourism

2.3.1 One of the most widely studied non-market benefits is that of woodland recreation. The various categories of benefit of woodland recreation comprise: leisure benefits derived by visitors to woodlands to carry out specific formal and informal leisure activities; health benefits associated with gentle but sustained physical exercise and psychological wellbeing; and lifestyle benefits for visitors who seek particular kinds of emotional and spiritual refreshment, and which are particularly associated with woods possessing ecological and cultural values.

2.3.2 An examination of national data on woodland recreation reveals a consistent and interesting feature. Most woodland recreation a frequent but short-duration activity

undertaken close to home in a woodland often perceived to be owned by a local authority. Thus, it is often very low-key in nature, benefiting from the presence of formal or informal general access or rights-of-way. This is very significant with regard to subsequent arguments about exercise, social inclusion and reductions in car use. Virtually no expenditure is involved by the users, and any economic values can only imputed indirectly. A significant minority of activity, though, may be more formal, generally involving expenditure in travelling to a far larger site, and may involve purchasing or hiring equipment to pursue particular leisure activities. Here, there are actual economic benefits, often to a local rural area.

2.3.3 A number of woodlands in the Region already make significant provision for recreation. The 'flagship' woodland recreation resource is the Thetford Forest Park, attracting over 1.5m visitors a year, and including the Lynford Arboretum and High Lodge Forest Centre. Provisions include a forest drive, bicycle hire, cycle trails, sculpture trail, an adventure play area, and – as an interesting example of private sector investment and a niche market in adventurous activities – a high wire assault course. A variety of 'lower key' provisions are made in The Sandlings, the other major location where Forest Enterprise has invested in visitor facilities, situated in the Suffolk Coastal AONB. This area includes Tunstall Forest, catering mainly for quiet recreation but also hosting twice yearly Motorcycle Enduros; Rendlesham Forest, which is the principal focus for informal recreation; and Dunwich Forest, neighbouring important wetland and heathland habitats on the Suffolk coast.

2.3.4 Private sector woodland generally makes less access and recreation provision than does public woodland. However, in England open access beyond rights of way is estimated to exist for 281,000ha, of which 128,000ha are non FC-owned. 40% of private woodlands are grant-aided through WGS, and this woodland has *provision for public recreation* as a stated high or medium priority objective. However, this does not always mean that access is generally available: uptake of the Forestry Commission's *Walkers Welcome* package has been disappointing (PSPS, 1997), and only 22% of non-public sector woodlands have public access beyond PROWs. Factors limiting the willingness of private owners to extend access include occupiers' liabilities, insurance costs, perceived risks to commercial interests and desires to protect field sports and property values (PSPS, 1997). Interestingly, proximity to urban areas *per se* does not seem to be a deterrent to owners

opening these woodlands to public access, whilst owners generally welcome certain types of user such as local people, conservationists and school groups (Sime et al, 1993).

2.3.5 There is extensive evidence confirming the popularity of a wide range of recreational activities in Britain's forests and woodlands. The main types of forest *recreation* provision are visitor centres, forest walks, cycle routes, forest drives, picnic sites, campsites, classrooms, arboreta and forest gardens; *tourism* provision includes cabins, camping, caravans and cottages. People prefer woods that include diversity of species, colours, ages, form and ground cover. In broad terms, Britain's woodlands are diverse and provide important values for recreation and enjoyment, including scenic and wildlife values, robustness, privacy, shelter, and ability to absorb noisy activities (PSPS, 1997). Recreational values of woodlands may be diminished by physical conditions, management regimes, closures for operational reasons, and restrictions on access to conservation sites. Visitors to larger woodlands tend to fall into two groups: those undertaking active pursuits, such as walking, cycling and sports; and those seeking leisurely activities, such as picnics, bird-watching and visiting attractions. Walking is the most popular activity and is undertaken on 57% of visits. Specialist users (horse riders, cyclists, climbers, pursuers of on-water activities, disabled) generally seek specific features in recreation land (MVA, 1999). Bird-watching is major specialist recreation activity, and Thetford Forest, for example, provides habitat for important populations of rare species such as woodlark and nightjar. Particularly in areas with low levels of woodland cover, there is likely to be significant latent demand for woodland recreation. Research by the Countryside Agency points to the effects of this imbalance. In a comparative study of Haslemere and Burnley, residents in the former town felt there was no need to extend access to woodlands, as there were sufficient current opportunities, whereas residents of Burnley felt that greater access rights would be of benefit to them.

2.3.6 The Public Opinion of Forestry survey indicates, for 2001, that 73% of adults in England had visited a woodland in the last few years. Most visits are by regular visitors, to woods near their homes, and for 2 hours or less. Most day visits (43%) are to woods perceived to be owned by local authorities (e.g. country parks), 17% to woods perceived to be privately owned, 12% to FC woodland and 8% to woods owned by voluntary organisations. It has been estimated that woodland day visits have an overall expenditure of around £1,090m /yr including travel costs.

2.3.7 Some of the most useful figures are provided by the UK Day Visits Surveys. The 1998 survey estimates that there were 308m woodland leisure day visits to woods in England. Unfortunately, unlike the 1996 survey, this did not provide a regional breakdown, and the 1996 survey only provides breakdown by former English Tourist Board regions. However, assuming the regional pattern to be relatively stable, and taking the East Anglia figures and appropriate fractions of South-East and East Midlands figures, it appears that about 18% of all recreational visits to English woodlands occur in the East of England. This would indicate in excess of 55m visits annually. Within this general pattern, there is significant regional variation with, for example, the majority of day visits to woods and forests in England being made in East Anglia (*sic*) and the least in Cumbria. Such generalisations require qualification, however, as the pertinent figures only cover day trips from home and ignore woodland visits on weekend breaks or holidays where visitors are attracted by the facilities provided by larger woodland sites, which may be a large proportion of total woodland visits to some areas. The presence of 'honeypot' sites may also have a major impact on regional figures (Scott, 1999).

2.3.8 Overall, visits to the countryside remain relatively steady, but underlying changes may be masked, such as the increasing demand for very active recreation. For woodland, cycling (away from the public highway) and the demand for open access will continue to be important trends. This is crucial to bear in mind in any discussion of woodland recreation – much of the potential use is a <u>latent</u> demand for relatively novel recreation and sport activities, and perhaps entertainment events, whose demand levels are not yet known. The dramatic success of mountain biking in Welsh forests and some anecdotal evidence regarding concerts suggest there is major untapped potential. Thus, visitor numbers to Coed y Brenin in west Wales increased by 20,000 (40%) in 1998/99 mainly due to mountain bikers from Merseyside and the West Midlands when the FC provided particularly good facilities. Similarly, there are as yet no log cabins in any of the East of England's forests. The Deerpark site in Cornwall, for example, has year round letting and, assuming an average price per unit of approximately £320 per 6 person cabin per week and an occupancy rate of 60%, the 45 units would yield an annual income of almost £450,000. Presently, large scale woodland tourism facilities in the East of England are relatively limited, the key provisions being the FC camping and caravan site in at Thorpe Woodland, Shadwell (Thetford Forest), Forest Heath Caravan Park near

Weybourne (part touring, part residential), and the re-opened Center Parks resort at Elveden Forest. We have not costed this separately in order to avoid double counting with tourism expenditure generally, but the relative paucity of provision points to the opportunities which could be available to enterprises in the context of diversification of the rural economy.

2.3.9 The pattern of recreational woodland usage also raises issues of social inclusion. Thus, Scott (1999) observed that the proportion of respondents to FC surveys who had visited woods in GB was larger for social classes ABC1 than for C2DE (60% and 40% respectively). This skew is also apparent from the most recent FC Forest Visitor Surveys (FC, 2001b), which indicates that 'wealthy achievers', 'affluent greys', 'comfortable middle agers', 'affluent executives' and 'well-off workers' from rural and suburban locations are significantly over-represented relative to urban and blue-collar members of the population (Table 5). For example, 'people in multi-ethnic, low income areas' comprise 2.2% of the population but only 0.1% of woodland visitors, whereas 'affluent greys, rural communities' are 2.3% of the population but comprise 4.7% of woodland visitors. Moreover, Scott reported that over 50% of those without access to a car had not visited a wood in the last few years. With careful design and planning, it is possible to adopt measures to balance participation rates, and a study of a Forestry Commission site in Norfolk found that the lack of entry charge made the site particularly appealing to unemployed persons with reduced disposable incomes. Also, the average age of the UK population is increasing such that in 30 years time it is forecast that quarter of the population will be aged 65 or more. An older population will place different demands on woodland for access.

Table 5 Acorn Area Postcodes for Woodland Visitors (FC, 2001b)

Acorn Group	GB Population Base	Survey	Index
A1 Wealthy Achievers, Suburbia	14.9%	23.9%	160
A2 Affluent Greys, Rural Communities	2.3%	4.7%	204
A3 Prosperous Pensioners, Retirement Areas	2.6%	2%	77
B4 Affluent Executives, Family Areas	4.4%	7.2%	164
B5 Well-off Workers, Family Areas	7.1%	8.4%	118
C6 Affluent Urbanites, Town and City Areas	2.7%	1.1%	41
C7 Prosperous Professional, Metropolitan Areas	2.1%	1.1%	52
C8 Better-off Executives, Inner City Areas	4.1%	1.9%	46
D9 Comfortable Middle Agers, Mature Home-Owning Areas	13%	15.8%	122
D10 Skilled Workers, Home Owning Areas	12.7%	12.6%	99
E11 New Home Owners, Mature Communities	8%	7.3%	91
E12 White Collar Workers, Better-off Multi-Ethnic Areas	4.1%	2.3%	56
F13 Older People, Less Prosperous Areas	3.3%	2.3%	70
F14 Council Estate residents, Better-off Homes	11%	6.5%	59
F15 Council Estate residents, High Unemployment	3.1%	1.4%	45
F16 Council Estate residents, Greatest Hardship	2.3%	1.2%	46
F17 People in Multi-Ethnic, Low Income Areas	2.2%	0.1%	5
U Unclassified	0.2%	0.1%	50

2.3.10 Macnaghten et al (1998) noted that, for most people, the experience of trees & woods has intimate personal significance associated with contact with nature and tranquillity. This tends to be associated with informal woods rather than commercial plantations. Thus publicly accessible woodlands, both urban and rural, are key places where people feel they can 'get away from it all'. People differ in their appreciation and use of woods according to both their socio-economic group and geographical location; ethnic minorities, in particular, feel disconnected and even deterred from using informal rural recreation sites. People display little direct knowledge of the significance of issues of ownership, though they may have a tacit sense of the different constraints of use. There is a 'frustrated' desire (i.e. demand exceeding resource availability) by many to get more 'involved' actively with local woodlands / forests (e.g. foraging / camping / experiencing). There is major scope for attracting families to woods, provided their needs are catered for: parents, especially mothers with younger children, need secure, accessible low cost opportunities, whereas families with older children seek more strenuous activities.

2.3.11 Demographic changes will increase pressures for woodland access and on recreation facilities on urban fringes. Also, it is reasonable to suppose that increased availability of, and accessibility within, woodlands closer to where people live is also likely to reduce the proportion of carborne trips and encourage visitors to walk or cycle. Thus, accessible and inviting woodlands would be likely to:

- encourage a higher level of exercise activity
- reduce congestion on roads and at car parks
- provide a more enjoyable and healthy overall recreation experience, bearing in mind that this comprises outward and return journeys as well as time at the destination
- provide a more restful and contemplative recreation experience, and
- reduce pollution.

2.3.12 Generally, it seems reasonable to suggest that two types of woodland will make strategic contributions to recreation in the future. First, large woodlands within a day's round trip by car will help to satisfy rising demand for sophisticated forms of leisure activity. These are also likely to attract visitors who stay overnight. Second, smaller but highly accessible woodlands, which generally supply only low-key facilities but do not (normally) make user charges, will meet the needs of more spontaneous recreation demand. These woodlands should be within walking distance of centres of population, should include paths that are conducive to walkers with impaired mobility, and make efforts to cater for non-traditional users. It is likely that latent demand for both types of woodland is unsatisfied and increasing.

2.3.13 Some of the drawbacks of catering for recreation in newly created woodland may be offset by the FC's Community Woodland Contribution (CWC). The Community Woodland Contribution is intended to:

- provide opportunities for access to woodland areas planted and managed for woodland recreation;
- contribute to the improvement of the landscape around the outskirts of towns and cities;
- involve local communities in implementing and managing these developments; Hand

- provide communities with a type of amenity that is locally scarce and highly valued.

In order to qualify for CWC, the woodland must be within five miles of the edge of a village, town or city where there are few other woodlands available for recreation. The Forestry Commission enters a 10 year contract with the applicant in which permissive access is granted to the public. Presently, the scheme is dominated by small (mean 3.9ha) local authority sites, with the smaller proportion of 'private' sites (38%) having a much higher mean size (8.9ha). A study by Crabtree et al (2001) draws attention to predominance of applications in the Central Belt of Scotland, NE and NW England and the Midlands; their scatter plot of applications on a map of Britain confirms the relatively small number of applications in the East of England. Their study of residents revealed strong public support for more woodland, with nearly 40% of respondents to their survey stating that they would prefer more accessible woodlands in their locality. When aggregated, the public benefit varied from £25 to over £32,000 per hectare per year depending on the woodland and the size and characteristics of the local population. It appeared that only a small part of the public benefit derived from physical access to the woodland, and most residents are more interested in trees in their locality for other reasons than access (though the study speculated that this might reflect the poor design of some community woodlands). In terms of non-market benefits, this study clearly demonstrates how well-designed, highly accessible woodland, especially in areas of social deprivation, can have very high policy impact indeed.

2.3.14 The importance of accessible open spaces – of a naturalistic kind, rather than just formal play areas – to residential areas has long been established. It is clear that this is desirable not only from the viewpoint of environmental enhancement, industrial attraction and property values, but also for reasons of social inclusion, energy/pollution reduction and exercise. English Nature (1995), for example, has recommended that people living in towns and cities should have an accessible natural greenspace less than 300m (in a straight line) from home, at least one accessible 20ha site within 2 kilometres of home, one accessible 100ha site within 5km of home, and one accessible 500ha site within 10km of home. However, Harrison (2002) has noted that not all greenspace enhances quality of life, and may have negative associations. It is important, in her view, to aim for spaces which are accessible, of good quality, and have an air of 'safety' about them. The Crabtree *et al* study further confirms that demand on foot only exists very

close to a woodland – probably within less than a kilometre. Beyond that distance most residents interested in woodland recreation will use a car or public transport.

2.3.15 These principles have led us to consider the availability of accessible woodlands in the East of England, based on woodlands as shown on 1:25,000 and 1:50,000 OS maps. The most recently available maps were used, ranging from 1993 to 2001. The areas were calculated as single blocks of woods, rather than individually named woods within a block. Any access features associated with the woodland were also recorded, namely, public paths (excluding public paths that ran alongside the boundary of the wood), walks/trails, car parks, picnic tables, country park, National Trust site, nature reserve, and Forestry Commission ownership. Data sheets were used to record the woodland information for each town and the data were entered into an Excel spreadsheet for analysis. We assumed that woods with access within 0.5km of the town perimeter were walkable and would also positively impact on the attractiveness of the town's setting, whilst those within 5km were accessible by a short drive or cycle ride.

2.3.16 Inspection of the results indicates two major issues. First, the Region contains many woodlands with public access, though these are largely beyond easy walking distance of the bulk of the population. According to our calculations, there are 87 woodlands with access within 0.5km of urban edges (not a large number for a Regional population some 5.4m) and a further 359 with access within 0.5-5km of urban edges. Consequently, the pattern of recreational woodland provision is likely to encourage carborne visitors. Second, there are clear variations in the availability of accessible woodlands across the region: for example, Luton, Colchester and the new towns (e.g. Stevenage, Welwyn, Harlow) appear to be favourably endowed with walkable woods with public access, whereas these are virtually absent from whole counties elsewhere.

2.3.17 In order to illustrate further the under-represented areas, we undertook an illustrative and preliminary analysis of geographical provision by assuming that a town of 2km radius would need about 6 minor woodlands in walking distance and 2 larger woodlands within a short drive in order to approximate to English Nature's preferred figures (a small facility within 300m of home, a medium one within 2km and a relatively large one within 5km). At average provincial urban population densities, this would be a town of around 30,000 population; thus as a simple yardstick we suggest that one small

walkable woodland per 5,000 population and one larger facility per 15,000 people would reflect the spirit of English Nature's guidelines. As naturalistic open spaces may well comprise other habitats than woodland, we assumed that towns where 50% of this level of provision existed in the form of woodlands may be deemed relatively well provided overall. On this basis, very few towns met the hypothetical level of provision of walkable woodlands with apparent access. Those which did were: Flitwick, Sandy, Ely, Whittlesey, Stowmarket, Woodbridge, Thetford, Taverham, Welwyn, and Hertford. Worst provided were the major towns, especially Cambridge, Bedford, Ipswich, Lowestoft, Basildon, Great Yarmouth, St Albans, Southend and Peterborough; and smaller towns in the Fens (Wisbech, Huntingdon, March, Newmarket), and industrial coastline or estuary towns (Harwich, Felixstowe, Clacton, Tilbury and Grays). (Whilst coastal towns are likely to be under-represented in woodland cover, as they cannot be 'surrounded', nevertheless there appears to be genuine under-provision in the landward area of these towns.)

2.3.18 Interestingly, several of these towns were quite well provided with nearby woodland, so it was apparent access rather than existence that was the problem. Of course, our measurements may have under-estimated the level of access provision as they were based on observable map characteristics, but this is likely to be closely related to perceived levels of local access, and certainly reflects a lack of access promotion. The availability of medium and large woods within 5km of the town edge was generally far more favourable. The general messages were, therefore, that some areas are relative deserts in terms of walkable woodlands and need additional resources, whilst in other areas incentives to open up existing woodlands more fully to recreation users may suffice.

2.3.19 In general, it is reasonable to suppose that the woodland wealth of a region needs to be diversified if it is to cater for the trends in recreational activity. Some of this could be met by owners of existing woodland if they were willing to let the public in their woods. In other areas this will need to be accommodated through the planting of new woodland. The demands of different elements of society at different times inevitably mean that a variety of woodlands, facilities and experiences will be required. In the East of England, it is important that smaller, more accessible woodland areas are sensitively developed so as to complement the major regional resources like Thetford Forest.

2.3.20 Woodland is also widely considered to be a positive contributor to the tourism industry. Within the East of England, the SQW/LUC (2001) study notes that visitor trips contributed £3.4bn to the region's economy in 1997. Although the traditional seaside holiday has been in long term decline, short breaks, particularly involving countryside and heritage locations, are growing. More specifically, surveys show many woodland visitors to the Region's major woodlands are non-local. It was reported to us that, amongst visitors to Maulden Wood, around 11% were staying overnight in the area and 60% travelled more than 10 miles. Recent studies of wildlife have indicated not only the direct and indirect contributions made by wildlife assets to local economies, but also the role of wildlife as an element in attracting tourists (Rayment and Dickie, 2001; Crabtree et al, 1992; A&M Training, 2002). Often, these tourists are knowledgeable, respectful of rural sensitivities, and purchasers of specialist facilities and equipment, so they make valuable contributions to the countryside. It is reasonable to suppose that woodlands have similar effects in attracting tourist expenditure, and studies into the 'additionality' of forests within the general tourism account are underway (Macaulay LURI, Geoff Broom Associates, 2000).

2.3.21 An analysis of tourist venues on the East of England Tourist Board's website (http://www.eastofenglandtouristboard.com) has identified numerous sites which are largely or partially associated with a woodland setting (Table 6). These 67 venues have been classified into visitor destinations where woodland is of major importance, i.e. where the OS map indicated that the appeal of the site would be strongly influenced or even primarily characterised by extensive woodlands, and those where woodland is of some importance, i.e. where the map suggested that woodland cover was likely to affect the attractiveness of the venue. This very comprehensive website lists 550 visitor attractions in total. Whilst it appears initially that only 12% of the Region's tourist features are woodland-related, this 550 includes an element of double counting where the same attraction is listed in more than one classification, and many of the sites are urban (e.g. factory, gallery, power station, museum) and are thus unlikely to be related to tree cover. As a broad estimate, we consider that woodland contributes significantly to about one-fifth of the Region's 'out of town' attractions, as well as contributing more generally to the visitor's experience of a day out or holiday in the Region.

2.3.22 Within these attractions, are included wooded landscapes that are important tourism generators in their own right, such as Dedham Vale. Some wooded areas are already major tourism/recreation magnets, and the website lists Thetford Forest as the third most visited attraction in the Region, and the heavily wooded country parks at Fairlands Valley (Stevenage) and Thorndon (Brentwood) as the fourth and fifth.

Visitor Destinations where Woodland is of Major or Predominant Significance	Visitor Destinations where Woodland is of Some Significance
Aldenham Country Park, Hertfordshire	Baylham House Rare Breeds Farm, Suffolk
Ashridge Estate Country Park, Hertfordshire	Blickling Hall, Garden and Park
Audley End (including Ring Hill and Brand's Hill)	Bour Blake Hall Gardens
BBC Essex Garden	Bourne Mill, Colchester
Benington Lordship Gardens, Hertfordshire	Cressing Temple
Brampton Wood Nature Reserve, Cambridgeshire	Feeringbury Manor, Essex
Brandon Country Park, Suffolk	Fellbrigg Hall, Garden and Park
Easton Farm Park, Suffolk	Hedingham Castle
Easton Lodge Gardens, Essex	Helmingham Park Gardens, Suffolk
Epping Forest	Hickling Broad Nature Reserve, Norfolk
Fairhaven Woodland and Water Gardens, Norfolk	Ingatestone Hall
Fairlands Valley Country Park, Hertfordshire	Kentwell Hall
Fingringhoe Wick Nature Reserve, Essex	Mole Hall Wildlife Park, Essex
Foxley Wood Nature Reserve, Norfolk	Norfolk Wildlife Trust, Broads Wildlife Centre
Gamlingay Wood, Bedfordshire	Oxburgh Hall, Garden and Estate
Hatfield Forest	Pettitt's Animal Adventure Park, Norfolk
Hedingham Castle, Essex	Redwing's Horse Sanctuary, Norfolk
High Woods Country Park, Colchester	Sacrewell Farm and Country Centre, Peterborough
High Woods Country Park, Essex	Suffolk Wildlife Park
Hoveton Hall Gardens, Norfolk	The Otter Trust, Suffolk
Knettishall Heath Country Park, Suffolk	Walsingham Abbey, Norfolk
Langdon Hills Country Park, Essex	Waterhall Farm and Craft Centre, Hertfordshire
Langdon Visitor Centre and Nature Reserve, Essex	Wicken Fen Nature Reserve, Cambridgeshire
Lee Valley Park	
Lee Valley Park, Essex	
Mannington Gardens and Countryside	
Marks Hall Estate and Arboretum	
Markshall Estate and Arboretum, Essex	
Marston Vale Millennium Country Park, Bedfordshire	
Nowton Park, Suffolk –	
Paradise Wildlife Park, Hertfordshire	
Raveningham Gardens, Norfolk	
Sandringham Holt Country Park	
Sandy Lodge Nature Reserve, Bedfordshire	
Sheringham Country Park, Norfolk	
Strumpshaw Fen Nature Reserve, Norfolk	
Sundon Hills Country Park, Bedfordshire	
Thetford Forest	
Thorndon Counrty Park, Brentwood	
Thornham Walks, Suffolk	
Waltham Abbey Woods	
Wandlebury Country Park, Cambridgeshire	
Waresley and Gransden Woods Nature Reserve, Suffolk	
Wat Tyler Country Park, Essex	
Weald Country Park, Essex	
West Stow Country Park, Suffolk	
Whipsnade Wild Animal Park, Bedfordshire	
Woburn Safari Park, Bedfordshire	
Wolterton Park, Norfolk	
Wolves Wood Nature Reserve, Essex	
Wrest Park Gardens, Bedfordshire	

Table 6 Popular visitor destinations in the East of England with a woodland aspect

2.3.23 With regard to the economic benefit of woodland visits, various estimates have been derived for the value of day trips (CJC Consulting with MLURI, 2000; Willis et al, 2000), and some of the most reliable have recently been developed in research in Northern Ireland. This suggests that the benefit of a recreation trip solely for the purposes of visiting woodland is £3.70. There are, however, several methodologies available, and these yield varied results. The current FC figure of £1 per trip seems to be toward the lower end of the spectrum, and a recent study suggests a variation of £1.15-£7, depending on site characteristics (Scarpa, 1999, reported in Willis et al, 2000). A more detailed study, based on 'benefit transfer' methodology, could assess the characteristics of the Region's woods and allocate appropriate trip expenditures on the basis of studies elsewhere (Lovett et al, 1997). In trying to obtain plausible estimates of woodland-related recreation expenditure in the East of England, we have taken account of the high proportion of woodland trips that are local and short duration, and entail little expenditure, and assumed that the figures of £3-7 relate to a minority of longer-duration visits. We have thus applied a relatively conservative 'per trip' figure for the intrinsic value of a woodland trip to the individual of £1.50, as a reasonable reflection of current opinion. We have previously estimated that around 55m woodland trips occur annually in the Region; on this basis, recreational 'wealth' would have an annual worth of some £82.5m.

2.3.24 To this must be added actual expenditure by visitors (in addition to imputed non-market benefit). This is particularly difficult to estimate, as the evidence mainly relates to day visits, with leisure-related visits as a sub-set, and there is no reliable information on the amount spent by woodland visitors *per se*. The South-West England study proposes a pro rata figure (based on national estimates) of £4.53 for day visitors and £9.60 per head by staying visitors per 24 hours (based on the figure of the 23.14% of total expenditure that is leisure-related). Given the constrained amount of time available to us, it is unlikely that we can propose a more accurate rationale than this. We do not have figures for the proportion of day to overnight-stay visitors, so we have taken an approximate figure of £5/day average expenditure to reflect the likely preponderance of day trip visitors. This indicates that total annual leisure expenditure by visitors to woodlands in the East of England could be as high as £217m. This seems a very high figure, and so we suggest – along with the authors of the South-West England study – that it is multiplied by the 27% of visitors who undertake a visit of three hours of more. This yields a more credible

figure of £59m or £421/ha, although the remainder will contribute some spending, and we therefore propose an overall rounding-up to £65m.

2.3.25 Specialist recreation – such as off road cycling, motor sports, orienteering, paintball – can also be locally lucrative. Clearly, its measurement raises risks of double counting in other recreation and tourism accounts, but the South-West study indicates that it might add about an extra 30% to revenues associated with 3+-hour visits, or a further £17-18m based on the foregoing estimates. The main benefit of such development is often in assisting the diversification of rural enterprises, as, although often substantial outlay by the woodland owner is involved, the returns can be considerable. However, further research deserves to be undertaken into the economic spin-offs of active woodland pursuits as some of these entail either the recreationalist in purchasing specialist equipment and/or overnight stays in local accommodation, both of which could result in local business development.

2.3.26 Overall, this would suggest a combined recreation/ tourism expenditure of £166m. It was also previously noted that woodland day visits have an overall expenditure of around £1,090m /yr including travel costs and, taking the 18% approximation for the Region, this would indicate an annual value of £196m. Although this is for day visits, and visits over three hours are only a minority of woodland trips, they would account for the bulk of actual expenditure (as opposed to shadow values). There is a reassuring similarity between these figures which gives us some confidence in proposing a conservative estimate of £160m annually for combined recreation and tourism benefit.

2.3.27 A significant recreation/ tourism benefit is associated with field sports, and it was clear from our landowner survey that this is a principal management consideration for many private woodland owners. Sporting/shooting usage of woodlands is one of the activities most likely to generate significant income, and may thus strongly influence woodland management and contribute to local rural economies. Short (1994) observes that the presence of woodland is a crucial factor in the use of land for shoots. On average, shooting holdings had three times as much woodland as non-shooting holdings and 3.5 times the average level of woodland for England. Importance of woodland appears to increase in direct proportion to the commitment to game conservation. On holdings where woodland is being used for game, positive management practices such as

coppicing, ride management and shrub planting have been introduced, and are especially noticeable where game is the main objective. Duckworth *et al* (2003) have recently confirmed that game management has led to greater woodland retention and planting, based on the findings of the national Countryside Survey and other land use studies.

2.3.28 One specific opportunity that was put to us was that the co-operative approach might work especially well with respect to deer control. The Wild Venison Quality Assurance Scheme sets very high standards which private owners (apart from perhaps the very largest estates) cannot meet; recently FE has set up a very high quality deer larder at Santon Downham, and a smaller one in the Northamptonshire District could serve a similar purpose and perhaps be made available to private owners. It has been suggested to us that this could make an important contribution to one of the most serious current management problems.

2.3.29 The issue of 'deer wealth' is being researched for the Forestry Commission at the time of writing. As has previously been noted, there is a cost-benefit problem to be resolved in relation to deer populations in woodlands as, whilst they are a 'charismatic' species associated with visitor interest and sporting/food income, they also incur major costs, principally related to tree damage. A full evaluation of the costs and benefits of deer in woodlands would need to consider (White, pers comm., 2002):

- road traffic accident and mitigation costs
- insurance costs
- poaching costs
- wildlife and flora conservation impact costs and benefits
- agricultural crop damage costs
- woodland crop damage costs
- animal health potential damage costs
- human health potential damage costs
- direct deer management costs
- venison revenue benefits
- commercial stalking revenue benefits
- rural tourism benefits.

It is likely that the overall cost-benefit ratio will be unfavourable.

2.3.30 There are two main sources giving relatively recent estimates of woodland game revenues. A study by Nixon (appendix in Cox et al, 1996) produced estimates for income from shooting in England of between £22.6-25.8m/yr. As these were based on two very different procedures – a sample of farmers in Yellow Pages and a re-survey of an earlier study of CLA members – the overall result was reassuringly close. Second, a study undertaken for the Game Conservancy by Cobham Resource Consultants (1997) is widely taken as an authoritative source on field sports. The South-West England study, using figures based mainly on the Cobham report, but modified by their own analysis of data on firearm certificates and land holdings with woodlands, arrived at a regional figure of £40m (their inflation-corrected estimate of GB expenditure was £444m). These figure are clearly very much at variance, but the differences can be explained to some extent, viz:

- the Cobham study reflected all field sports, not just game birds (the South-West England study reported a per capita expenditure on deer stalking roughly four times higher than game shooting, albeit participation in the former was only 17.5% that of the latter);
- the Cobham study was for the whole of GB and thus included large and lucrative estates in Scotland;
- the Cobham study included field sports in any setting, not only woodlands, and the South-West England study deflated figures by (a somewhat arbitrary) 50% to correct for this;
- the Cox et al study noted their failure to include an East Anglian county in their survey, and remarked that East Anglia contained a high concentration of commercial shooting;
- the South-West England study updated the original Cobham figures to allow for inflation, whereas the Cox et al study used data from the mid-1990s.

2.3.31 Based on the Cox et al study, the expenditure on game in the East of England would be approximately £3.3m at mid-1990 prices or, making allowances for inflation, just under £4m. Using the Cobham figures, adjusted by the same corrections used by the South-West England study, yields a figure of just over £12m. We feel that, given the approximations inherent in the latter figure, it is likely to be an over-estimate. However, the first figure is certainly an under-estimate as it does not reflect the large estate holding

of East Anglia and excludes stalking. We feel that a mid-point estimate of £8m may not be far from the truth. We also note that the South-West England study applied Cobham's multiplier of 1:1.625 for indirect expenditure stemming from field sports, which is a well regarded figure. Applying a multiplier for illustrative purposes – though for comparison, note that multipliers have not been applied to other non-market benefits – this would indicate a total annual income (direct, indirect and induced) from woodland-related field sports in the East of England of around £13m.

2.4 Biodiversity

2.4.1 With regard to biodiversity and nature conservation, the stock of Regional wealth can be inferred from county Biodiversity Action Plans (BAPs) and other countryside reports produced by local authorities. In general, BAPs allude to the low levels of woodland cover in the Region and the need to retain and extend existing cover. BAPs typically include not only assessments of current resources and trends, but also measures to achieve future targets, which may include provision of advice, planning, research and practical action. The Forestry Commission is regularly mentioned as a key actor in all of these.

2.4.2 Cambridgeshire's *State of Environment Report* expresses concern at the county's low level of woodland, and notes that it is one of the least wooded areas in the UK, so that the priority task is to conserve the surviving sites and ensure that they are appropriately managed. The county BAP makes similar observations, and notes that woodland habitat, especially ancient woodland, is unevenly spread and relatively small (the majority of ancient woodlands are less than 50ha in extent). The county woodlands of principal interest are oak-ash on the clay soils and ash-hazel-field maple on the chalkier soils, both of which are associated with distinctive ground layers. A number of woodland habitats are highlighted for special attention in the BAP, especially 'wet woodland', 'veteran trees and parklands' and 'urban forest'.

2.4.3 The Norfolk *State of Environment Report* notes that county woodland cover is close to the national average, with the largest continuous area being the Thetford Forest. A

principal adverse trend has been the decline in woodland management and the loss of traditional markets for woodland products, though disease, pests and environmental stress are also noted as significant adverse factors. The county BAP advocates particular attention to wet woodlands and to the recovery of woodpasture. Key species associated with woodland are the red squirrel (maintaining a tenuous hold in Thetford Forest), the song thrush, spotted flycatcher and bullfinch; numerous invertebrates and flowers are also mentioned.

2.4.4 The Suffolk BAP includes reference to a number of woodland habitats, once more highlighting the particular importance of 'wet woodlands' and their associated species such as invertebrates, liverworts, bats and the otter. The county's rich (but relatively poorly surveyed) heritage of 'woodpasture and parkland' is also noted, with early maps and documents describing vast numbers of free standing trees in pastures and parks. The county's Local Agenda 21 also refers to a new cataloguing project - the Veteran Tree Initiative – based on a partnership which includes the Forestry Commission.

2.4.5 The Essex BAP includes a number of woodland habitats, and also includes a species action plan for the Native Black Poplar (*Populus nigra* ssp. *betulifolia*). County woodland cover is below the national average and is unevenly distributed. The *ancient woodland* HAP notes that several species from the UK priority list - including bats, the brown hare, bullfinch, spotted flycatcher, heath fritillary and stag beetle - are present in the better managed ancient woodlands.

2.4.6 The Bedfordshire BAP draws attention to its relatively low (below the national average) level of woodland cover. A key BAP target is thus to increase woodland by 1,500ha by 2015. The county structure plan contains a policy commitment to substantially increasing the proportion of woodland and hedgerows, through mechanisms such as the Marston Vale Community Forest and planning 'gain'.

2.4.7 The Hertfordshire BAP notes that woodland cover is close to the national average. Whilst percentage cover has remained relatively constant over the last few centuries, the past 100 years have seen some significant changes in the nature of the woodland resource. Historically, the ancient woodland resource of Hertfordshire was managed mainly under either coppice (in the north and east of the county) or woodpasture

systems (to the west and south). The 44% loss of ASNW in the 20th century has resulted in the decline in many species which depend on a long continuity of woodland cover, particularly plants, fungi and invertebrates. Several other important species have diminished due to deteriorating woodland management, particularly associated with the decline of woodpasture and coppice management.

2.4.8 Collectively, the Region's BAPs contain many action plans that are likely to impinge on woodland management. These relate to increasing the extent of semi-natural woodland cover, bringing more ancient woodlands into active management, creating woodland where it will link or buffer existing habitat, better recording of heritage woodland resources, better protection for veteran trees, restoration of coniferised sites, more universal application of the 'Forestry Standard', and encouraging traditional industries that will give an economic purpose to coppice and woodpasture systems. Many 'priority' wildlife and plant species in the Region are intimately associated with woodland habitats.

2.4.9 We have endeavoured to place an economic value of the biodiversity of the woodlands in the Region. This poses several methodological difficulties as methods for determining the proportion of the value of a woodland that is specifically attributable to biodiversity are still under development. In broad terms, the methods that have been used so far have helped explain the biodiversity value of:

- particular types of woodland, with particular attributes in particular places; and
- woodlands that are additional to an existing stock, with values often deflated to compensate for the loss of prior habitat.

Generally, too, they have been applied to habitats which are perceived by respondents to be under some sort of threat, though in the current context it could be argued that woodland in the East of England is broadly perceived as a desirable and under-represented land cover type. It is difficult to find a measure which can be applied generally to the biodiversity of a Region's existing stock of woodland, and free of double counting of other environmental attributes. Further, the methods used typically reflect the value of biodiversity as perceived by interviewees, rather than its intrinsic and instrumental values.

2.4.10 We have considered a number of valuation studies of woodland biodiversity (particularly drawing on Hanley et al, 2002). Whilst acknowledging that these figures have been derived by different methods, indexed to different years and based on different questions, we note that:

- willingness to pay per household ranged between £35-53 (the higher figure subsequently needing deflation to reflect the loss of moorland habitat) for particular native reforestation schemes (Macmillan and Duff, 1998);
- a University of Newcastle and ERM (UNERM, 1996) study, making various assumptions about location and composition of remote woodlands, arrived at a sample mean WTP for forest biodiversity of somewhere between £19 and £29 per household.
- in a more recent study, Garrod and Willis (1997) estimated the mean WTP of the public for the non-use biodiversity value of remote coniferous forests in Britain under different management scenarios, in relation to the consequences of increasing areas by specified amounts. A generalized figure from this approach was £10-£11 per household per year.

2.4.11 It has not proved possible to estimate a consistent 'per hectare' value of the biodiversity value of woods, and a per household value seems more appropriate, even though this is insensitive to the actual extent of the region's woodland. Given the range of figures and the fact that we are referring to an existing stock of woodland, and also give the preponderance of broadleaved woodland in the Region, we feel justified in proposing a value of £25 per household per year as a broad reflection of people's valuation of the biodiversity of the Region's woodlands at 2002 prices. We suggest that it is likely that the BAP-related woodlands discussed above deserve higher scores, as would carefully targeted and well designed new woodlands. Also, it is likely that the intrinsic (life-support) biodiversity value of woodlands is greater than their perceived willingness-to-pay by the lay public, but there are no reliable ways currently of reflecting this value.

2.4.12 The above logic would indicate that, for the Region's ca.2.34m households, the biodiversity value of the Region's woodlands is around £59m per year. By comparison, the South-West study used a different basis for arriving at separate *per hectare* values for the biodiversity values associated with (a) the full suite of conservation values and (b) gene pool preservation. So far as we can tell, this resulted in a regional woodland wealth

related to biodiversity of almost £60m, for a rather larger area of woodland but a significantly smaller number of households. Given the inevitable uncertainties associated with valuing the biodiversity value of such a varied woodland resource, we consider that the value of £59m is a reasonable estimate.

2.5 Landscape Quality

2.5.1 Perhaps the most pervasive public benefit of woodland is that of landscape. This potentially ubiquitous good is widely assumed to influence inward investment into an area, and to underpin a significant part of the tourism industry. Thus, on the one hand researchers have claimed that attractive landscapes make a general contribution to quality of life and economic vibrancy; on the other, studies have found that tree cover is one the most ubiquitous factors influencing scenic beauty. Whilst there are some places whose attractiveness depends on lack of tree cover, landscape evaluation methods generally allocate very high scores to deciduous and mixed woodland categories.

2.5.2 The diverse scenic qualities of the East of England are recorded in various landscape assessments conducted by local authorities in the East of England (FA England, 1995), and through the Countryside Agency's *Countryside Character Initiative*. Thus, the countryside character of *Norfolk* has been related to five main zones – The Fens, Central Norfolk Rolling Farmland, South Norfolk, The Brecks, and Coastal Marshes. These, in turn, are composed of a suite of landscape types, such as fen edge, parkland, domed plateau, river valley, wooded areas, coastal fringe, arable with pine belts, and heathland. A more detailed study has been undertaken of the Brecks, and this drew attention to the landscape components of this mixed farming-woodland area. These comprised coniferous forest, deciduous woodland, parkland, and peripheral (river valleys and wetlands) landscapes. The shelterbelts and lines of pine trees were described as being notable for their effects of enclosure whilst permitting long views. In addition, the Wensum Valley Strategy included references to small-scale wooded landscapes, rolling wooded landscapes and historic parklands.

2.5.3 The main survey undertaken of the *Suffolk* landscape classified the county landscape into the Brecks, High Suffolk (Bagshot Hills, Boulder Clay, Plateau and Hills),

Sandlings, the Fens, Lothingland (Broads), Suffolk River Valley, and Chalk Downland. A further survey – of the Suffolk Coast and Heaths – defined categories of coastal scenery but also drew attention to the importance of the heaths, woods and farms of the 'Sandlings'.

2.5.4 Less information was available on the remaining counties in the Region. The landscape of *Essex* has been divided into the Boulder Clay Plateau, chalk hills, Bagshot Hills, London Clay, Tendring Loams, South Essex Hills, Thames Terraces, and Marshes. *Cambridgeshire* has a similar classification into landscapes of South-east Clay Hills, Chalklands, Western Claylands, Ouse Valley, Grafham Water, Nene Valley, Peterborough Gravels, North-west Limestone, and Fenland. In *Bedfordshire* and *Hertfordshire*, the Countryside Agency's Countryside Character Initiative notes the importance of commercial woods, ancient deciduous woods, river valley woods, parklands and hedgerow trees in areas such as the Bedfordshire Claylands, Greensand Ridge, and Yarley/Whittlewood Ridge

From these studies, it is clear that:

- existing plantations, for instance in the Brecklands, are of major regional significance;
- tree presence is also critical in terms of defining certain key landscape types, such as parkland, river valley with wet woodlands, and the carr woodland of fen edges;
- farmland shelterbelts/ tree lines and wooded areas are of major significance in giving character to the more open parts of the Region;
- there are several specific landscape types affording opportunities for new/regenerated woodland areas.

Woodland is thus contributing both to the structure and the fine grain of important regional landscapes. Equally, whilst open landscapes require to be retained in some places (e.g. parts of the North Norfolk Coast), there are areas where the paucity of tree cover diminishes landscape quality and needs to be supplemented.

2.5.5 With regard to the foregoing comment on the need to enhance less attractive landscapes, an area of particular relevance is the 'gateway' to the Region across the Thames Estuary. Thus, the *East Thames Corridor: a study of development capacity and potential* outlines the need for a more co-ordinated approach to the Corridor and its potential role

in the South-East's development strategy (DoE, 1993). The M25 corridor is heavily industrialised at Thurrock and Dartford, and the Report suggests that this ambience leads to an attitude which 'sets the East Thames Corridor up as a soft target' for heavy industry and power stations, leading to a negative image. Whilst the corridor is not excessively industrialised, it is perceived to have a harsh industrial landscape, highly visible from the main radial routes. A softening of the landscape, the Report advocates, would have beneficial effects in terms of enhancing the prospects of this key strategic zone for attracting inward investment in high value added industry and services. In this instance, woodland landscapes are seen to promote regional competitiveness by improving image and environment.

2.5.6 The public benefits of landscape have never been satisfactorily costed though there are some pointers as to how this might be done. As previously noted, some 'privatised' landscape benefits are incorporated into increased house prices. However, these are comparatively small relative to public landscape benefits, yet quantification of these wider benefits suffers from the 'free rider' problem, that is, they are available to anyone in the vicinity. A further problem is that urban landscape quality and rural landscape quality produce somewhat different benefits – such as house values and industrial location, relative to tourism and spiritual refreshment – and the economic literature appears to make no distinction. As with other non-market valuations, different studies report in different units, such as value per visit, per household, per year, per hectare, etc., and it is difficult to reconcile these.

2.5.7 There is evidence that people will pay entry charges to enjoy landscapes, such as at National Trust properties, but most people enjoying the landscape probably do so from afar without paying a fee. Cobbing and Slee (1994) attempted to value the public benefits of the 29,380ha Mar Lodge Estate in the Scottish Highlands using contingent valuation methods, using both 'willingness to pay' and 'willingness to accept' questions. Two results were obtained – one for passive use and one for active use (with access). The former would seem to be most appropriate for landscape values *per se*, though even this mixes scenic, conservation and heritage qualities. Nevertheless, the value of £15.14 per person (based on the population of Scotland over 16) gives a starting point. Also, it appears to be a one-off payment, and would need conversion to an annual rent in order to yield an annual equivalent.

2.5.8 Willis (1994) undertook a contingent valuation study of alternative landscape scenarios in the Yorkshire Dales National Park and found that willingness to pay for the three most clearly wooded landscape options (conserved, sporting and wild) was around £34/household/visitor and about £26/head/resident household. Benson (1994), assessing forest landscapes by a travel cost method, set a landscape value of around £10.6m for the Forestry Commission estate (800,000ha with tree cover) (£13.25/ha for the whole population of the UK) at 1988 prices, whilst Bergin and Price (1994) using a travel cost method found a consumers' surplus (excluding accommodation costs) per visitor to fine landscapes of around £27/visit to the best landscapes and around £18 for attractive mixed landscapes. One point of particular interest in their argument was that, if the sites in question all had similar recreation facilities, then their landscape quality could be considered to account for differences in willingness-to-pay between sites (of course, even the site with lowest WTP had some considerable landscape value which the WTP would in part reflect).

2.5.9 Most recently, Willis *et al* (2000) have noted that well designed and nationally important woodlands may attract significant willingness to pay. (At times, though, unattractive and unvaried plantation may lower landscape values, and the interior areas of large forests have a reduced landscape impact). They report that Hanley and Craig (1991) found the general public were willing to pay £300/ha to prevent commercial afforestation of the Flow Country in northern Scotland, but Macmillan and Duff (1998) found a willingness to accept compensation of £24/household/year to re-forest a heathland with native woodland, though willingness to pay at another was £53/hh/yr. Interestingly, various researchers find that willingness to pay is relatively insensitive to woodland type.

2.5.10 There is, therefore, significant variation, together with complex methodological issues of double counting, type of question asked, method of valuation used, whether the value is imputed to individuals or households, and whether the payment is one-off or annual. Thus, for various reasons it difficult to standardise between studies or say what the landscape value of the woodlands of Eastern England would be collectively as opposed to specific landscape features. Despite these dilemmas, there appears to be a broad convergence that, in current day terms, the qualities of a valued landscape – which

the wooded area of the East of England undoubtedly is – are worth about £35/household/year or around £15/person/year. Related to the regional 16+ population, the latter would represent around £60m/yr.

2.5.11 The South-West England study took a value from Bergin and Price (1994), of £1.10 surplus per visit to small woodlands designed for good landscape impact, and grossed this up by the number of visitor days to the region per year divided by the hectarage of woodland to give a per hectare/ per year value of £208. This figure, although a useful start, has a number of problems, such as only referring to visitors and not residents and making no allowance for the differing landscape quality of individual woodlands. The South-West study also considered estimates of individual recreation trip values where the 'landscape experience' component could be singled out. These values ranged from £0.47 to £2.04 per person per trip which, for the East of England would equate to ca.£190-800/ha/yr. Our figure of £60m/yr would equate to a value of ca.£430/ha, and this appears to be suitably 'mid-range' by comparison. A fair interpretation of this range may be that the top end of these figures reflects only especially well designed and attractive woodlands, whereas the lower end may need correcting for inflation (some of the estimates were derived in 10-15 years ago). Our figure of £60m would convert to a 'landscape-related' consumer surplus of £1.09 per visit (refer to visitor levels in 'Recreation and Tourism' section) which again seems reasonable relative to the South-West England study. We have therefore settled on a figure of £60m/yr to reflect the Region's woodland-derived landscape values.

2.6 Physical and Mental Health

2.6.1 Three major health benefits have been shown to derive from trees and woodlands: the psychological benefits of trees on well-being; improved post-surgery recovery rates in hospital wards which overlook wooded settings; and the opportunities for moderate exercise which exist in well-designed, accessible woodlands. Some of these benefits apply equally to other forms of vegetation and open space and so cannot be exclusively attributed to trees. However, the literature widely refers to woodland as a prime example of land cover conferring these benefits, and the majority of recreational

visits to woodland – regular, short-duration, informal trips to local sites – fit well with the 'identikit' exercise prescription.

2.6.2 Much of the evidence for health benefits has been provided by Ulrich in a series of related studies. Thus, one study found that American and European adult groups displayed a strong tendency to prefer views of nature, relative to most urban scenes lacking natural elements, and that these had positive influences on emotional and physiological states (Ulrich, 1986). Ulrich *et al* (1991) also found, from heart, pulse and other measures, that recovery from stress and anxiety was faster and more complete when subjects were exposed to natural rather than urban environments. In a carefully controlled experiment, post-operative patients were also found to recuperate more rapidly and spend about a day less in hospital, when assigned rooms with a view of a small stand of deciduous trees (Ulrich, 1984).

2.6.3 Care has to be used when interpreting these conclusions as little allowance is made for the value of trees relative to other forms of vegetation, the size of woodland necessary to produce the effect (which is very unlikely to show a simple linear relationship), and the quality of planting (for example, it has been suggested that monotonous conifer plantations could be depressing). However, the general association between trees and mental or physical health is widely acknowledged and is starting significantly (especially in the USA) to influence hospital landscaping and even location.

2.6.4 Woodland recreation also provides health benefits, principally in relation to the 2-3% of the National Health Service costs that derive from physical inactivity (Harrison, 2002). This is increasingly important in the light of new views regarding exercise which emphasise the fact that fitness cannot be 'stored' and thus must be maintained by taking by the equivalent of a brisk 30 minute walk five times a week – a level not reached by 60% of men and 70% of women. Dr William Bird (2002) argues that the benefits of physical activity are demonstrable in relation to: heart attacks, strokes, Type II diabetes, fractured femur, colon cancer, breast cancer, and Alzheimers disease, whilst others also cite hypertension and mental health problems. The benefits of the availability of green spaces as venues for physical activity include additional factors such as decreased social isolation and decreased health inequalities. It is currently estimated that increasing the numbers who are moderately active by 5% and reducing the numbers who are sedentary

by 10% could reduce numbers of deaths in the UK from heart disease alone by over 500 per year.

2.6.5 There is a consensus of opinion using available evidence that low-moderate intensity physical activity may reduce the risk of cardio-vascular disease (CVD) without having any observable influence on fitness. This can result in considerable cost benefits to health services. For example, an average middle-aged man who does not smoke but has slightly high blood pressure and cholesterol has 1 in 5 risk of having a heart attack in 5 years; it is estimated that out of 100 similar individuals, six heart attacks in 5 years could be prevented, and precautionary medical treatment for the condition could be greatly reduced, by taking the kinds of increased physical activity associated with regular country walks. An indication of the potential effect of this on the NHS budget can be inferred from costs of preventative treatment: in 5 years each patient costs £14635, and 16 patients need to be treated to prevent one heart attack or stroke in 5 years, so the preventative cost is £234,160.

2.6.6 Nickson and Cartwright (2002) also refer to a 'post fascination' process whereby workers who take lunchtime breaks in open space return in a more productive state, and this can be linked to 'health improvement'. Other evidence indicates even wider benefits of greenspace – including demonstrable benefits of driving to and from work through aesthetically pleasing corridors, and the effect of looking at vegetated environments in lowering blood pressure and reducing stress.

2.6.7 A leading advocate of the health benefits of light outdoor exercise, Dr William Bird, has promoted the concept of the 'green gym', which uses the countryside as a health resource, involves the local community in practical conservation work, and promotes conservation activities as beneficial to physical and mental health. Further, Harrison (2002) refers to 'strong evidence' that, if GPs tell their patients to walk, this produces a negative reaction, whereas adherence to exercise is far more likely where people have actually been involved in the development of community facilities.

2.6.8 In addition to creating opportunities for exercise, various research projects allude to other health benefits from woodland. It is widely accepted, for example, that trees act as pollution filters, since their leaves have a surface area up to 12 times greater than the

ground they overshadow and this canopy helps trap dust and carbon particles and helps absorb polluting gases. On sunny days, the shade from the urban forest also helps to slow the formation of harmful ozone. Woodland shade can also help reduce the risk of skin cancer, which, in the UK, causes 2,000 deaths and a further 50,000 cases a year (NUFU, undated).

2.6.9 The actual savings on the health budget must remain highly speculative, as there is no firm evidence about the additional benefits from exercise, tranquility or post-surgical recovery which accrue specifically from trees and woodlands, nor any clear indication of the marginal benefits of additional woodland where a basic amount of greenery produces an initial effect. However, some approximations can be made. For example, it is pertinent to note that finished consultant episodes related to circulatory disorders in the NHS amount to just over 1m/yr in England for all age-sex groups, and that the typical cost of an operation for non-fatal illnesses involving bypasses and open heart surgery cost an average of £11-12,600 per operation. We have not been able to obtain more accurate figures for the range of treatments related to coronary disease. However, as an order of magnitude indication, we could surmise that £5,000 was a working estimate for an average consultant episode and that perhaps half the episodes are broadly related to cardio-vascular conditions, yielding an approximation of £5bn/yr of NHS expenditure being thus spent. The East of England has around a tenth of the UK population so it is likely that around £0.5bn/year reflects regional health expenditure related to this condition. Every 1% reduction in treatments which could be related to healthy exercise would thus yield a saving of £5m. Interestingly, the South-West England study, via a more complex series of calculations related to the incidence of cardio-vascular diseases in the Region and the likelihood of at-risk groups taking woodland walks, arrived at a similar figure of £2-7m/yr for a rather smaller population.

2.6.10 However, these figures relate only to one disease, and one aspect of the health benefits of woodland. A more general measure could be related to the portion of the health budget related to physical inactivity. The current national NHS plan aims for 9.4% of GDP to be spent on health care which, for the East of England, would be around £7.7bn. Noting that around 2-3% of HNS expenditure is related to physical inactivity, this could equate to some £200m per year once the current plan is fully implemented. If, as an illustration, one-tenth of this amount is currently being saved by recreational visits

to woodlands involving healthy exercise, then a value of £20m/yr could be ascribed. Considering all these figures, we propose that £20m/yr is a reasonable approximation to the health and exercise values of the Region's woodlands.

2.7 Housing and Industry

2.7.1 Woodland has a number of values as a setting for built development (for a wide-ranging review, see Randrup et al, 2000). It is, for example, widely supposed that tree cover raises the desirability of an area for residential and modern economic investment. However, there is a case for linking woodland creation into the planning process more generally so that a woodland matrix, rather than opportunistic tree planting, occurs. Thus, an integrated approach with built development could ensure that: 'framework' planting is established, so that construction can be merged into the landscape without undue visual intrusion or loss of privacy; existing designations such as Tree Preservation Orders are respected and appropriately managed; careful design realises benefits such as urban wildlife, flood alleviation, screening sources of noise, pollution reduction, and moderation of heating/cooling bills; and housing and industrial units are linked to accessible informal leisure and other facilities, with woodland providing safe and attractive settings for footpaths and cycleways. Development-linked forestry has occurred, for example, in some of the community forests and is well suited to the growth zones of expanding towns within the Region, such as Peterborough.

2.7.2 Several researchers have demonstrated that woodland has a positive effect on house values (e.g. Morales, 1980; More et al, 1983; Anderson and Cordell, 1980). One study found that dwellings with a view onto woodlands were on average 4.9% more expensive than dwellings with otherwise similar characteristics (Tyrväinen and Miettinen, 2000). Nickson and Cartwright (2002) noted a study of Windsor (Ontario), which demonstrated that a property's value increased with increasing proximity to open space. Thus, the increase in property values averaged around $25/metre closer to a green space (this could translate into a potential increase in property tax revenue for the municipality of 8%). A similar study in Berlin indicated that land prices decreased by distance from open space, though with 'noisy' open spaces prices dipped within 100m. This study confirmed the specific effects of trees and woodland, with street trees accounting for

some 17% of the variation in land prices. Whilst house price inflation may be considered to have some drawbacks, it is important to emphasise that researchers note very positive effects of woodland-related house values on community cohesion and stability. Additionally, higher property values translate into higher property taxes which will yield improved public services. Some studies have, however, shown that poorly designed conifer stands can actually reduce property values.

2.7.3 The contribution of trees and woodlands to property values has been considered by Somper (2001) who, in an exploratory study, found that property developers and property market experts believed that tree cover exerts a significant impact on residential property values and the sales process. Regrettably, the scope for objective measurement of this effect in the UK is limited. Overseas studies have used hedonic pricing models for which relevant input data are generally not available in the UK. Somper suggests that expert interviews are the most practicable way of deriving estimates although no work has been done on this to date. However, there is broad circumstantial evidence of trees having positive effects on new house sales. For example:

- developers add greenery/trees to create site ambience early on;
- sites with mature trees are considered more desirable, facilitating sales;
- trees may increase the rate of sales;
- trees may be used to enhance show homes;
- illustrations of trees are often used in promotional visual sales aids to promote properties before construction.

Our analysis of peri-urban woodland (see 'recreation and tourism') indicates the uneven levels of tree cover adjacent to residential areas throughout the Region, and thus points to a loss of potential benefits.

2.7.4 A further benefit relates to the role of woodlands on floodplains in alleviating urban flooding. This has not yet been widely documented, but its significance can be inferred from policy guidance on Sustainable Urban Drainage Systems (SUDS). Planning Policy Guidance Note 25 reports that development reduces surface permeability by replacing vegetated ground with roofs and paved areas and through compaction of other areas by vehicular movements. This reduces infiltration rates and increases surface run-off, which has conventionally been drained by underground pipe systems designed for quantity, to convey water away as quickly as possible and thus prevent flooding locally.

However, this increases the speed of run-off and can change the flooding regime of the catchment, so that disruption to natural flow patterns through urban expansion can trigger problems such as flooding downstream. Water quality issues are also important because pollutants from built up areas are washed into rivers or groundwater and, as conventional systems aim for rapid removal of surplus water, they cannot easily control poor runoff quality.

2.7.5 PPG 25 observes that amenity issues, including landscaping potential and the provision of wildlife habitats, have largely been ignored in past planning and design of drainage systems. Continuing to drain built up areas without having regard to these wider issues is not considered to be a sustainable long-term option. Consequently, there is increasing interest in reducing flood risk and other environmental damage by the use of sustainable drainage systems, which minimise changes in the volume and rate of surface runoff from development sites. A wide range of sustainable drainage options is available, including the use of filter strips and swales – vegetated landscape features with smooth surfaces and a gentle downhill gradient to drain water evenly off impermeable surfaces, mimicking natural drainage patterns. Equally, there is evidence that lowland woodland planting can arrest flooding from farmland. Generally, scientific principles suggest that, in lowland settings, floodplain woodland would help to buffer flood events, provided it was not overwhelmed by the scale of the catchment.

2.7.6 A 1998 report produced by consultants ERM for the then Countryside Commission, listed a variety of hydrological impacts of forestry, identifying both positive and negative benefits. These included impacts on water quality and river flows, and highlighted forestry's influence on dampening flood peaks and reducing catchment water yields. While the latter may have some disbenefits in areas of low rainfall and low river flow, the former could be regarded as a potentially important contribution to reducing the risk of flooding. Kerr and Nisbet (1996) have classified the main types of woodlands on floodplains as:

Broadleaved woodland - all broadleaved or mixed woodland on a river floodplain that is no longer subject to regular flooding due to engineered flood control, and is not directly associated with existing watercourses.

Riparian woodland - mainly broadleaved woodland on land immediately adjoining the watercourse and influenced by it. Normally this would comprise a relatively narrow strip

of land along any watercourse, which could function as a buffer from the adjacent agricultural land.

Natural floodplain woodland - broadleaved woodland in close proximity to the intricate hydraulic system characteristic of river floodplains that are subject to a regular or natural flooding regime. Reinstatement may require current river management to be changed over a fairly sizeable area.

2.7.7 The options for re-establishing tree cover in floodplains are complex, both in relation to the preferred woodland type, and relative to the magnitude of the risks (e.g. losing control of flooding in previously engineered river systems) and benefits (such as pollution control and fisheries). The creation of 'riparian woodland' is considered to be a useful compromise for many sites, providing some of the environmental benefits of 'natural floodplain woodland' while maintaining river control where this exists. However, current knowledge relating to British conditions is limited.

2.7.8 There have been some important studies on the role of trees in water catchments, and whilst these show a number of costs as well as benefits (e.g. Willis, 2002), many of the negative impacts relate to upland situations where water abstraction is from rivers and reservoirs. These studies are not readily transferable to the East of England, where much of the abstraction is from groundwater, large forests have not been established around reservoirs and where clearfelling on steep slopes does not occur. Given the benefits associated with soil conservation and reduced flooding risks, and the effect of trees in filtering out nitrates from farmland that is hydraulically connected to groundwater aquifers, it is likely that the costs are at least cancelled out by benefits.

2.7.9 Turning to industrial benefits, it is widely assumed that wooded landscapes tend to contribute to economic buoyancy. Attractive scenery is considered to be conducive to inward business investment and its multiplier effect, retention of population and associated consumer expenditure, and enhanced tourism/recreation revenues. The literature is somewhat ambivalent about the effects of landscape on business investment. Keeble et al (1992), reporting to the former Department of Environment, claimed a positive relationship between landscape quality and attraction of investment, although Wong (1998) found no particular effect as investors perceived good residential environments to be available near most cities (though, presumably, many of these

environments are characterised by tree cover). Nickson and Cartwright (2002) provide a balance to this argument, by noting that a quality environment is important to business retention, and that Corporate CEOs state quality of life for employees as the third most important factor in locating a business, behind only access to domestic markets and availability of skilled labour. Owners of SMEs ranked recreation/ parks/ open spaces as their highest priority. Other research tends to confirm that, in scenic rural areas, investors typically place environmental quality among the top three factors influencing location. Intuitively, too, it appears that regions with the greatest legacy of industrial damage to the environment currently experience the greatest difficulties in attracting high value footloose investment, whereas the more scenic regions are economically buoyant.

2.7.10 Woodland establishment can be an important means of regenerating urban and industrial wasteland (cf Davies, 2001), and it is held to be one of the most cost-effective and technically successful 'soft' end-uses. According to the Forestry Commission (2000), there are four principal land areas where woodland could be introduced:

- Operational Land – In active working use (esp. mineral working / waste disposal / industry);
- Vacant Land – Used previously, inactive for a significant period of time;
- Derelict Land – Previously used, damaged and incapable of future use without treatment;
- Contaminated Land – Represents an actual or potential hazard to health or the environment.

Estimates of the extent of these types of land are not currently available for the East of England, but an indication of their magnitude can be obtained from the East Anglia and South-East figures contained in the FC report, namely: 1300ha and 11,830ha vacant urban land (EA, SE respectively) and 1022ha and 2895ha derelict land of which c.92% justifies reclamation (EA, SE respectively). Also, the National Land Use database, which tends often quite significantly to under-estimate actual levels of damaged land, records the combined total of 2,590ha of previously developed vacant land, and area of derelict land and buildings, for the East of England (1991). The benefits of woodland establishment on urban and industrial wastelands are: pollution amelioration; improvement of land and property values and the stimulation of inward investment; shelter and energy conservation; community environmental perceptions; mitigating liabilities; and savings in the management of landscaping schemes.

2.7.11 Whilst the benefits of woodland to inward investment are somewhat unclear, it is possible to make a number of generalisations based on current knowledge:

- many business owners, especially those already in a scenically attractive area, state environmental quality as a significant influence on location;
- woodland can be an important and cost-effective means of improving the physical environment of industrial areas;
- there is a general shift in the relative importance of intangible factors in business location decisions; quality of life factors are significant for those areas dependent on the retention of highly footloose businesses;
- 'rising sun' industries, whilst principally seeking the agglomeration/cluster effects of major centres of population, tend to locate in well designed business parks with good environmental quality.

It is therefore becoming popular to refer to the 'environment driver' as one of the cornerstones of regional economic policy.

2.7.12 Within the North-West Region, it is notable that one of the pre-eminent success stories is Warrington, where a strenuous effort has been made over many years to 'green' the setting of the town partly through the efforts of the Mersey Forest. Given the former image of the town, it is remarkable that it has been named as the only Northern location in England in the top 25 Index of Local Competitiveness and Knowledge Based Industries (*http://www.warringtonuk.com*). Further, as its Economic Development and Competitiveness Strategy (2002) notes, its growth in VAT-registered stock is almost five times the regional average, whilst it contains 10% of all the inward investors into the Region (despite having less than 3% of its population). Clearly, there are other factors than environment which contribute to this success, but the role of systematic 'greening' over quarter of a century has certainly been an important factor.

2.7.13 Although there are no readily available methods to value the various 'built environment' benefits, in the spirit of consistency we have endeavoured to attribute an indicative annual sum. With regard to residential properties, we can note that the residential tax base of the region (based on local authority websites) is about £250 per head of population, amounting to around £1.35bn annually. Consequently, for every 1%

added to the tax base by well designed and located tree cover, an additional £13.5m of annual revenue could be created.

2.7.14 In relation to flood control, the Environment Agency (website) reports that over 125,000 properties in the East of England are at risk from flooding, affecting about 5% of the region's population. The projected growth in household numbers will place flood risk areas under even greater development pressure. The Agency has been negotiating SUDS with local authorities such as the Ravenswood housing development in Ipswich. Regrettably, no economic studies have been undertaken on the effects of woodland establishment on flood damage to buildings. However, in 2001 the insurance cost of flooded properties in England and Wales was around £1.1bn. It is not known how much of this was in the East of England, but as noted the Region has 125,000 properties at risk out of a total of around 1,830,000 homes and commercial properties in England and Wales. This is about 6.8% of the national total, suggesting a potential regional bill of some £74.8m. If the woodland in the Region were to reduce this by 1%, they would have an annual worth of £748,000.

2.7.15 Regarding the role of woodland in a region's 'environment driver', one way of approaching this would be to consider the costs of <u>not</u> maintaining a multi-benefit environment. For example, in North-West England, the Regional Development Agency is currently proposing to spend a total of £35m over three years on a 'Newlands' programme to establish woodlands on reclaiming brownfield sites. Even these brownfield sites are only a subset of the total amount of damaged industrial land, and represent those for which 'hard' end-uses cannot be found.

2.7.16 Although there is no reliable basis to calculate the industry and residential benefits of woodland, an illustration can be offered by combining the 'percentage points' for the local tax base (£13.5m) and flood mitigation (£0.75m), and the £12m 'avoidance cost' of not having to remediate damaged land. A figure of £26m/yr seems conservative but at least loosely indicative of these various roles.

2.8 Education

2.8.1 Woodlands also have important educational values both as immediate settings for schools and as places to visit for outdoor work. With regard to the former, a pertinent example from the UK is the Mersey Forest's 'Schools Ground Development' programme, aimed at creating wooded play areas surrounding schools. The scheme is based on the observation that Advisory and Inspection work in schools over the last 20 years has demonstrated a profound link between the quality of the playspace and grounds, and the observed behaviour relationships and attitudes of the pupils who use them. Evidence suggests that improving the quality of the space will bring about dramatic changes in behaviour and relationships, reduce accidents, ease tensions, reduce bullying and confrontation and provide increased opportunities for learning. To this end, the Mersey Forest has produced a Schools Pack facilitating a holistic approach to creating woodland settings for play. Some recent research in Norway suggests that small forests or woodlands have a positive influence on children's (5 to 7 years) motor development. Fjørtoft and Sageie (2000, reported in Willis et al, 2000) found that the natural landscape had qualities to meet children's needs for a stimulating and varied play environment, with a positive relationship between landscape structures (shrubs, trees, slope and roughness of terrain) and play activities. The play functions afforded by a small woodland landscape had a positive impact on motor development in children as well as positive health effects. Children are thus enabled to develop more fully in a range of ways, both as individuals and as part of wider society.

2.8.2 The Green Light Trust based at Bury St Edmunds is an educational charity with a particular interest in the role of woodlands in learning and community development. Notably, the Trust has established a 'Forest for Our Children' scheme which now owns two woodlands close to Bury. The woods are linked to a local school and children are involved in a rolling programme from collecting seed to tending trees; the work is linked into the National Curriculum in order to maximise benefit. Work in relation to 'life long learning' is also undertaken by a Youth Action Group and adult volunteers, and will relate over time to the woodland/coppice cycle. A national programme has now spun off from this initial project and twelve sites have been created. The wider message of this work is that there is great potential for using local woodlands in building social capital, citizenship, self-esteem and self-confidence for a range of age groups.

2.8.3 The importance of school visits to woodlands can be gauged by reference to the Forestry Commission's website, which draws attention both to specific educational facilities, such as the Forest Classrooms and Education Centre at Cannock Chase, which offers organised programmes designed in accordance with the National Curriculum, and to more general forest visits by educational groups. All of these are supported within the Forest Education Initiative which aims to increase young people's understanding of the local and global importance of trees and woodland, the forestry industry and the timber trade. The Forest Education Initiative has had various launch events (e.g. the 'Ecofun' festival near Cardiff in 2000), whilst the Scottish education 'clusters' host a website. With regard to specific facilities, it is reported, for example, that the Bedgebury National Pinetum (Goudhurst) has experienced a huge increase in student visitor numbers, and its education rangers are sending out bulletins to 150 schools following a ten-fold increase in field trips to the centre. Whilst fewer than 450 young people came on education trips in 1997, this had risen to 2,500 by 1999 and 4,500 a year later. The catchment was extremely wide, extending well into the London.

2.8.4 Unfortunately, no reliable evidence exists on the economic value of school visits to forests. The South-West England study made some reasonable assumptions based on: the numbers of schoolchildren that may visit woodlands as an educational exercise, teachers' expressed willingness to pay an entry charge, and the amount of money spent by children during the visit. This resulted in an estimate of £2.26m annually. The East of England has some 24% more schoolchildren that the South-West so that, whilst the figure must be considered as very much a first approximation, a sum of around £3m/yr would pertain to the East of England on a pro rata basis. Again, this omits many other educational values of woodland which could potentially be realised.

2.9 Physical Environment

2.9.1 Under the heading of the 'physical environment' we identify the following important contributions of woodland:

- atmospheric carbon sequestration
- air quality

- water quality
- soil conservation.

2.9.2 Woodlands make a significant, if minority, contribution to the Kyoto Protocol agreements on CO_2 reduction. Thus, carbon sequestration is generally accepted to be an important non-market benefit of forestry, and carbon sequestered by forestry is rising over time. The 'Yorkshire and Humber' study considered the magnitude of the carbon sink attributable to the Region's woodlands. The study made the assumption that if the forests and woodlands of the Yorkshire and Humber Region had the average sequestration capability as those for European forests as a whole, then they would have a current carbon sequestration stock of 12,350,000t (4.9m in tree biomass and 7.45m in forest soils) and an annual carbon sequestration gain of 78,000t (62K in tree biomass and 17K in forest soils). The authors admit that this assumption is heroic, but it does provide a useful starting point. Yorkshire and Humber Region has about 92,000ha of woodland compared to the East of England's 139,000ha. Thus, if the same assumptions were made, we would expect that trees and forest soils in the East of England would sequester about 117,800 t/C/yr, and would have a total mean stock of just over 18.6m tonnes.
In addition, we have estimated the total carbon content of woodland in the East of England Region using the CO2Fix Model developed at Wageningen in the Netherlands (Nabuurs et al, undated). Using simplified data on tree stocks and assumptions about management practices, the total carbon was estimated for both conifers and broadleaved species. The estimate was derived from assessing the annual increments and losses of carbon to the forest and wood processing industry over a 125 year period and deriving average annual estimates of the total stocks of carbon. Elements in the model examine carbon flows in the forest biomass (stems, foliage, branches and roots), soils and wood processing (including losses in processing, recycling and final disposal over time). Forest management practices and the effects of thinning on competition and mortality are also taken into account. Based on an assumption of 139,112 ha of forest the mean annual carbon stock is just under 3mt/C for conifers and just over 13.2mt/C for broadleaves. The mean annual increment provided by the model is just over 200,000t/C/yr for tree biomass, which is reasonably in line with the Yorkshire and Humber approximation.

2.9.3 Turning to pollution filtration, the East of England is particularly vulnerable to nitrate pollution of groundwater resources. The effect of trees in diffusing pollutant

inputs to groundwater is well known. In particular, leaving or establishing a 10-20m wide strip of riparian woodland, water from surrounding land filters through it and retains many chemical pollutants and sediments. This would be particularly important in a nitrate vulnerable region such as the East of England, where much of the water supply is abstracted from aquifers.

2.9.4 The fact that woodland covers over 7% of the Region also leads to a significant reduction in diffuse nitrogen contamination of groundwater supplies. Relative to the arable lands of the East of England, artificial nutrient inputs into woodlands are very low, leading to far superior water quality beneath them. Water abstracted from beneath Thetford Forest, for example, is used to dilute nitrate concentrations in supplies from elsewhere in East Anglia and thus achieves a very real cost saving relative to de-nitrification.

2.9.5 There is also extensive evidence of the role of woodlands in trapping air pollutants (e.g. CEH/University of Lancaster, 2002). Much of this research has focused on upland forests and their role in filtering particles from the passage of mists and clouds through the forest canopy. In lowland areas dry deposition of particles is more important, though particular species in particular locations can also capture pollutant-laden raindrops. However, no studies have yet placed economic values on these functions (ERM, 1998), partly because of the difficulties in separating out pollution reduction benefits from other perceived amenity benefits of urban and suburban woodland. Latterly, recommendations have been made to develop models which cost the benefits of air pollution and noise abatement in terms of improved crop growth, reduced medical bills and improved house values, though these presently remain speculative. However, there is general agreement that air pollution reduction by trees is 'cost effective'.

2.9.6 Broadmeadow and Freer-Smith (1996) have shown how trees facilitate the uptake, assimilation and decomposition of pollutants such as ozone, sulphur dioxide and nitrogen oxides and can thus reduce the concentrations of these gases in the atmosphere. A simple model of pollution uptake was derived by the authors and tested in Greenwood Community Forest, with the conclusion that the existing 20% woodland cover should reduce these pollutants by 4-5%, with a similar additional uptake if the area of forest were to be doubled. Further, the filtering of particulate air pollution appears to be

particularly important in urban areas, where woodland could act as air filters between population centres and busy arterial roads (Freer-Smith *et al.*, 1997). Goodman (1996, reported in Willis et al, 2000) estimated that over a typical growing season, urban broadleaf woodland could capture up to 50kg of particulates in the upper and lower canopies. However, whilst these estimates of the scale of filtering are informative, they do not reveal the net impact of woodland planting on reducing particulate matter compared with other land uses, or on the optimal planting for air filtration, though particular benefits are seen to lie with using certain conifers, and planting linear woodland features in areas of pollution (e.g. along roads or adjacent to industrial areas). There is reasonable evidence that well designed woodland planting can also mitigate possible pollution incidents in areas adjacent to high risk industrial facilities.

2.9.7 The soil conservation value of woodland cover, especially in a low lying area such as the East of England, should not be underestimated. Trees can prevent soil erosion in two ways: through shelter from wind erosion and protection from water erosion. Planting rows of trees or shelter belts on lowland areas in particular can provide protection for soils from wind and help trap air-borne soil particles. There is widespread evidence that hedgerow removal has increased the risk of soil erosion, particularly by wind (RCEP, 1996). Shelter provided by trees will particularly reduce the risk of wind erosion on susceptible soils, such as silt, sand and peat soils. This type of soil is prevalent in the East of England and soil blowing occurs on light soils of East Anglia and especially on the intensively cultivated fenlands, where it has been found to be associated with a 5% loss of spring sown crops (Farmers Weekly, 1981). The loss of finer soil particles reduces the soil's nutrient levels and the depth of soil available for rooting and water storage for crop growth. The benefit provided by trees to the soils will depend on the frequency and direction of the damaging winds. Protection of the soil reduces with distance from the shelter and does not exceed 20 times its height.

2.9.8 Trees can also protect soils from water erosion. In woodlands, about 85% of rainwater is absorbed and released slowly over a period of time. This sponge effect helps to reduce surface water run-off and sheet erosion. The tree canopy also provides shelter and reduces the impact of the falling rain, so reducing the splash erosion effect. The roots of trees also help to prevent the soil from being washed away and facilitate the infiltration of water into the soil.

2.9.9 In terms of valuing the contribution of woodland cover to the physical environment, we note that estimating the role of carbon sink is difficult for a number of reasons, not least the variability in estimates of the actual amounts of carbon being sequestered. Individual estimates for carbon sequestered by woodland vary widely, as well as varying according to the year of the forest rotation; moreover, it is not always clear whether authors are referring to annual or total values. Nonetheless, a widely quoted annual figure is £55/t, and on this basis, the annual carbon sequestration value of the Region's woodland estate would be £11m. However, many different figures are quoted, ranging from under 30 to over 100 £/t, and £55/t is taken as a reasonable compromise. The South-West study produced, by a different method – based on a wide range of sequestration estimates and a per hectare rather than per tonne value – a reassuringly similar figure of £19m annually, for an area of woodland some 50% greater. Noting from the Yorkshire/Humber study that annual soil uptake is reckoned in some models to be about a quarter of biomass uptake, we would feel justified in inflating our £11m to nearer £14m/yr.

2.9.10 One way of illustrating the economic benefit of woodland relative to pollution would be to consider the abatement costs which would be incurred in its absence. Research by Ecotec (1993; reported by Myers, 1998) found that pollution abatement expenditure in EU countries varied between 0.5 and 1.6% of GDP, with the UK at 1.2%. In the East of England, therefore, the annual costs would be just under £1bn for all types of pollution. As a first approximation, taking the 4-5% mitigation effect of 20% woodland cover on air pollution as a general indication of all pollution benefits, a 7.3% woodland cover might mitigate costs by around 2% or around £18-19m annually.

PART 3: THE MARKET BENEFITS OF WOODLAND

3.1 Introduction

3.1.1 This section of the report looks at the woodland and timber industries of the East of England. It commences with general considerations of the public and private sectors of the woodland economy. It introduces the principal market benefits of woodlands and timber and summarises some of the key production, processing and marketing issues connected to the industry.

3.1.2 Whilst this report in general considers the wider benefits of woodland, and recognises that woodland wealth is much broader than timber production and processing, this section pays particular regard to the core woodland/timber industry. The industry is, of course, instrumental in driving the good management of the woodland estate role and thereby facilitating, both intentionally and inadvertently, a supply of public benefits. Equally, with regard to market benefits, it is important to see the industry not in terms of a narrow economic sector, but as part of a wider process of rural development. For example, the Forestry Strategy for England points out that woodland assets do not only generate jobs in timber-related industries, but also support jobs in recreation, conservation and other environmental activities, as well as providing a setting for the tourism industry.

The England Forestry Strategy states, amongst its objectives for rural development that the Forestry Commission will

- encourage new investment in the wood-processing sector by publishing forecasts of wood production and through our policies for regional development and support for rural economies;
- ensure that the supply of timber from our woodland resource is available at the levels indicated in long-term forecasts;
- continue to provide support for regional and local marketing initiatives, including small-scale and craft uses;
- extend the range of business advice, training and local support offered to woodland businesses, particularly small producers.
- support a targeted programme for short-rotation coppice planting and encourage the use of wood fuel for energy production using the most efficient technology.

3.2 The Woodland and Timber Economy

3.2.1 The economic and employment benefits of trees and woodland are related to:

- the composition and extent of the timber resource
- the availability of timber in future years
- the condition and accessibility of woodlands and their potential for economic exploitation
- capacity in timber processing facilities
- skills availability in the workforce
- employment in timber production
- employment in timber processing
- employment in the production and marketing of timber products.

These are in turn dependent on an efficient infrastructure to fell, move and process the raw material. They also operate at different scales, from international to very local, and the markets at these scales differ in their operation and degree of formality.

3.2.2 Thus, the core 'woodland industry' consists of establishment, maintenance and harvesting. Upstream linkages comprise suppliers of seeds, 'grow tubes', chemicals and fertilisers, fuel, equipment, professional services, and so forth. Downstream linkages comprise mainly the processing facilities (sawmills, paper and board plants, wood-based panel mills, etc.). In regions with large woodland and timber industries, it is likely that these linkages can be provided internally, but the timber industry is characterised by large economies of scale and highly specialised equipment and services, so economic 'leakage' can be extremely high. With regard to employment, a very high proportion of direct labour is drawn from a local catchment – PACEC (2000) found this to be as high as 94% - and is thus significant in the context of rural development.

3.2.3 In a benchmark study of the English industry, PACEC (2000) analysed the role of forest establishment, maintenance and harvesting, together with an economic impact and multiplier analysis for timber processing, across different types of woodland. The study calculated two measures of the 'direct' economic impact of timber, the net output (staff costs + profit) and gross output (sales + change in value of stock). The study also estimated 'indirect' effects (gross and net output and employment arising from supplier linkages outside the forestry industry) and 'induced' effects (gross and net output and

employment effects arising from the spending of wage income and distributed profits arising in the forestry/ processing sector and supplier industries).

3.2.4 We have referred both to this study and to the Forestry Commission's Forest Employment Survey and report on Regional Employment in Forestry and Primary Wood Processing to obtain estimates for the East of England Region. There are apparent discrepancies between these sources (both of which are based on sample surveys with margins of error) and, whilst estimates for employment in the processing industries are extremely similar (about 8,500 in England), the PACEC study cites significantly higher figures for each of establishment, maintenance and harvesting. Thus, overall forestry and woodland processing in England is around 18,500 (1997-98) according to PACEC, but is just under 15,000 (1998-89) according to the FC's most recent figures. However, bearing in mind the inevitable inaccuracies in any sample survey the estimates are not excessively divergent. We have utilised the PACEC figures, not only because they were corroborated against NOMIS data, but also because they offer the opportunity of obtaining estimates for a range of economic measures, and not just employment.

3.2.5 The Forest Employment Survey (FC, 2000) provides a regional breakdown showing that the East of England has 8.5% of total employment, despite having 11% of England's woodland cover. It is evident from the data that those regions with high proportions of conifers are those with the highest employment densities, whilst the East of England's ratio of employment to area of woodland is similar to other regions with predominantly broadleaved cover. Given the greater scope for efficient infrastructural provision and larger-scale processing industries in plantation-dominated areas, this lower percentage might also reasonably be applied across the board to PACEC's figures. This assumption is corroborated by the input-output analysis of the Scottish forest industry (Macaulay LURI et al, 1999), which found that, whilst harvesting of native woodlands was more labour intensive per unit output harvested than conifer plantations, the latter had higher direct requirements for material inputs and thus generated greater indirect effects in the economy (see also Eiser and Roberts, 2002).

3.2.6 According to this apportionment, therefore, forestry employment in the Region would be around 930 FTEs, and employment in processing around 630 FTEs. As expected, this is some 25% higher than the FC estimate of 1249 for the Region. We feel

it fairer to 'split the difference' in order to obtain a more realistic measure of the size of the woodland economy, and thus adopt an apportionment of 7.7% of PACEC's figures. On this basis, we estimate the following woodland-related employment levels in the East of England:

measures of net annual economic impact

- output associated with the woodland and timber industries - £14.9m
- output associated with the processing industries - £13.7m
- output associated with the indirect impact of the industries - £41.6m
- output associated with the induced impact of the industries - £5m

measures of annual gross economic impact

- output associated with the woodland and timber industries - £24.4m
- output associated with the processing industries - £57m
- output associated with the indirect impact of the industries - £112.2m
- output associated with the induced impact of the industries - £26.9m

3.2.7 Thus, the total net direct impact is some £28.6m and the indirect an induced net impact around £46.6m annually, with corresponding figures of £81m annually and £139m annually for gross impact.

3.2.8 The FTE employment associated with the industries must also take into account indirect and induced effects, and the combined multiplier stated by PACEC is 1.82 (comparable findings have been reported for Wales (Welsh Economy Research Unit et al, 1999) and Scotland (Macaulay LURI et al, 1999)). Thus, employment figures are estimated as:

- direct employment in woodland and timber production – 825
- direct employment in processing – 563
- indirect employment – 953
- induced employment – 218.

Overall employment associated with the Regional woodland and timber industries is thus likely to be around 2,559 FTEs.

3.2.9 Additionally, there are likely to be many more jobs associated with the crafting/ manufacturing and sale of timber products. The South-West England study indicates that the total FTEs associated with the production and processing of timber and the use of its products is over 150,000 in England. An apportionment related to the East of England's woodland area would suggest that total related employment could be around 19,000 FTE jobs. Whilst the predominantly broadleaved and significantly undermanaged nature of the Region's woodlands might suggest a smaller figure, the importance of the Region's ports for timber imports would tend to compensate.

3.2 10 The regional woodland economy broadly comprises four industry 'chains', comprising the production, processing and end use stages of: domestically grown softwood, domestically grown hardwood, imported softwood and imported hardwood. Very broadly speaking, these may be represented as the region's conifer plantations (predominantly managed by Forest Enterprise) supplying a range of UK processing mills; a varied broadleaved resource, mainly in the private sector, supplying a wide range of end uses although only about half of which is productive; highly competitively priced softwoods imported mainly from Scandinavia and Eastern Europe through ports such as Harwich and Felixstowe and providing quantitatively and qualitatively reliable supplies to processing facilities (some of which are in the Region); and a variety of hardwood supplies, including tropical timbers (especially teak and iroko) which cannot be produced domestically. These are all important in their own right and generate various types of opportunity within the Region.

3.2.11 The major player in the region is, of course, Forest Enterprise, with the East Anglia FE District covering Norfolk, Suffolk, Essex and part of Cambridgeshire; the South-East District including Hertfordshire; and the Northamptonshire District Office including Bedfordshire, Peterborough and the remaining part of Cambridgeshire.

3.2.12 The East Anglia District's estate is dominated by commercial softwood plantations: 85% is coniferous (mainly Corsican and Scots Pine), and 15% deciduous (mainly Beech and Oak). All its estate is actively managed for commercial production, but simultaneously for multi-purpose benefits. Most of the woodland (20,000ha) is in Thetford Chase, but there is about another 5,000ha in the wider District, mostly production oriented and moving into a mature phase suitable for extraction and

replanting. The exception is the Sandling forests of Suffolk, which were potentially highly productive but were severely damaged in the 1987 gales and thus now comprise immature replanted forest. The heavier soils in the south of the District support some coniferised woodlands, which are presently being converted back to broadleaf. Most of the woodland is freehold so that access can be encouraged.

3.2.13 The Northamptonshire District estate is strikingly different, with a strong emphasis on restoration to coppice-with-standards. 49% of this estate is coniferous (mainly Corsican Pine and Norway Spruce), and 51% broadleaved (with oak as the main productive species, but with ash and field maple covering the greatest area). Although the District has a legacy of softwood plantations and coniferisation of native woodlands, this is being reversed as the estate is gradually returned to broadleaved woodland often as coppice-with-standards. Commercial production is thus seen as a by-product of an estate primarily aimed at biodiversity, conservation and recreation.

3.2.14 In the East Anglia District, some 180,000 cu.m. timber are produced annually (85% Corsican/Scots Pine; 15% beech/oak), and FE's core business is with local sawmills – 3 in Norwich and a smaller one at Woodbridge – and one in South Yorkshire. These are sawn fencing mills, so almost all the production is for posts, rails and boards. Low value wood, suitable for products such as MDF and chipboard, is sent to the Kronospan plant in North Wales. There have been some closures in the recent past which caused significant problems, so FE has now entered into 5-year supply contracts with the main mills. There is also a residue chipping plant at Brandon (the biggest in the country) which takes the lowest value parts of the tree. Production within Cambridgeshire and Bedfordshire is estimated at 7000 cu.m./yr, much of which is high quality hardwood sold with a premium, mainly to processors outside the Region.

3.2.15 With regard to the FE, the East Anglia District employs 85 FTE staff, 95% of whom are estimated to live locally; most are employed in forest establishment, harvesting/ extraction and recreation/ conservation, a small number are in maintenance and marketing, and there are 15 office staff. With regard to the Northamptonshire District, employment falling within the East of England Region comprised two full-time staff working on forest maintenance including deer control, and four part-time staff on environmental/recreation work.

3.2.16 Turning to the private sector, more detailed information is available for that portion of the Region falling within the 5b and LEADER II areas of East Anglia. For this area, Anglia WoodNet's surveys have shown that some 26,000ha of broadleaf woodland are undermanaged, to a greater or lesser degree. This survey identified 236 farm woodlands and a further 131 on larger estates. As might be anticipated, woodlands on estates generally tended to be more actively managed than those on farms, and management input tended to increase within increasing size of woodland. Over 60% of farm woodlands, and just under half of estate woodlands experienced at least some degree of under-management. Other studies have suggested that reasons for undermanagement include environmental/sporting/recreational/ amenity constraints, high working costs for small areas, fragmented ownership, and conflicting management interests (Walker, 1994).

3.3 The Issue of Under-Management

3.3.1 A recurrent theme in commentaries on English woodland is the widespread contention that much of the private sector resource is undermanaged, and thus needs to be revitalised by changes to incentives, business support and markets. This is of particular importance to the East of England, with its predominance of broadleaves and reported levels of under-management.

3.3.2 Thus, many observers see the main challenge as that of unlocking the potential markets in the domestic hardwood sector, especially as high quality hardwood is relatively price inelastic and can thus make a sustainable contribution to rural development. A study by Clegg and Co. (1994) sought ways of utilising the hardwood resource more effectively, and advocated a mixture of methods based on improving the image of the domestic product, specifying domestic hardwoods in public contracts, persuading the development industry to use domestic hardwoods, and developing small scale local markets. The first three of these are now difficult to sustain for reasons of market demand and restrictive practices, but there remains scope for stimulating carefully selected markets.

3.3.3 One of the significant aspects of English timber production is the low quality of much of the broadleaved resource. Further, large volumes are normally more efficiently handled by highly mechanised systems, and the small private woodlands which typify much of the English resource are often unsuited to effective harvesting, marketing and transport infrastructure (Clegg/Firn Crichton Roberts, 1995). The main types of market for low grade hardwood are firewood, chipwood, pulpwood, and chips for horticultural use. The firewood market can be particularly important locally, whereas the market for chips tends to be small. The net price which a woodland owner receives is highly dependent on such factors as the distance of the wood from markets (increasingly so, as transport costs rise relative to depressed timber prices), access into the woodland, the size and shape of the wood and volumes to be harvested. The stability of the market is also very important – a mill that buys regular quantities is a key stabiliser, yet purchasers often refer to the inability of smaller woodland owners to guarantee continuous supply of acceptable quality, whilst the latter frequently find the prices offered by the former unattractive. A major output from native woodlands is coppice and small roundwoods, but this is labour intensive and demand is still relatively weak (Lindsay Marketing Services, 1993).

3.3.4 Previous consultants have suggested that there is also some scope to increase the use of domestic hardwoods for fencing and rustic garden products, and to promote a quality assurance scheme reflecting the technical and commercial requirements of joinery manufacturers for sawn products. More careful market research is need to investigate markets associated with charcoal, stakes for tree shelters, external door sills, flooring, rustic garden furniture and civil engineering (e.g. river/canal revetment and temporary road repair). Mackay Consultants and Irvine Ross (1994) have noted the importance of tourist expenditure on 'premium price' local goods (as souvenirs and gifts), and that there is scope for further promotion of these in local retail outlets. However, the consultants warned that it was easy to exaggerate the potential for marketing local hardwoods, and most processors found that imported hardwood was superior in terms of quality and reliability of supply.

3.3.5 A widely mooted market opportunity for small roundwood is the development of wood-fired fuel plants, either large- or community-scale. It has been suggested that small scale and domestic woodfuel and community heating schemes provide stable markets

embedded in the local economy, and yet are massively underdeveloped in comparison to many other European countries. We turn to the current and potential roles of fuelwood in a later section.

3.4 Employment and Expenditure in Forest Industry Businesses

3.4.1 The woodland economy supports a range of Forest Industry Businesses (FIBs), conventionally defined in the narrow sense of being directly associated with timber, rather than the wider economy associated with recreation, tourism and so forth. The range of types of FIB, but unfortunately not their geographical distribution, is available from national Forestry Industry Business surveys (Table 7). Thus, a report to FC and Forest Industry Associations (Firn Crichton Roberts/ Clegg, 2000) shows that, nationally, of the private Forestry Industry Businesses (FIBs), over 50% are sole traders, and 20% are family based partnerships. It is estimated that there are approximately 3500 separate FIBs in Britain; a characteristic of this sector is the very large number of microbusinesses, and around 97% of FIBs employ under 10 people.

Table 7 Industry estimates of FIBs in GB (Spring 2000)

BUSINESS TYPE	**QUANTITY**	**%**
Forest nurseries	30	1
Arboriculture Businesses	300	9.2
Forest managers & contractors	420	12.9
Silvicultural contractors	238	7.3
Harvesting contractors	625	19.2
Timber haulage contractors	340	10.4
Charcoal & coppice workers	94	2.9
Equipment suppliers	100	3.1
Trainers	200	6.2
Mobile sawmills	200	6.2
Timber merchants	200	6.2
Static Sawmillers	500	15.4
TOTAL	3247	

3.4.2 Unfortunately, the pattern of responses to our questionnaire survey has not enabled us to produce a comparable and statistically reliable equivalent classification for the East of England. However, we are able to make a general assessment of the diversity and contribution of FIBs to the regional economy.

3.4.3 Before turning to more detailed analysis of FIBs in the Region, we feel that it is useful to give a qualitative impression of the range of business types and their broad characteristics. Thus, our survey identified typical groupings:

- Many of the respondents described themselves as **self-employed or sole traders,** and this is likely to be a fair representation of a sizeable part of the region's forest-related businesses. These respondents were typically involved in activities such as coppicing, thinning, firewood production, charcoal production and, more rarely, marketing.
- **Furniture makers** were amongst the most larger businesses. They tended to purchase little or no timber from the region, as they were reliant on where their timber wholesalers sourced their supplies. A specialist manufacturer of doors and flooring predominantly exported products out of the Region.
- **Timber processing units** – mainly sawmills – comprised a small number of large companies, as well as microbusinesses (which still sometimes had high financial turnover despite few employees). They obtained their timber from various sources: some sourced mainly from within the region, but others – especially specialists in high-grade timber – imported all their inputs.
- **Agricultural fencing businesses** employed relatively large numbers of staff with high expenditure on mainly externally sourced timber.
- A number of **tree surgeons** responded, though they tended to answer the questionnaire patchily, and did not see their work as being associated with the region's 'woodland wealth'. Their main timber 'product' was timber waste (e.g. chippings) and low-grade timber (e.g. firewood), invariably sold locally.
- **Timber merchants** were a very variable group who often combined their activities with subcontracting and timber processing.
- There were some small businesses dealing in **conservation work and traditional woodland management**. This type of respondent tended to be optimistic about the potential for biomass energy and composting of waste timber products.
- **Pallet producers** stated quite large numbers of employees but relatively small inputs.
- A small number of **growers of nursery/Christmas tree stock** responded, although there are no large specialised forestry nurseries in the Region.

3.4.4 We found that **forestry contractors** were engaged mainly on coppicing, maintenance, firewood and game management. It is also pertinent to refer here to Anglia

WoodNet's (2001) survey which showed, similarly, that contractors' work was related primarily to the 'common' land management operations. Thus, most opportunity appears to relate to conservation, pest control, scrub clearance and sporting management, rather than the more specific forestry operations (e.g. fencing, access, timber work), though planting operations were more widely reported and a sizeable proportion of 'other' work was associated with coppicing. Also, it appeared that most of the 'timber' operations were being conducted on the largest woodlands. The survey also reflected the degree to which work was contracted out or undertaken by the owner or their staff, which made it clear that most opportunities for contracted out work arose in relation to planting, where contractors carried out about half of the work, and harvesting and thinning, where they undertook about one-third. Contractors were also engaged for pest and weed control, pond restoration, ride management and coppicing, though here, work was substantially more likely to be undertaken by the respondent or their employees.

3.4.5 Our survey indicated that highest employment densities were to be found in management companies, processing and contracting, as well as value added areas such as timber merchants, furniture making and joinery. Closer examination of these data revealed that the major pockets of employment lay in a small number of large businesses, with a long tail of microbusinesses, typically with six or fewer employees and often single-person businesses. Statistics were skewed by isolated large employers (though, by urban industrial standards still 'medium' sized enterprises) in the areas of forest maintenance, harvesting, by-products of timber harvesting, sawmilling, and firewood/charcoal production. In terms of employment densities, timber product manufacturers had most employees, followed by processing companies, nursery owners (although there are no large specialist forest nurseries in the Region), and subcontractors (Figure 6).

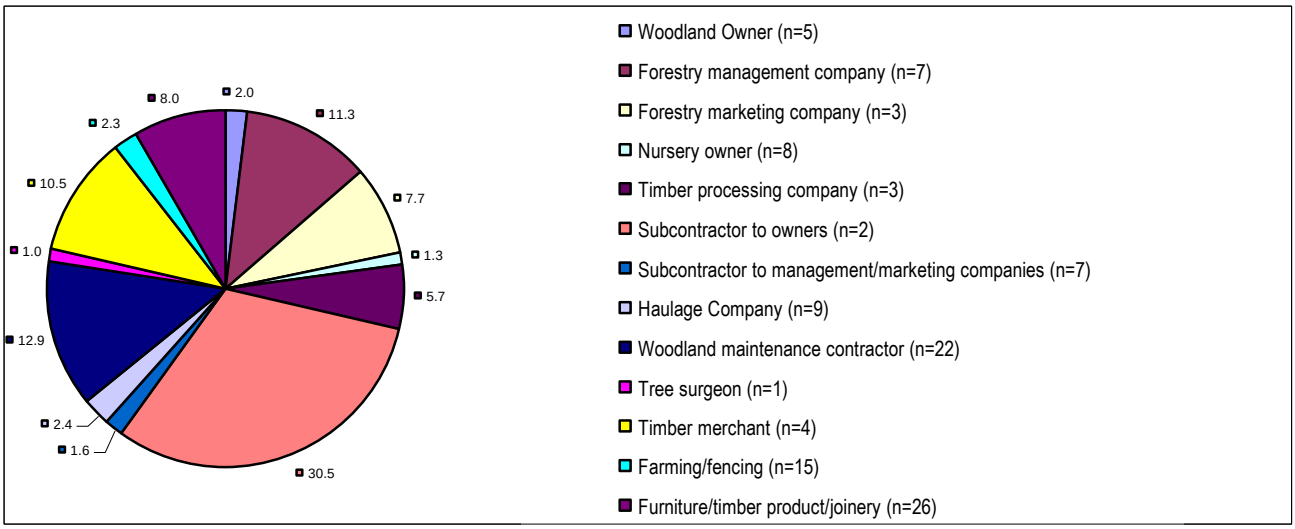


Figure 6 Average FTEs by Industry
('woodland owner' is top pie slice, and other industries in the list continue clockwise)

3.4.6 Employees were drawn predominantly from within the locality (Figure 7), confirming PACEC's (2000) report of very high proportions of labour being recruited locally. However, even journeys-to-work of 20 miles in rural areas can be difficult by public transport, and industry wage levels tend to be low relative to the costs of car ownership. Consequently, recruiting suitable 'local' labour still poses problems to many FIBs.

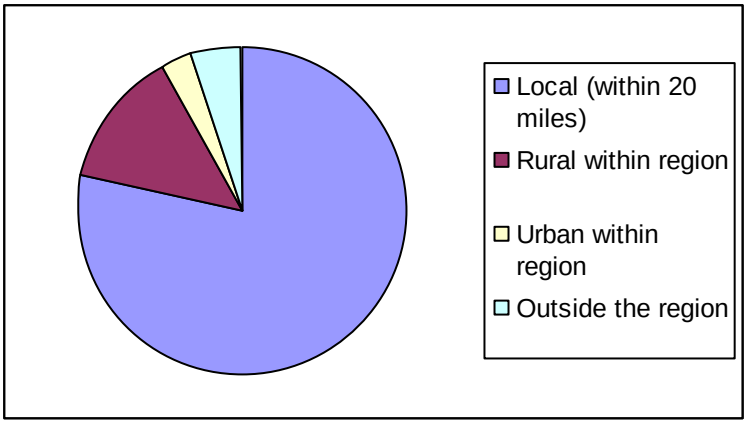


Fig 7 Provenance of Employees in Woodland/Timber Industries, East of England

3.4.7 With regard to **skills**, respondents from FE did not perceive availability of trained staff to be a problem, and FE operate a training plan to maintain and improve skill levels. However, there were certainly problems for small operators in achieving certification of operators. Even for FE, however, there was evidence of an emerging problem in

appointing and retaining forest craftsmen as vacancies arose. This is mainly a reflection of low wages (FE can only appoint on a national pay structure) combined with high housing costs; similar arguments relate to the scarcity of contracting firms, especially in relation to skilled personnel for native woodland management.

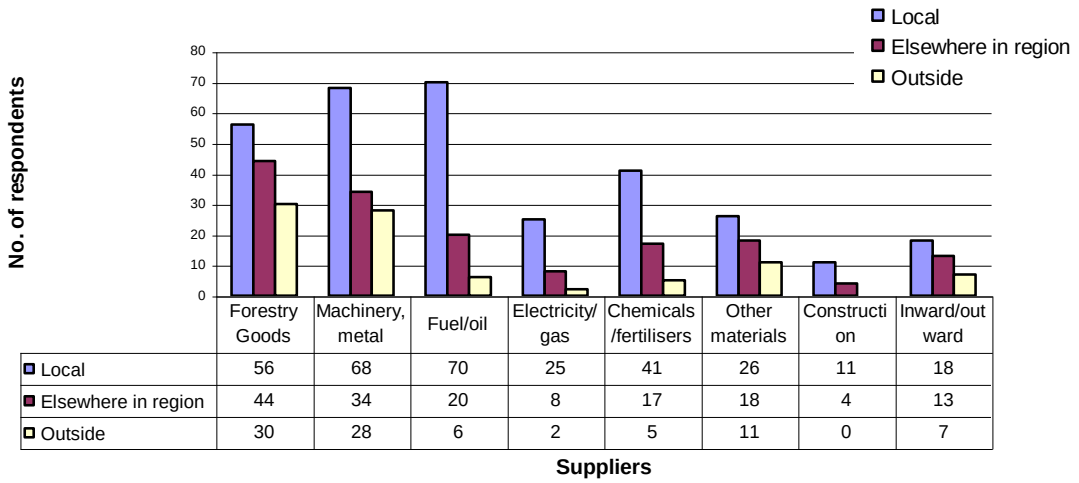
3.4.8 Throughout the woodland industry in the southern parts of the UK, the general consensus is that many woodland skills are rapidly disappearing and the age of those remaining skilled workers is rising to a point where it will not be possible to guarantee the survival of their remaining skills. This is exacerbated by younger workers' expectations of comfort and safety, requirements for skills certification, and high housing costs. Expansion of skills, however, is crucial not only for the core timber business, but also because they are integral to diversification of forestry businesses within a context of cross-sectoral approaches to rural development.

3.4.9 Skills availability in the private sector was varied. In our survey, of the 32 respondents who answered this question, 20 felt they had the full range of skills and abilities among their staff, although for a few this was because of the small quantity and low level of work they undertook. Areas in which additional skills were required included: marketing and market intelligence; computer skills; machine operators; and intelligence on sources of grant aid. One respondent noted the difficulty of attracting high calibre staff, and some commented adversely on the skills levels of newly qualified entrants from college. One suggested a need for additional grant aided courses. There is a concern that, in the very small enterprises that often characterise the sector, skills may be only 'one deep', and one business found itself without sales, buying and marketing expertise due to the loss of one member of staff.

3.4.10 Turning to patterns of **expenditure** made by woodland owners and timber processors in the public and private sectors, there is encouraging evidence of high levels of retention relative to certain goods and services. However, there is substantial leakage of expenditure given the lack of 'upstream' linkages such as forestry nurseries and equipment suppliers, and 'downstream' linkages related to major processing facilities, in the Region. Balance of payments also appears to be adversely affected by the comparatively unreliable quality or quantity of locally produced timber, relative to East European supplies arriving through the main ports in the Region.

3.4.11 With regard to the FE, most goods and services are procured through central purchasing or provided in-house through an internal charge, so it is often impossible to apportion expenditure geographically. However, most machinery will be obtained from outside the region, whilst fuel will be obtained from local suppliers, even though it is purchased centrally. Expenditure for East Anglia Forest District is estimated at £100,000/yr for forestry goods, £65,000/yr on machinery/vehicles (as an internal charge), £80,000 on forestry subcontractors, and £70,000 on construction contracts. Expenditure (all of which was considered to be local) in Cambridgeshire and Bedfordshire was estimated at £5,000 on fuel/oil, £1000 on other materials, and around £10,000 on civil engineering contracts.

Private sector purchases of goods and services are summarised in Figures 8 and 9, and are also reviewed below in qualitative terms. The broad pattern is that supplies are predominantly obtained from within the Region, though specialised purchases such as forest goods (n.b. lack of major forest nursery) and machinery tend to leak outside.



	Forestry Goods	Machinery, metal	Fuel/oil	Electricity/ gas	Chemicals /fertilisers	Other materials	Construction	Inward/outward
Local	56	68	70	25	41	26	11	18
Elsewhere in region	44	34	20	8	17	18	4	13
Outside	30	28	6	2	5	11	0	7

Figure 8 Location of Suppliers, East of England

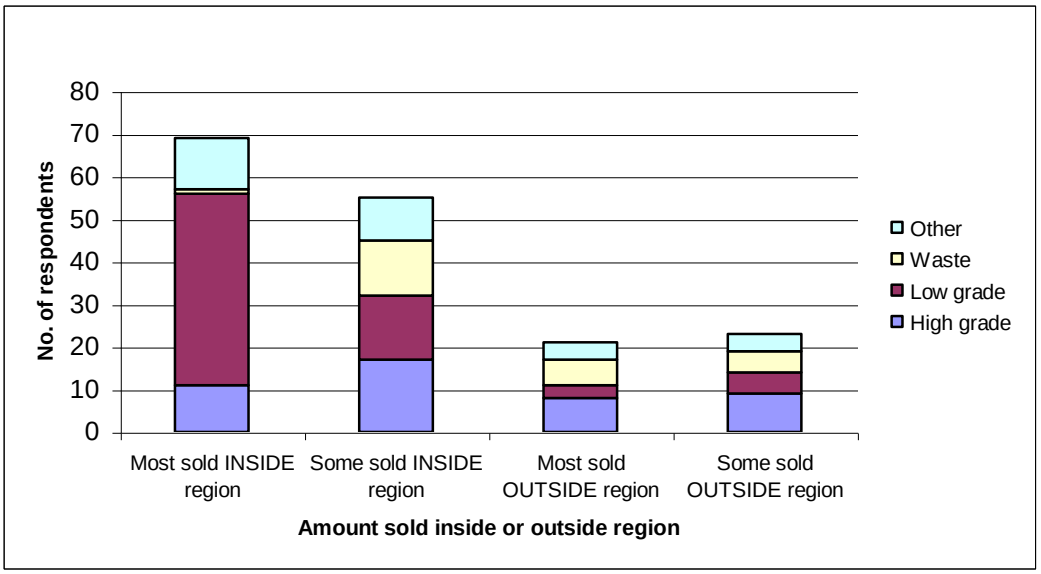


Figure 9 Destination, Amount and Purpose for which Timber is Sold, East of England

3.4.12 Respondents who were involved in activities such as coppicing, thinning, firewood production and charcoal production stated that their timber-based inputs came from, and their products were sold within, the Region, indicating a high level of economic retention. Their sphere of work was predominantly local, as were their modest purchases of inputs (mostly machinery and fuel). Typical quantities of timber processed during the year were around 75-100 tonnes (but could be much lower). Expenditure tended to be modest, though could rise to £1-2,000 on machinery and fuel, predominantly purchased locally. Two sole traders working in sawmilling and forest establishment/maintenance made most of their purchases locally (including timber), though more specialist materials and machinery were purchased outside the Region. One basketmaker obtained materials exclusively from outside the Region. Microbusinesses in conservation and countryside management could have relatively high expenditure, reflecting the specialist nature of the work.

3.4.13 Larger companies (e.g. furniture makers) tended to purchase little or no timber from the region, as they were reliant on where their timber wholesalers sourced their supplies. Timber was mostly high quality hardwood, and thus typically of high value (e.g. £700,000/yr for one business), the exception being one pine furniture microbusiness obtaining 80% of its (modest) timber requirements from within the region. Employees were predominantly local and numbers relatively high (a range of c15 to c60), mostly

engaged in furniture making with some office staff. Transport and overhead costs could be high (e.g. £20,000 transport).

3.4.14 Timber processing companies (typically sawmills) were often large businesses. One purchased 90% of timber from outside the region, but there was local expenditure on machinery (£5,000), fuel (£20,000) and overheads (£30,000). Another purchased mostly low grade timber (£4,000,000/yr), and incurred other costs of £50,000 on machinery, £25,000 on fuel, £100,000 on overheads, and £96,000 on transport: this expenditure was spent fairly widely, though machines, transport and timber were predominantly from outside the Region. Sawmills were sometimes microbusinesses in terms of employees, but could still have high turnover (e.g. £500,000 timber purchased from outside the region and £120,000 on transport, mainly sourced outside the region). Other processing businesses were very varied in their patterns of timber purchasing with some procuring mainly from within the Region and others importing all their inputs, especially where specialising in high grade timber. Their outputs were partly or mainly sold within the region, though there was a tendency for more local sales to be of low grade timber, with high grade timber being sold/exported over a wider area (Figures 10, 11).

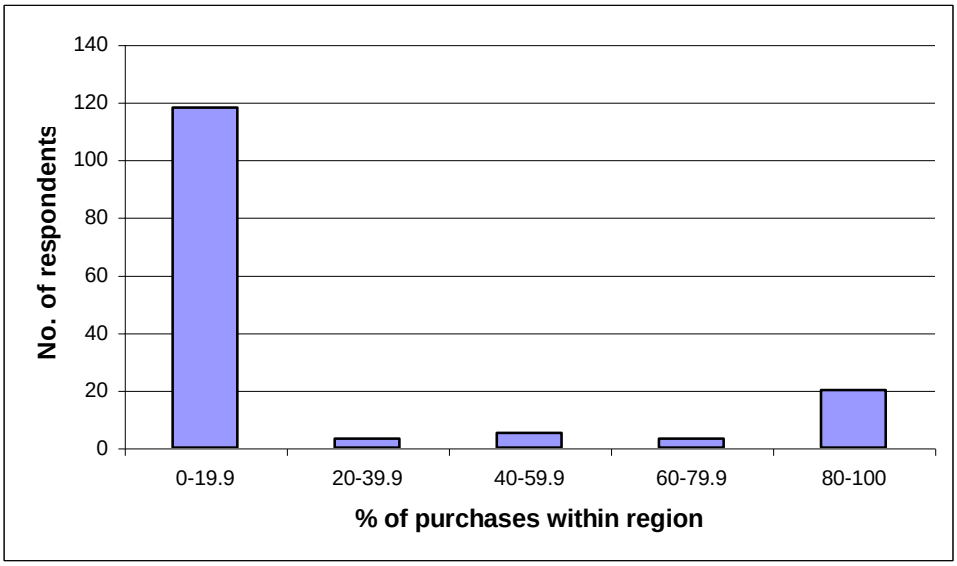


Figure 10 Purchases of Regionally Produced Timber by Users

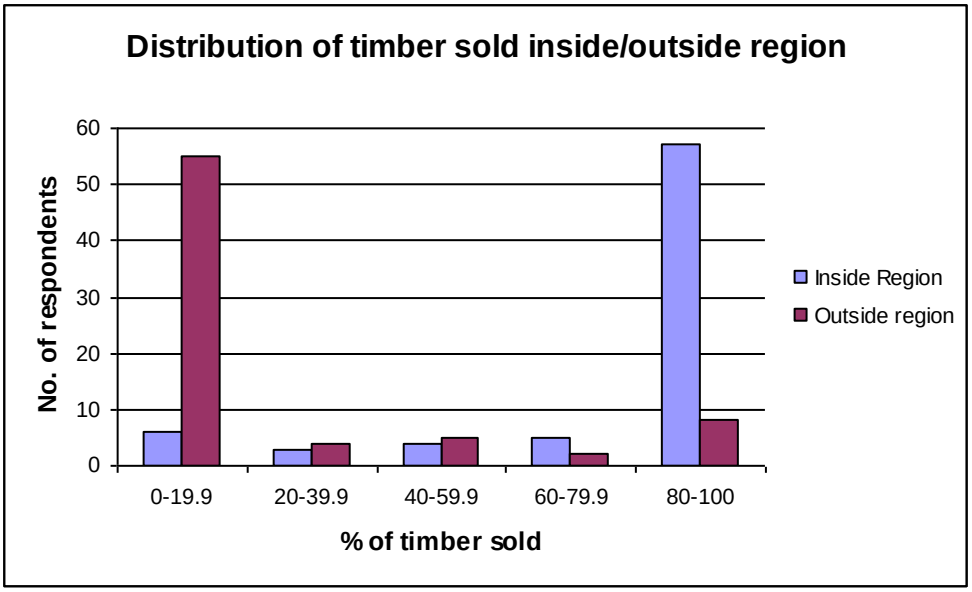


Figure 11 Distribution of Timber Sold Inside/Outside Region

3.4.15 The timber processing sector had significant expenditure on machinery (£3-20,000), transport (£3-15,000), overheads (up to £20,000) and fuel (£2-8,000), much of which was local, but with machinery being purchased more widely in the Region and some materials leaking outside the Region. Expenditure on timber supply was obviously a major factor and ranged from £30,000 for low grade and construction timber, to £400,000 on high quality timber. Two agricultural fencing businesses, employing relatively large numbers of staff (c.10 FTEs) had high expenditure (£250-450,000) on timber goods but sourced mainly or entirely outside the Region. One complained about the poor quality of local wood – 'badly grown and poorly treated' – and imported entirely from Eastern Europe. Expenditure on machinery was notably high, with about half being spent within the region.

3.4.16 Tree surgeons' expenditure on overheads, chemicals and forestry goods was relatively low (£'00s) whilst machinery and fuel/oil could be in the range £1-3,000. Expenditure was predominantly local, though some machinery and transport were purchased from elsewhere in the Region and occasional specialist materials from outside the Region. Businesses generally comprised only one or two people. One arboriculture business undertook almost 90% of its work in the region, with relatively high expenditure – £30,000 on machinery, £18,000 on fuel, £75,000 on overheads, again predominantly locally purchased, but with some machinery and fuel from outside the region. Other

arboricultural consultants/contractors had similarly significant expenditure on forestry goods, machinery and fuel (totalling c. £20,000/yr); expenditure remained relatively local, apart from significant leakage on fuel and specialist materials.

3.4.17 Timber merchants were a very variable group who often combined their activities with subcontracting and timber processing. One single-person business replied that all their timber would continue to be sourced from and sold within the region. Some would be sold as either high or low grade timber, but most as firewood. Time was divided equally between harvesting and coppicing with a smaller proportion of time dedicated to sawmilling and timber processing. Expenditure was mainly on machinery (£5,000), fuel (£3,500), overheads (£5,000), subcontractors (£2,400) and transport (£3750); almost all of this was purchased locally, apart from small amounts on transport and machinery). Other timber merchants employed between 2 and 5 staff and could be very specialised, for example in relation to construction materials (one was concerned primarily with building restoration timbers) or high grade hardwoods. Purchases of timber by larger businesses were mainly (at least two-thirds) from outside the Region though sales were normally within, indicating an adverse trade balance. In addition to expenditure on timber, other expenditure was on machinery (c£5,000), transport (£2,500), and around £30,000 on overheads, with most expenditure being local.

3.4.18 One major producer of firewood stated that 95% of supplies came from within the Region and would remain at about this level, mainly because of the difficulty of obtaining more. With an improved supply, they would have a possibility of investing in an automatic charcoal retort, but presently this would entail sourcing outside the Region. Annual production was about 4,500t of firewood logs, currently sold to major distributors (e.g. DIY stores) outside the Region, though some would filter back to local stores. Profits were expected to remain steady though prospects were viewed positively; whilst there was little expectation of substantial product diversification, new trade was being captured in traditional markets. Expenditure was mainly on timber (about 40% from landowners and 60% from merchants) as well as significant overheads, fuel and haulage costs. Forestry inputs and haulage were purchased mainly non-locally but within the Region, and machinery from outside the Region.

3.4.19 Christmas tree producers mainly grew their own conifers, typically spending about £6,000 on inputs plus significant sums (within the region) on subcontractors (c£5,000) and transport (c.£2,000). One nursery owner had high expenditure on goods (£240,000), overheads (£25,000) and transport (£5,000), mainly within the locality and Region.

3.4.20 These indicative accounts of the different sectors point to a number of general features:

- with regard to timber purchases and sales, there is a negative trade balance, partly occasioned by a regional supply which is sometimes perceived to be of poor quality and uncertain continuity of supply;
- suppliers of goods are predominantly local, though the lack of specialist tree nurseries results in high imports of forestry goods, and specialist machinery is often purchased outside the Region;
- in terms of materials most likely to be sourced outside the Region (forest goods, machinery), those purchasing the highest proportions were nursery owners, timber merchants, contractors and tree surgeons;
- those types of business recirculating most of their expenditure within the Region were management companies, manufacturers and processors of timber products, and woodland owners.

3.4.21 Sales of timber within the Region were mostly described as 'low grade' (almost 70% of respondents stating that their timber sales within the Regions were mostly low grade, and some 25% stating that these were mostly high grade), and around 40% of respondents stating that they also sold some timber wastes within the Region. Those selling outside the Region (17 out of 66 respondents selling timber) mostly sold high grade timber, whilst very few (less than 10 on average) sold low grade timber, timber waste or other by-products beyond the Region in any significant quantity.

3.4.22 The economic impact of principal FIBs, is included in the multiplier calculations previously discussed. However, these do not normally include more indirect, and often value added, products associated with craft and manufacturing. These subsequent products are important for a number of reasons, including the volume of local business generated by products based on timber as a primary resource, and the opportunity for

locally grown timber to capture new niche markets and perhaps substitute for imports. Sales of **wood products** in the Region are provided by Intermark's study of market data in the East of England (2002), an update of their 1994 study which covered only the counties of Essex, Suffolk, Norfolk and Cambridgeshire. This study investigated four types of outlet, namely, garden centres, garage forecourts, farm shops and DIY stores with gardening/ horticultural departments. It excluded the sale of wooden products through hardware stores, village shops, department stores, mail order and small DIY stores. This survey found that sales of all wooden products had risen from £9.7m in 1994 to £17.9m in 2001 for the four counties; adding in Hertfordshire and Bedfordshire raised this total to £23.7m (Table 8). Some of this is attributable to the increasing number of large garden centres and DIY outlets, though this has put pressure on the smaller distributors.

Table 8 Results of Intermark survey (East of England market value at retail prices £'000.)

4 Original Counties	Total		Garden Centres/ DIY Sheds		Garage Forecourts		Farm Shops	
	1994	2001	1994	2001	1994	2001	1994	2001
Fencing/trellis	1924	4108	1924	4096	-	-	-	12
Hardwood furniture	724	3493	716	3470	-	-	8	15
Softwood furniture	289	790	263	772	11	10	15	8
Tubs/Planters	310	927	365	914	24	-	13	13
Bird tables/boxes	235	311	196	296	16	-	23	15
Bark	605	673	605	672	-	-	-	1
Charcoal	2141	2077	160	184	1976	1890	6	3
Fuel wood/kindling	3275	5037	-	-	3272	5020	3	17
Stakes	35	60	35	60	-	-	-	-
Others	218	427	116	380	-	40	10	15
Total	**9756**	**17903**	**4380**	**10844**	**5298**	**6960**	**78**	**99**
Herts and Beds	**-**	5823	-	3906	-	1873	-	44
Grand Total		**23726**		**14750**		**8833**		**153**

3.4.23 Overall, the market in the original four counties had grown in value at 9.1% per annum, well above the rate of inflation. The increase in wood material used had been significant, with the largest growth being in sales of fencing products, furniture, planters and a range of new products not previously available. Sales through garden centres grew at 13.8% pa, through garage forecourts at 4% pa and through farm shops at 3% pa (comparisons cannot be made for DIY stores as they were not included in the earlier

survey). Given the continuing upward trends in purchases related to gardening, growth in demand for wood products is likely to be maintained, albeit at a lower rate than during the survey interval. However, much of this growth appeared to relate to tropical hardwood and imported pine products, and the use of domestic/regional timber has been more variable. Many of the uses of domestic timber were in 'mature' products (e.g. such as bird tables, bark, charcoal and stakes) showing relatively slow rates of growth. UK softwood still proved to be the main raw material for fencing, trellis, bird tables and bark products, but there were reports of 'up-market' bird tables using Scandinavian redwood. Also, there had been a rise in the use of Scandinavian pine for furniture and planters, mainly because manufacturers believe it can produce a better finish than UK softwood. Products with a 'rustic' appearance seemed to be going out of vogue. Larger products such as furniture and sheds were likely to be made principally from imported timber.

3.4.24 The study also considered the factors influencing customers' decisions to purchase: distinctive features are the growth in preference for an environmental label (especially FSC approval) at larger outlets and, for farm shops, the continued weight attached to 'buying local'. The report anticipated that quality expectations will continue to grow and suppliers need to be able to produce higher, consistent quality products to pre-set costs; aggressive marketing, consistent supply and competitive pricing by larger companies was generally affecting local suppliers. This was true even of fuel products, where the local supply chain tends to be relatively strong: CPL, the major player in the region and nationally, has increased its market share due to a wide product range and a very effective distribution strategy. Overall, there was a move towards industrialised processes and away from cottage industries producing rustic items. Distribution of all products had also become more specialised. However, there were some bright spots for smaller, more local producers, such as expectations that split logs for fuel would continue to be a major product, as would kindling and charcoal sold mainly through the garage forecourt system. Also, the impressions of British suppliers – in terms of their service, delivery and environmental credentials – showed some improvement, especially in Norfolk and Suffolk.

3.5 Timber as Fuel

3.5.1 One of the major opportunities, especially for private woodland owners, in the Region is the production of timber for fuel. Presently, the major market is firewood, but there are some opportunities for charcoal production and, more speculatively, for energy production either at the community level or for the national grid. Many reports have pointed to the need for new markets for small roundwood, but equally have identified problems over the security of supply from a fragmented supply chain. However, we found that exploiting timber as a source of fuel was widely viewed as the most promising opportunity for the future regional sector, particularly in relation to creating a market for low quality roundwood. Consequently, we have given specific attention to this topic.

3.5.2 Firewood is often identified as an actual and potential key product, especially for the private sector. However, to build up a programme of firewood sales requires strenuous effort and then constant support to maintain the contacts established. Previous research points to the problems posed by staff changes, where it becomes almost impossible to maintain firewood sales as contacts have to be re-established, and by bad debts, regular thefts, and disproportionate effort in product preparation. Another factor may be the high degree of informality in the sector, short-circuiting the efforts of established businesses. However, such is the importance of firewood to the woodland wealth of the private sector, and particularly of the local economy, that we made it the subject of a supplementary study.

3.5.3 Views about the significance of charcoal vary. The investment in equipment for the production of charcoal may be substantial, the market seasonal and problems of marketing considerable. Nevertheless, authoritative advice to farmers (www.farmerslink.org.uk) is that hardwood consumption by the charcoal trade in the UK has been estimated at around 60,000 tonnes, of which the barbecue market is 40-50Kt. Of the latter, 96% is sourced from overseas. There is, therefore, significant potential for increasing charcoal production from UK woodland. Imported charcoal is still being sourced from the clearing of mangrove and tropical rain forests, which is inherently unsustainable. If the quality and quantity of charcoal from well managed UK sources were to increase, expansion of production would enable a considerable number of small-scale enterprises to be established. Even with such a low level of UK sourcing, there are

still around 200 charcoal producing enterprises in the UK, so the potential for growth is evidently very substantial.

3.5.4 With regard to fuel for electricity production, we heard a number of knowledgeable representations for a major new timber-burning power station. The principal sources of material for this would be low grade roundwood and wood waste, and specifically grown short rotation willow (for which there could also be other industrial uses). Thetford power station burns chicken litter with some wood waste, whilst Ely is straw burning but could be converted to take some woodchip, and a new domestic waste burning plant is under construction near Corby. Wood burning power stations could take wood waste up-front as a means of paving the way for willow suppliers (who often find themselves in a 'Catch 22' of not being able to invest without a long-term contract, and power stations being unable to expand without assurances of a reliable willow supply). However, one respondent felt that willow would probably not compete with wood waste unless it received a favourable grant.

3.5.5 The Non-Fossil Fuel Obligation (NFFO) requires regional electricity companies to obtain a proportion of their power from renewable energy sources, and the Government has a target of achieving 10 per cent of UK electricity requirements from renewables by 2010 (DTI, 1999). Currently only 0.45% of the East of England's regional demand for electricity is met from renewable energy resources (Hams et al, 2000). Scenario studies estimating which technologies might contribute to renewable energy in the UK in the medium-term show that energy crops, along with wastes and wind, will make the dominant contributions. The PIU (2001) also suggests that energy crops, alongside wind energy, are the key technologies likely to help achieve targets based on their commercial viability. Short rotation coppice can be grown on most UK land types and is suited to a wide range of soil conditions from those of arable land through grassland to the poor soils of reclaimed sites. Although this is largely an unproven product in the free market, a number of trial projects have recently been established in the country, and a new 5.5 Mw (e) biofuel plant is proposed at Eye in Suffolk. This will require 3,000 ha of short rotation coppice within a 50km radius of the power station. There is also a more speculative possibility of locating a wood-fired power station in lower Thames estuary.

3.5.6 A report by Hams et al (2000) for the East of England Roundtable for Sustainable Development produced regional targets for renewable energy, based on an assessment of the region's capacity to generate electricity from all potential renewable sources. Biomass was viewed as making a key contribution to renewable energy in the region and also to the local economy in terms of local employment, farm diversification and local fuel for schools. They estimated that if a 14% renewable energy target for the region by 2010 was adopted, the region would have to produce, amongst other renewable energy sources, 700 GWh/yr of electricity from biomass. This would require 92,000 hectares of wood. They suggested that set-aside land offered the most potential, as well as the large areas of unmanaged woodland in the region, which, as previously noted, amount to some 50,000ha.

3.5.7 Without knowledge of the types of energy crop to be grown, or allowing for the double-counting of low grade hardwood included in other calculations, it is impossible to give an accurate estimate of the value of such a crop. However, it would presumably need to be competitive with Miscanthus as a power station fuel, and this typically yields 15t/ha – 20t/ha in Southern Britain, having an energy value to power generators worth about £30/t dry matter. (*www.bical.net*) Allowing for loss of weight on drying, a value might therefore be £400/ha, indicating an approximate potential future value of regional energy crops to be around £37m (for 92,000ha).

3.5.8 The main barrier to expansion is the lack of a market mechanism (Hams, 2000). Despite entitlement to DEFRA's *Energy Crop Scheme* subsidy to help with start-up costs and eligibility to use set-aside land, the high start-up costs and relatively long lead time to the first harvest severely restrict profitable production of short rotation coppice, under prevailing market conditions (Hams, 2000). The PIU report suggests that further Government subsidy and facilitation of contracts between growers and energy companies is likely to be required. In particular there appears to be a gap in support with respect to the interim infrastructure of harvesting, drying, transportation and storage.

3.5 9 Although several of our respondents and previous studies have pointed to the scope for a wood-burning power station in the Region, it may be that smaller scale community heating schemes hold greater potential. The Royal Commission on Environmental Pollution's report (2000) on *Energy: the Changing Climate* proposed a

substantial expansion of community heating (combined heat and power) schemes as a way of meeting the proposed 60% carbon dioxide cut by 2050. One of their scenarios included up to 4,000 small-scale (up to 10 MW) CHP plants fuelled by energy crops and agricultural and forestry wastes. As an illustration of what is possible, the Beddington Zero Energy Development (BedZED), in the London Borough of Sutton, incorporates a woodchip-fuelled CHP unit which distributes heat around the site. The scheme, by the Peabody Trust housing association, working with Dunster Architects and environmental specialist the BioRegional Development Group, incorporates 82 town houses, maisonettes and apartments, business units, a café, shop, clubhouse, nursery and green space. The entire heat and electricity needs of the site will be provided by a 130 kW CHP plant, using wood gas derived from tree surgery waste as its base fuel. 'Waste' heat from the engine is retained, and piped to the dwellings to heat water.

3.5.10 Turning to firewood, we gathered evidence from a number of operators within the local economies of Beccles (North East Suffolk) and East Dereham (North West Norfolk). Our respondents were a mixture of timber processing companies or agents, tree surgeons, an estate owner, a harvesting company and a fuel merchant; one was carrying out unpaid improvement work on an estate and was allowed to take the timber to sell. This study points clearly to the role of timber in rural pluri-activity, where a readily saleable and seasonally complementary product is used to supplement another enterprise. There is one very large operator in the region using 4,500t of wood per year to produce bagged logs and charcoal, but, as this is a different scale of operation from the other producers described here, and as this operator has been included in the main private sector survey, the current account centres solely on the village economy.

3.5.11 The average number of full time equivalent (FTE) persons employed by each business was 2.5, of which the firewood element averaged 0.88. Only one business employed a part-time person year round packing firewood and one provided short-term full time employment; the majority of work tended to be on a part-time year round basis. In some cases employers used firewood production as a means of keeping employees busy during otherwise slack periods (this applied particularly to farm workers and tree surgeons). Employees in all but one of the businesses lived locally, and in the case of the exception all full time personnel lived locally but 30% of the part time labour was from Ireland or even mainland Europe.

3.5.12 Major items of expenditure were on forest machinery (processors, splitter, chain saws, vehicles) followed by fuel and oil for machinery and vehicles. In many cases respondents found it difficult to assign specific costs to firewood production as vehicles and machinery tend to be used for other activities. In general, forest machinery, other than chain saws, tend to be purchased outside the Region; most other goods were purchased inside, though only fuel and oil tended to be purchased locally. Four of the businesses produce charcoal in small kilns though only one business was based purely on charcoal. Three businesses produce pre-packed kindling in polythene bags and one is experimenting with delivering logs in large plastic sacks, but the main form of firewood is loose, split logs. Only one company produced woodchips but this was not used for fuel and one business was investigating woodchip production from pallets. One business used wood imported from outside the region and acted as a distributor of bagged logs; another produces the majority of its wood (600 tonnes) in 2 metre lengths to be delivered to a large regional firewood and charcoal producer.

3.5.13 Five businesses obtained all their wood from within 30km) and three others obtained wood from within the Region. This was principally sourced from thinnings or as a by-product of wood manufacture or tree surgery. There were two exceptions to this situation, which appear remarkable in terms of transport and the presence of so much undermanaged: one business was making an average of 12 trips per year to a sawmill in Grimsby to buy slab wood (c. 240 tonnes/year); a second company that previously used local sources of firewood now imports its wood from West Yorkshire (150 tonnes/year) due to inconsistent local supplies. Basic processing tasks tended to be the same for all businesses.

3.5.14 The majority of sales of logs were to households; only two of our interviewees sold to commercial companies for processing and selling on, and one acted as a distributor of bagged wood selling mostly to commercial outlets (70% to garages, 30% to households). Respondents estimated around 5% of sales were to households using wood as a major source of heat (based on size of individual sales). Visitors tended to buy bagged wood in smaller amounts for 'weekend' fires. Kindling was sold almost entirely to commercial outlets (98% to shops, garages), as was charcoal, which was sometimes contracted to large retail chains such as B&Q. Income was very variable, ranging from a

tree surgeon selling a little firewood on the side to companies selling firewood full time, and from part-time farmers to those with contracts from large retail organisations. Producers selling firewood as a part of other operations tended to have net annual incomes from firewood of £4,000 - £10,000 while sole operators whose firewood business is their main enterprise derived incomes of around £20-25,000. Sales were found to be very seasonal with most sales occurring between September and December, and a second peak between January and March, with levels significantly affected by weather (according to one respondent, a 2 degree change in the average seasonal temperature affecting sales by up to 20%). Based on interviewees' local knowledge, there seemed to be relatively few people providing firewood on a full-time basis but potentially large numbers operating on a part-time basis. In North-west Norfolk, for example, respondents suggested that there might be as many as 10 to 20 people engaged in part-time firewood operations but only 2 full time companies. A relatively wide range of organisations appear to be engaged in part-time firewood operations including sawmills (provided they do not send all off-cuts to board mills), fencing specialists, tree surgeons, farmers, and others who may not be declaring their income. Only two respondents specifically mentioned that there were people in their area, on social security benefits, working part-time selling firewood, although others mentioned that they believed it was occurring.

3.5.15 It is extremely difficult to estimate actual regional production of firewood due to lack of information about the informal economy, the potential for double counting (e.g. woodland owners selling to larger companies that distribute firewood across a large radius), and lack of evidence on the provenance of firewood sold by large retail companies. However, this study suggests that there are relatively few major firewood producers (defined as producing over 500 tonnes per year) in the region but there may be large numbers of small producers (defined as 200 tonnes or less). There is at least one major firewood and charcoal business (4,500 tonnes wood per year processed), and several large retailers of firewood operating in the Region (e.g. CPL, B&Q, Sainsbury's) though much of the wood sold by these retailers originates elsewhere. Yellow Pages covering the East of England reveal a total of 71 listings selling firewood. This does not include small producers who might only advertise in the local newspapers during heating season and tree surgeons who might also be producing firewood but not advertising the fact in Yellow Pages (e.g. in the Peterborough area alone 51 tree surgeons were listed but

only 4 explicitly stated they produced firewood). In addition 37 entries were found in the Yellow Pages for wood stoves suggesting a significant demand for both wood burning stoves and firewood. Forest machinery other than chainsaws does not appear to be readily available within the region. No references were found for companies selling equipment such as log splitters or firewood processors.

3.5.16 Based on responses regarding person-hours to produce, process and distribute firewood, the labour cost per load was calculated as approximately £19.50, which must be added to the cost of standing firewood at £3.75/load (i.e. £5/tonne), and additional labour costs of £6.50 (one hour average of mixed skilled/unskilled work), then the costs of producing a load of firewood lay in the range £23.25 – 27.50. Costs tend to be variable year to year and several respondents were not able to calculate depreciation costs of machinery. However, annual expenditure per business ranged from £2,800-£35,800 (mean = £13,035); mean tonnage of firewood produced per business is 313 tonnes/year which provides an average expenditure of £41.66/tonne firewood produced. Expenditure is mainly within the regional economy, although specialised forestry equipment is purchased externally, and some interviewees reported purchasing vehicles and even chain saws outside the Region. One other product not sourced regionally appears to be polythene bags which come from the Midlands.

3.5.17 Based on the evidence from our sample, we make the following assumptions: there is one very large producer in the region (almost five times larger than the next biggest producer of firewood); 2/3 of producers are small scale, part-time producers operating firewood production in conjunction with other operations, and averaging an output of 150 t/yr; and 1/3 of producers are large-scale, full time operating year round, and producing on average 600t/yr. We can also make some assumptions about very small, part-time producers not represented in the sample. Based on estimates of numbers of 'other operators' by interviewees in the case study areas we can assume that for every firewood producer advertising in Yellow Pages (71 in total) there are 6 small scale producers (selling up to 75 t/yr, i.e. equivalent to approximately 100 loads), typically operating during the heating season only and advertising locally. Thus we assume: one very large producer (>4,500t), 24 large producers (600t/yr), 47 small producers (200t/yr) and 432 very small producers (75t/yr). This does not include those who might be

producing firewood for their own consumption, such as farmers or landowners with their own woodlands, and these users could represent a sizeable level of activity if we assume that they might realistically consume 1-2 cu.m. a year.

3.5.18 Employment varies between the businesses depending on the extent to which value is added in the production of firewood through splitting, seasoning, bagging or netting. As previously noted, employees are often involved in a range of jobs not associated with firewood production (e.g. tree surgery, farm work, hurdle making), and the average number of FTEs per business in our sample employed on aspects of firewood production is 0.88 per year. If we assume this level of employment is sustained across all 71 firewood producers in the region then a conservative estimate of total employment in known firewood production is 62.48 FTE. With regard to very small producers, we estimate that 75tpa firewood is equivalent to approximately 100 loads, each load takes three hours from felling to completed load on truck, and thus around 20 weeks' work is generated, approximately the length of the heating season. Thus, the 432 very small producers represent 62.1 FTEs in firewood production. Using average figures and interview data from firewood producers, estimates of the regional economic impacts of firewood production can be made, based on the assumptions below (drawn from the interviews):

Assumptions for Large and Small Producers

- All wood is produced within the Region
- Average distance for delivery of firewood is 16km
- Mean expenditure per tonne of firewood produced is £46.78
- Mean income per tonne of firewood produced is £78.11
- Mean expenditure per business is £14,635/yr
- 66% expenditure takes place within the Region.

Assumptions about Very Small Producers

- 100% expenditure takes place within the Region
- Mean expenditure/tonne firewood produced within the Region is estimated to be £22.22
- Mean income is likely to be lower than that for large businesses as they will sell below the commercial rate to local customers, so we estimate average prices at £50/load (£62.50/t).

3.5.19 On this basis we estimate firewood-related expenditure within the Region to be c.£1.6m/yr (with about £0.45 occurring outside the Region), and total regional income from firewood sales to be around £4.24m/yr. These figures do not include farmers and other woodland owners who might be producing firewood for their own consumption.

Category	**Estimated No. in Region**	**Total Production tonnes**	**Total regional expenditure £**	**Total income £**
Very large producer	1	4,500	138,915	351,495
Large producers	24	14,400	444,528	1,124,784
Small producers	47	9,400	290,178	734,234
Very small producers	432	32,400	719,928	2,025,000
Total	**782**	**60,700**	**1,593,549**	**4,235,513**

3.5.20 Comparison with Intermark figures for 2001 (stating total sales of firewood and kindling of about £5.037 million) suggest that the values in the table above might be conservative. Intermark's estimates are based on wood brought into the region as well as locally produced wood. Our estimates suggest that considerably less than £2.2 million of firewood, sourced from the Region, is sold through garages and shops. Thus perhaps only 20-25% of the wood sold in retail outlets is from within the region. Intermark's own data suggest that for wood sold through garage outlets only between 20% and 50% is sourced locally, the majority coming from outside the region and even from abroad; perhaps, therefore, about £3.53m of non-regional firewood/kindling is sold through main outlets. We thus estimate total regional sales at £7.76m (£4.23m regional, £3.53m non-regional).

3.5.21 As we note below, it is also probable that part of the income stream will be in the hidden economy. With regard to large and small producers, as they are established businesses, the proportion of hidden activity is likely to be small. Taking the lower estimates of UK hidden economy activity it is estimated that 8% of £1,859,018 (or £148,721) will be in the hidden economy (equivalent to £2,094/producer). For very small businesses, for whom firewood production is more likely to be a 'cash in hand' sideline, if we take the highest estimates for UK hidden economy activity from the literature then up to 30% of the £2.025 million (or £607,500) of income could be in the hidden economy for very small producers (equivalent to £1,406/producer). Thus is

estimated that a further £756,221 of income (17.8% of production) from firewood is in the hidden economy.

3.6 A Note on the Informal Economy

3.6.1 It is important to consider the extent to which timber and timber products may be associated with the informal economy, as there is a supposition that parts of the sector may lend themselves to unregistered trading and unofficial employment practices. The general consensus among one group of economic researchers is that the informal economy has been growing, at least since the 1970s, due to a number of reasons including increased tax burdens, health and safety legislation and other forms of regulation. Although a range of approaches has been developed at both macro and micro levels to try and estimate the size of the informal economy, no one method is able to give an accurate picture. By its very nature the 'hidden' economy is difficult to measure. One of the key issues has been defining exactly what is meant by the 'informal economy' as a wide range of terms are in use and different authors use the terms in a variety of ways.

3.6.2 Dalgallo (1990) notes that it is important to distinguish between "economic irregularities" and statistical measures as some economic activities occur but are not observed or measured due to the "conventions of national accounting" or due to difficulties of measuring. He points out that statistical underestimation is a "well-known occurrence" involving more formal economic activities as well as informal ones. A similar observation is made by Carter (1984), who defines the hidden economy as that which "encompasses all unmeasured economic activity". He points out that this is a broader definition than that used by many economists at the time who tended to view the hidden economy as "GNP…not measured by official statistics". In other words the hidden economy was a function of the level of unreporting based on the inability of statistical techniques in use at the time. The Grabiner Report (2000), the most recent UK government study on the subject, does not make much attempt to define the hidden economy and takes a fairly narrow view. The hidden economy is defined as "any undeclared economic activity. It covers tax evasion of all kinds, ranging from casual moonlighting and work paid cash-in-hand through to organised crime".

3.6.3 It is clear that, whilst informal activity is likely to take place in relation to forestry, estimating its actual nature, incidence and magnitude will be extremely difficult. There is certainly scope for significant levels of hidden economic activity in the forestry sector. Certain activities such as felling and maintenance are characterised by part-time workers and self-employed people with a range of skills, work can be seasonal, and some transactions (e.g. firewood) are commonly made in cash. These are all elements that are likely to promote 'hidden' or 'informal' economic activities. The landowner or farmer who sells some timber or firewood for cash, the estate that allows workers to take some forest products for free (e.g. thinnings which are then sold-on), the part-time worker receiving extra cash for delivering firewood in winter, or the casual worker doing a bit of forest maintenance in return for the right to take and sell forest products undoubtedly exist. They are 'hidden' to the extent that cash transactions go unreported or barter arrangements are made that involve work and/or an exchange of goods.

3.6.4 Our only insight into the potential scale of the 'hidden economy' in the East of England comes from our firewood survey. Although this is only a specialist sector, it is perhaps the area in which there is most scope for 'informal' activity as opposed to corporate fraud. Our nine interviewees intimated evidence of some non-monetary transactions. On one estate workers were able to collect wood in their own time, from forest operations, and sell it on as firewood. Three interviewees were engaged in forest maintenance work in return for which they were allowed to take wood for hurdle making, firewood or charcoal. In two cases there was no other payment for the forest maintenance work. In terms of under-reporting income there was some suggestion in the interviews that self-employed people tended to be clear about levels of expenditure and less clear on income from sales of firewood, in one case an estimate of income under-reported firewood sales by 40% (when checked against tonnage produced and prices at which it was sold). In general, however, those in the business for the long term noted that it was self-defeating to under-report income and expenditures as they viewed their business as a valuable commodity that could be sold as a going concern. If hidden economic activities were occurring, this could only reduce the sale value of their business. Only one person was specifically mentioned as committing benefits fraud, though there were implications that it did exist among part-time producers.

3.6.5 Despite the extreme difficulties of measuring the informal economy, various estimates for the UK consistently place informal activity in the range of 7-13% of the official economy (reviewed by Schneider and Enste, 2001). We thus conjecture that the magnitude of the informal economy in the Region is around 10% of the total, and mainly restricted to the more local economy within the private sector. The highest estimates for the informal economy in developed countries are around 30%, but if these levels are occurring anywhere in the Region's timber economy they would most likely be in isolated pockets associated with firewood, though we found no evidence that this degree of undeclared work in fact prevailed.

3.6.6 At the local level, it could be argued that a low level of informality in the sector could bring some benefits. For example, local economies might benefit from the added level of spending that results from extra income, or from utilisation of forest resources that might otherwise remain unused or be treated as waste. Barter arrangements might also benefit the local economy through provision of employment, enabling forest maintenance that would not otherwise take place, and making use of skills that might otherwise disappear. However, costs from tax avoidance would be spread more widely among all taxpayers and there would be dangers from casualisation within the labour force. Such factors might be of longer-term disadvantage to the industry, by reducing the value of a business as a going concern or by discouraging a new generation of workers from seeing forestry employment as a safe and enjoyable alternative to other career opportunities.

PART 4: LOOKING TO THE FUTURE

4.1 Introduction

4.1.1 This final section has two main purposes. First, drawing mainly on our questionnaire survey and producer interviews, it considers the economic prospects for the sector, and explores ways in which the Forestry Commission can assist producers, suppliers and processors in optimising the contribution of woodland and timber to regional GDP and employment. Second, it assesses the scope for proactive development of the public benefits of woodland, in pursuit of enhanced regional quality of life. These purposes are intimately connected. On the one hand, a healthy woodland and timber industry will create 'ripple' effects, maintaining and enhancing a multi-benefit resource. On the other hand, a wider recognition of the 'non-market' benefits of woodland will be more likely to secure the industry's future in unfavourable economic circumstances. Promoting both the private and public benefits of woodland will require improvements to both 'hard' and 'soft' infrastructure at regional level.

4.2 Commercial Prospects

4.2.1 Latterly, the domestic timber industry has faltered due to low raw material prices, not least resulting from East European imports. The view from within FE, however, was that, despite low timber prices, prospects were expected to improve slightly, partly because of the growing policy importance of multiple-benefit woodland (e.g. biodiversity and social/health values), and partly because FE is working very closely with current customers to enter into long-term supply contracts.

4.2.2 There was seen to be little scope for major new processing facilities. It was dubious economically to be sending low grade and waste timber to Kronospan in Chirk, but this plant together with plant in Scotland meant that there was probably over-capacity in particle/chipboard processing at present so there was little scope for a major new investment closer to the East of England. Instead, future development of the 'volume' industry was seen to lie in consolidating markets and producer-processor linkages, extending the recreation business and establishing replacement markets for small

roundwood. In the Northamptonshire District, where the FE is re-focusing on coppice-with-standard systems, effort is more likely to be directed towards:

- the craftsman route, producing charcoal, hurdles, firewood, and so forth (albeit the rate of achieving this is currently hampered by the small available workforce), and
- woodfired power stations, although this promising but embryonic market had been set back by the temporary liquidation of Arbor Energy.

The major prospective problems are the marketing of coppice and finding people to work it, but there is an optimism that the construction of a wood fired power station would result in contractors coming forward.

4.2.3 In the private sector, of those who were responding as 'woodland owners', 49% believed that they would extract timber for sale on a commercial basis, 42% replied that they would not, and 9% did not know. Amongst all respondents, very few expressed an opinion on whether the proportion of regionally-sourced timber would increase in future. However, these respondents were generally optimistic, and reasons why regional sourcing of timber could potentially increase included rising levels of log sales, rates of planting of broadleaves, and grants to landowners for the restoration of woods. One respondent was hoping to invest in their own saw mill and use their own oak for fencing rather than for firewood. However, there was clearly some uncertainty about the willingness of purchasers to go for local timber. One respondent stated that the quality of the Region's timber was inconsistent, and thus now sources 85% of timber from Eastern Europe; one referred to the destruction of coppice by clearfelling; another stated that they purchased heavily from their Scottish and Sussex sawmills, and from Eastern Europe, due to price and availability. Levels of woodland management matched other surveys, with woods occupying relatively small proportions of the holding more likely to be unmanaged or used mainly for sporting purposes. Under-management is thus likely to reflect mainly small, awkwardly shaped or isolated blocks which will be increasingly difficult to regenerate, given the requirements of modern lorries, and their future may lie in their contribution to biodiversity and amenity. It is likely that other woods are managed to at least some extent even though it may not be to the standards of an approved WGS plan.

4.2.4 Respondents' views on business confidence (Figure 12) were unadventurous, with 66% of respondents expressing the view that the performance of their business would remain about the same during the next three years, 19% expecting an improvement and 16% a deterioration. Most respondents were, however, relatively optimistic about the general prospects for the industry, even though they anticipated their own profit margins remaining relatively steady. Woodland owners were generally less optimistic about prospects than contractors.

4.2.5 One firewood producer referred to the increased planting of hardwoods by farmers, and felt that prospects would improve considerably if small woods were better managed. One tree surgeon who was also engaged in log sales expected business to increase based on current upward trends. Indeed, tree surgeons were generally very positive, further reinforcing the significance of the urban forest. Negative expectations were rare, but one relatively large (18 employees) subcontracting business engaged mainly in game management/ woodland establishment and maintenance felt that trade would deteriorate, and found difficulty in recruiting and retaining good staff. Generally, woodland owners were less optimistic than timber users, due to low prices for wood, sometimes making it scarcely economic to harvest. One had recently laid off his two employees due to abandonment of his felling programme. Many woodland owners were also primarily farmers, for whom timber was a minority enterprise and for which it was difficult to attribute accurate staffing and financial data. Private woodlands mainly comprised deciduous species, and farmers' attitudes ranged from disinterest (taking only a small amount of firewood for own use) to positive enthusiasm for a keenly developed hardwood resource.

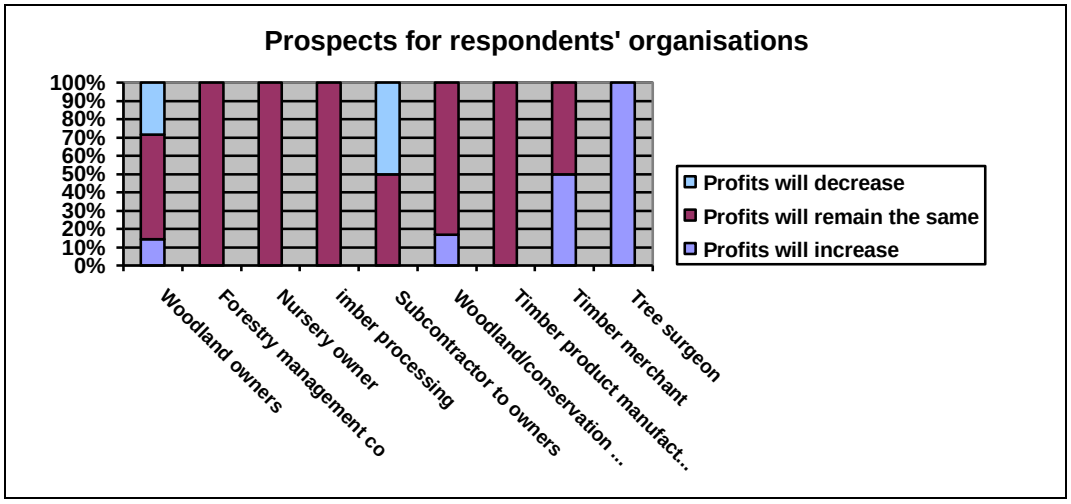


Figure 12 Organisations' Perceptions of Future Profitability, East of England

4.2.6 Views on woodland development over the next 5-10 years were that:

- it would benefit from increased public awareness of local goods and environmental issues;
- the industry would become more focused on the domestic timber market and more mechanized, and would become more diversified (biomass/ renewable energy, crop processing, marketing);
- there would be more opportunities to secure payments related to conservation, to undertake forestry consultation work, and to diversify into 'green' businesses such as composting of waste timber products;
- there are rising prospects for sustainable timber generally;
- there is scope for particular species and systems, e.g. coppicing, *Abies nordmann* for Christmas trees. One buoyant niche market that we noted was the cricket bat willow (*Salix alba coerulea*), for which Essex, Suffolk and the Thames Valley are the main growing areas in the world, and for which demand is expected to expand.

There were some concerns, though, about the lack of profitability of some timber work at present, low timber prices, low cost of imported timber, unattractive grant scheme (in terms of speed of returns and maintenance costs of mature woodland), and low wage levels. However, there were more comments expressing optimism over growth than concern over decline. One respondent was sufficiently positive to identify scope to increase efficiency, generate more income from sales, move away from direct contracting, install new plant, provide relevant education and develop staff.

4.3 Business Intelligence

4.3.1 In respect of the FE, business intelligence was obtained from internal sources, as well as through contacts with customers and contractors. Private operators were considered to be more reliant on trade organisations, such as the Forestry Contracting Association, for their information. However, there was a sense of unease among private operators about relying on these sources, as their headquarters and key personnel were often perceived to be distant and thus of limited help in addressing regional conditions. The major auctions were seen to be venues where smaller producers could network with the wider industry, and it was suggested that there would be benefit in the FE opening up its auctions more widely.

4.3.2 Smaller operators (e.g. coppicing, firewood/charcoal producers) stated that they made little or no use of business intelligence, and felt that most benefit could be gained from directing sources of support towards woodland management and local businesses, and making the work 'on the ground' more attractive to jobseekers. Larger companies involved in making wood products mainly derived their intelligence through trade journals, exhibitions, etc., and manufacturers were very dependent for business prospects on more retailers displaying their products.

4.3.3 Few respondents to our survey could name any regularly used sources of intelligence on the regional timber industry. Responses comprised:

- own knowledge (1)
- trade journals (9)
- local business contacts (1)
- professional trade organisations (8)
- land/forestry agents (2)
- customers (2)
- exhibitions/trade shows (2)
- word of mouth/peer groups (8)
- adverts/signs/circulars (4)
- local authorities/government departments (5)
- local environmental organisations (2)
- internet (2)
- Anglia Woodnet (2)
- consultant (1)
- newspapers, radio, television (2)

4.4 Constraints and Opportunities to the Future Development of the Woodland and Timber Industry

4.4.1 This assessment of woodland wealth in the East of England Region has revealed a diverse woodland sector which has clear potential to expand. However, the capacity for development in both quality and quantity may not be realised unless a number of limitations to future development can be overcome. Previous research (Anglia Woodnet, 2001) has identified existing deterrents to the better management of woodland, and the types of problem appeared to be similar, regardless of location or size. The main issues associated with woodland ownership were mainly economic ones; second order problems comprised time, bureaucracy, size, management, lack of in-house expertise, labour, pest damage, and appropriateness and availability of advice. Only a minority of owners felt that woodland was potentially profitable. Woodland owners made a number of suggestions about improving forestry advice, notably the wider and more targeted use of contractors, changing farming practices (to free up time in winter), exploring new markets (the potential for a power station was mentioned) and generally being receptive to learning new techniques. Deterrents to further woodland planting were also identified by the same assessment as falling into: *price* deterrents (e.g. lack of spare capital, loan availability, grants and perceived value of crop), *people* deterrents (e.g. lack of motivation/time, inefficient use of farm labour, suspicious of not getting fair price for products), *process* deterrents (e.g. lack of product/market knowledge, disruption of other work, unavailability of equipment, bureaucracy, prior unfavourable experience) and *place* deterrents (problems of access, disturbance of game/wildlife).

4.4.2 Other research has confirmed that woodland expansion and rehabilitation is discouraged by low current timber prices combined with the strength of the pound, poor marketing and lack of cooperation between timber producers, exclusive purchasing and distribution strategies of the major timber merchants, lack of a premium for good quality local products, ageing and labour intensive processing plant, and the need to transport high bulk/low value timber products over long distances. An evaluation of woodland creation under the WGS and FWPS conducted fir DEFRA/FC has also pointed to the ways in which grants tend to encourage new planting but then woodlands tend to be undermanaged, leading ultimately to reduced yields and higher extraction costs.

4.4.3 It is apparent that current rates of harvesting are well below the level of available timber and, although accelerated felling at a later date could make up this shortfall, this would have implications for processing as most sawmills are equipped to handle round wood and small diameter saw logs, and the production of larger diameter timber will require more sophisticated handling equipment and will only be feasible at sawmills that have invested in new plant.

4.4.4 In a similar vein, the Forest Industry Businesses survey (FC/FIA, Aug 2000) identified a number of challenges/barriers experienced by respondents, principally: increasing costs (14.1% of respondents); technical regulations (11.3%); finding time to investigate new business opportunities (10.5%); falling profitability (10.4%); and recruiting reliable qualified employees (9.6%). The top five factors that businesses felt would be most beneficial to their profitability comprised reduced fuels/transport costs, increased domestic roundwood prices, an increase in imported timber prices, more generous woodland grants, and the emergence of new markets for roundwoods. Problems perceived by users of small roundwood included a fragmented wood supply, the discontinuous nature of the supply, shortage of skilled cutters, access into woods, and environmental difficulties.

4.4.5 Our own survey reinforced the perception of a similar set of challenges to future business development. These included:

- the need for more retailers to display local products;
- low profitability of timber industry, preventing investment in more local mills and better transport links with mills to the west;
- insufficient Government support (national and local) for renewable energy and waste timber recycling;
- grant aid that was presently seen as being poorly advertised, bureaucratic, unfairly skewed towards parts of the Region (EU programmes), and requiring unrealistic levels of match funding;
- cheap imports from Eastern Europe;
- lack of overall marketing strategy to raise awareness of and demand for local timber;
- economic pressures over-ride opportunities for environmentally sensitive management;

- lack of outlets for low grade timber;
- obstructive attitudes from landowners where commercial activities might interfere with sporting interests;
- mistrust amongst firewood producers about getting fair prices;
- lags in the system, especially the long decision-making time in many UK companies;
- high labour costs and low timber values.

One significant constraint identified by the premier firewood producer was the declining availability of suitable small roundwood in the Region. This was attributed to changing planting practices, where a traditional 1.2m spacing was giving way to 3m spacing, resulting in a diminishing supply of thinnings which had been their mainstay of 5-30cm diameter timber. This was compounded by the dwindling availability of skilled labour for selective thinning and for the main alternative, coppicing. The loss of many small village sawmills was also leading to reduction in supplies.

4.4.6 Although skills availability was not widely perceived as a major barrier, the following points were made in relation to employment and staff development:

- depressed market prices mean that staff cannot be released for training;
- college courses were insufficiently practical;
- a reluctance to provide formal training and certification as this could lead to staff leaving to take better jobs elsewhere;
- there was a need for better follow-through after initial training from providers;
- cost of attending courses, and loss of income for self-employed people;
- finding time (this was a bigger constraint than money especially in small businesses); and
- requirements for knowledge skills (e.g. computing, marketing) as well as practical skills.

4.4.7 Given the relatively poor transport infrastructure of parts of the Region, especially relative to east-west routes, it was anticipated that a number of comments would be made about this issue. However, of the 28 responses received on this topic, 23 stated or implied that transport was not a significant constraint. Of those who expressed a view, one felt that the percentage of timber and finished products transported by rail should increase; one complained about the poor standard of road surfaces in Norfolk; one noted

the high cost of transport; one was somewhat concerned that new Health and Safety Regulations would lead to a reduction in the tonnage which could be carried in a single load; and one felt the pulp mills were too far away, and hoped that more local outlets (e.g. biomass power stations) would offer a solution. Haulage costs are very significant to the industry, though these were not often referred to as a problem. Some producers (including Forest Enterprise) do not bear haulage costs as timber is sold 'on the lorry' or at roadside. The local rail network was not suited to most local timber markets, though it was used for some transport between Brandon (Thetford Forest) and Chirk (North Wales), despite the limited railhead facilities. Although the regional road network has its limitations, it was not widely criticised. Of much greater concern was access to and within small woodlands, especially with the near-universal advent of 40-tonne lorries.

4.4.8 Health and Safety Certification seemed to be the main concern in terms of recruiting and retaining a workforce. This was reinforced by the growing unattractiveness of hard, outdoor and often poorly paid work. In addition, there were sometimes real difficulties of employing staff because of the isolation of many businesses, which then suffered from a combination of inadequate public transport, relatively low wages and long commuting.

4.4.9 A number of constructive comments were made about ways in which governmental organisations could help the regional industry, for example:

- grant schemes to focus more on direct benefits to woodlands and associated recreation, rather than support services;
- increase the appeal of jobs in the industry (grant aiding protective clothing was mentioned);
- encourage and market the use of home grown timber (one respondent felt strongly that FC should take the lead);
- better promotion of UK forestry products including timber certification;
- support to bring neglected woodland (especially coppice woodland) back into useful production;
- raise awareness and demand for local sustainable hardwood timbers and publicise the local suppliers;
- more help for micro-businesses working in small woods (often have the knowledge, but lack tools and transport);

- preferential rates of loans for plant and machinery upgrades to keep in line with EU legislation;
- transfer knowledge from timber management overseas;
- import restrictions, especially to discourage 'dumping' of underpriced Baltic and Russian timber;
- increase levels of planting; and
- develop power station/s to provide a market for low grade timber.

4.4.10 We have also received representations that the FE could provide a greater lead in organising supply contracts and achieving continuity of work across multiple landowners. Indeed, FE staff identified problems with the management of many private woods in the Region, due to lack of infrastructure. For example, it was reported that Bedfordshire County Council are finding it difficult to restore ancient woodland because of the problems in obtaining staff and contracts with the necessary knowledge, willing ness and equipment. Timber is generally only being taken out by the major players with large machinery. Smaller woodland owners cannot give the guarantees of supply, whereas FE is well placed to set up five-year contracts. Thus, there is an 'organisation problem' for small woods, particularly in relation to lack of organisation in a fragmented supply chain, and in marketing the end product.

4.5 Future Development of Public Benefits

4.5.1 Much of this report has been concerned with realising the contribution made by woodland in the quality of life of the East of England in the broadest terms. Consequently, we see major opportunities for the development of woodlands for their non-market benefits. The main prospects appear to relate to:

- recreation
- health
- biodiversity
- landscape
- tourism
- carbon sequestration
- development-led planting
- education

- energy.

4.5.2 The opportunities in these areas are sometimes fairly clear, but generally they require further research and feasibility testing. However, we feel that the most promising issues for medium-term attention are:

- targeting of peri-urban areas for new, well-designed woodlands with community involvement, and improving recreational access in existing woodlands;
- investigating the scope for more sophisticated types of woodland recreation and entertainment that may have a regional or even national catchment;
- promoting woodland walks as a healthy activity, and making appropriate 'welcome' provisions for non-traditional visitors;
- promoting changes to planting and management practices to optimise biodiversity benefits of woodlands;
- aiming to meet biodiversity action plan targets in relation to woodland habitats;
- targeting woodland grant aid in ways that reinforce existing landscape character;
- investigating the viability of woodland related tourist facilities, such as holiday cabins;
- optimising the role of woodlands in carbon sequestration through appropriate harvesting cycles;
- developing guidelines for planning authorities to demonstrate the multiple benefits of integrating woodlands into built development;
- developing close links with schools and colleges throughout the Region and exploring the possibility with Education Authorities of establishing schools within woodland settings;
- undertaking a feasibility study of the economics, logistics and technology of wood-burning power stations, at a community scale and/or as a regional facility.

Some of these benefits may be further enhanced by strategically linking 'rural' woodlands to the urban forest.

4.5.3 There is a need for these initiatives to be driven from the public sector, principally by the Forestry Commission. However, they can only be effectively realised by genuine and broadly-based collaboration amongst public, voluntary and private sectors. Devine-Wright et al (2001) have discussed how the sustainable development of a region is to increase its 'institutional thickness' so that social capital is accumulated as institutions and

businesses develop their links in mutually reinforcing ways. In essence, the authors argue, institutions should promote:

- mechanisms for innovation, coupled with changes in behaviour and perceptions, to encourage divergence from 'business as usual' scenarios;
- ways in which individuals and organisations can work together in identifying and achieving change, as sustainable development cannot be achieved by any one individual;
- a systems view of the flows of information and resources within networks of interacting individuals, organisations and institutions at a regional level.

The authors argue that regions with high levels of social capital will be more successful in achieving sustainable development than those with low levels.

4.5.4 The 'institutional thickness' that is necessary to support regional sustainable development grows from the work of a 'prime mover' in each sector, supported by gatekeepers, brokers and monitors of information (Table 9). The authors also point to the importance of 'bridges' – individuals who draw together partners and resolve difficulties. In this context, the prime mover is clearly FC, but the number of partners is potentially wide within the inclusive definition of 'woodland wealth'. Some of these partners, especially those from public and voluntary sector conservation organisations, can adopt a complementary role in woodland establishment, actually helping to deliver strategic targets. Some partners, notably local authority planners, can help ensure that woodland targets are coupled to the 'drivers' of land development and economic promotion. Other players can assist strategic targets by addressing the benefits of woodland within their own corporate plans.

Table 9 Summary of key network roles in enhancing regional sustainable development (after Devine-Wright et al, 2001)

Role	**Action**	**Effect**
Prime mover	Guide action, devise strategy and tactics, allocate resources for network actions	Instil a vision and sense of purpose amongst network actors; prevent inertia
Gatekeeper	Control access to the network	Maintain cohesion, clarify boundaries
Monitor	Measure, map and evaluate network performance	Communicate with external networks
Spokesperson	Act as a voice for entire network	Communicate with external networks
Bridge	Link disparate actors, sub-networks and networks, build partnerships, provide contacts, hold meetings, mediate conflict	Maintain cohesion and stability, improve network performance, ensure cordial inter-network relations

4.5.5 We suggest that a 'core service' is provided for private woodland owners and the timber industry throughout the whole Region to facilitate market development. In addition, a looser network of partners needs to be assembled to reflect the wider benefits of woodland, and to assist with policy targeting so that woodland contributes strongly to recreation, environment, health, education, industrial promotion and residential amenity.

4.6 Mechanisms for Delivering Enhanced Public and Private Woodland Benefits

4.6.1 Throughout the report, we have advocated a symbiotic relationship between a vibrant regional woodland/timber industry and a diverse regional woodland resource delivering multiple benefits. Given the marginal economic circumstances facing the British timber industry at present, we do not feel able to recommend major investments in the 'hard infrastructure' of the sector. However, we feel that considerable results can be obtained from creating a new 'soft infrastructure' to support individuals and organisations associated with 'woodland wealth'. In general, we believe that careful targeting of grant aid and investment, and improved levels of management, will invariably enhance woodland wealth, even in situations where the most appropriate action is 'benign neglect'. Consequently, we propose specific collaborative and supportive ventures.

4.6.2 With regard to the core woodland/timber industry, the key needs are identified as being:

- better orchestrated marketing and promotion of regional timber, especially hardwoods;
- mechanisms for building trust and reliability in local supply chains, to overcome concerns amongst smaller operators about payment and fair rates;
- securing new markets for low grade timber;
- developing a wood-burning power station or smaller community level power schemes in the Region;
- targeting grant aid at small-scale processors to improve the state of machinery;
- bringing more coppice into production, combined with developing and promoting related markets;
- finding ways of making the industry more attractive to new entrants;
- providing in-house training facilities with effective follow-up;

- promotion of quality standards and FSC accreditation;
- deer management and marketing of quality assured venison.

4.6.3 One option for the regional timber industry would be to promote an industry 'cluster'. This approach is currently very popular amongst Regional Development Agencies. Essentially, cluster development refers to a group of industries whose linkages naturally reinforce and enhance their competitive advantage. Their essential characteristic is that they are 'competitive' rather than 'co-operative', so that members can be each other's customers, competitors, partners, suppliers or R&D sources. Thus, members of a cluster do not so much collaborate in a partnership, as compete, whilst sharing the benefits of innovative ideas and practices. The main players in cluster promotion are:

- key stakeholders from industry, government and academia
- a leadership group, of people who are prepared to contribute their personal skills, knowledge and business networks
- independent facilitators who help and direct a five-stage process - engagement of key players, background preparation, a number (typically three) of carefully planned meetings, action and business plans, gaining commitment from the leadership group
- co-chairs, comprising highly respected and collaborative industry leaders whose involvement confers credibility and integrity, and
- project champions from the industries who accept the challenge of leading separate industry initiatives that evolve from the process.

Inevitably, this is a fairly intensive and resource consuming process over a 6-9 month period, and it needs to draw upon the enlightened self-interest of cluster members.

4.6.4 We would not necessarily advocate the creation of a 'forestry cluster' in the East of England, as only the much larger Scottish industry has so far justified one in view of its status as a 'driver' of the economy with potential for significant growth (The Scottish Forest Industries Cluster, undated). In this context, where the sector currently contributes £1.3bn in terms of sales to economy and supports an employment base of about 44,000, the cluster's aim is to create over 1000 jobs, stimulate an extra £100m investment, and increase market penetration from 9% to 15%. The report sees a cluster as a way of addressing traditional weaknesses relative to market penetration, inadequate knowledge of fitness of types of timber produced to industry needs, insufficient R&D, low public profile of the industry, and weaknesses in logistics and infrastructure. Current

priorities thus relate to stronger development of the cluster, in line with situations in major competitor countries, and the creation of a specialised soft infrastructure (e.g. e-commerce, training, research) and hard infrastructure (e.g. transport, sites). Whilst we do not consider the creation of a formal industry cluster to be appropriate for the East of England, several of the priorities of the Scottish Forest Industries Cluster have a clear resonance, and need to be addressed in some way.

4.6.5 Some elements of a 'cluster' approach were reflected in the activities of the Anglia Woodnet project. The project aimed to bring into management neglected and under-managed woodland by identifying products and services sought by the market, and it assisted supply chain management, procurement of wood and woodland products, market research, product development/branding/ accreditation, woodland resource assessment and deer management. AWN failed to obtain national or regional core funding, and funding was only available on a project basis. This fundamental difficulty has forced AWN to restructure radically and to suspend most activity. Should core funding become available it would be possible to expand its advisory and supportive activities once more. The work of the Greensand Trust has also been commended to us as a cost-effective means of promoting wise use of woodlands locally and facilitating co-operation amongst producer and supply chains.

4.6.6 One view expressed in respect of the East of England woodland and timber sector was that 'forums' have not been especially useful as members are reluctant to share information perceived to be confidential and they have thus remained as 'talking shops' addressing generic issues; however, the sharing of market-sensitive information was felt to be feasible, and capable of resulting in real benefits from forum participation.

4.6.7 We suggest that a core-funded networking organisation could be established to provide:

- a practical, effective service to current operators in the woodland and timber industries, to assist with co-ordination of production and supply chains;
- a strategic role in promoting the Region's timber, in ways that emphasise its quality, reliability and distinctiveness;
- a research role, investigating emerging market opportunities (which might include speculative markets such as carbon credits);

- an advocacy role, promoting the benefits of woodland to developers, health authorities, education authorities, and others.

These roles would need to be conducted in close collaboration with representative groups from the regional woodland/timber industry and from the wider constituency of organisations with an interest in the public benefits of woodland. Some of these organisations, such as conservation bodies and local authorities, are also in a position to help deliver a regional strategy, not only to support it.

4.6.8 In addition, we envisage a regional-level policy development 'collaboration' between major players in the public, voluntary and private sectors, facilitated by the Forestry Commission. This would have the role of identifying and promoting the role of woodland in contributing to regional quality of life. It would also provide a strategic steer to the Forestry Commission in directing grant aid and advice to aspects which were particularly conducive to the realisation of wider public benefits.

4.6.9 An outline 'map' of the way in which interests could be brought together in the East of England is shown in Figure 13. This illustrates how a 'core' industry cluster might be targeted by specific advisory, grant-aid and practical support, and a more strategic 'collaboration' of interest groups might review and influence the characteristics and locations of the Region's future woodlands. It is self-evident that the generation of a soft infrastructure will need to be based on an inclusive approach, reflecting a wide-ranging dialogue across the spectrum of stakeholders.

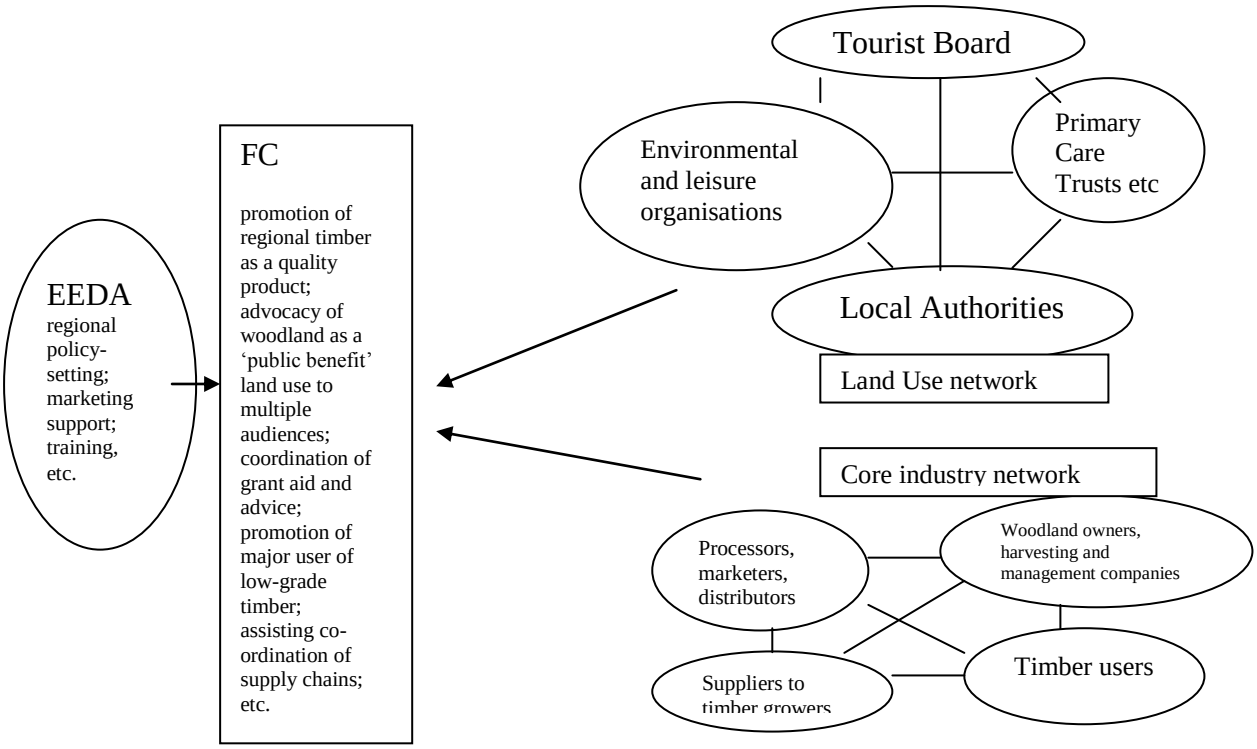


Figure 13 Possible 'Soft Infrastructure' Provision for Woodland-Related Benefits Delivery

4.7 A Balanced Scorecard

4.7.1 Having reviewed the wide-ranging nature of woodland wealth in the East of England Region, an attempt is now made to summarise this resource and identify ways in which it can be developed for the benefit of the whole Region. The method chosen is that of the 'balanced scorecard' in which, whilst attributing monetary values to assets where appropriate, importance is attached to both market and non-market benefits.

4.7.2 The essence of a 'scorecard' is to achieve a wide base of organisational commitment to future development and innovation in relation to a range of financial, customer, process and learning perspectives. This both ensures a forward-looking attitude, and a movement away from narrowly financial or customer-centred approaches, whilst nevertheless not taking undue risks. It also recognises that knowledge resources are crucial to future adaptation, and that intellectual and social capital must be developed

alongside physical and financial capital. In the words of Olve et al (2000) it strikes 'a balance between profits today and preparedness for tomorrow', and helps to change the ways in which people see and think about issues. We feel that this perspective is helpful to the production of a regional woodland strategy in the East of England as the essential need is for a shift away from a narrow focus on the timber sector, towards an industrial and institutional commitment to public benefit woodlands, whilst not losing sight of the need for a well supported core industry.

4.7.3 The essence of the balanced scorecard is illustrated in Figure 14. This uses conventional business terminology, but we suggest interpreting the four key perspectives in the following ways:

- financial perspective – the need to make realistic returns in the private and public sectors of the woodland/timber industry, including diversification into woodland-related opportunities;
- customer perspective – the consumers of all woodland products and services, from timber goods manufacturers to 'green' tourists;
- internal process perspective – processes within the Forestry Commission which move clearly towards 'sustainable development' and respond to needs of the private sector, and processes within the 'collaboration' of regional interests;
- learning and growth perspective – the accumulation of intellectual capital and skills within the broadly-construed woodland/timber sector.

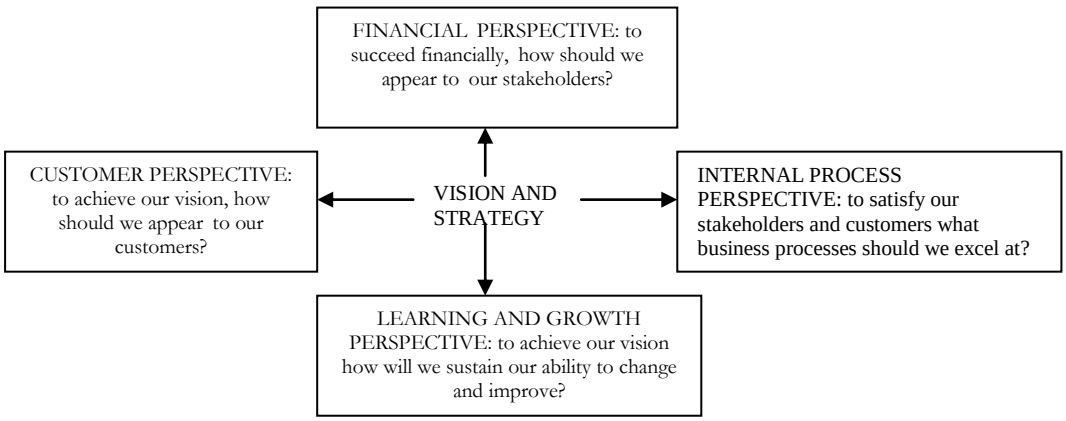


Figure 14 Principles of 'Balanced Scorecard' Development (after Olve et al, 2000)

4.7.4 This framework provides the basis for the production of a balanced scorecard. We have attempted to outline the kinds of topics worthy of attention in an illustrative scorecard in Figure 15. This only provides an initial illustrations of the issues to be addressed, but indicates the types of challenge involved in moving towards a strategic focus on public benefit woodland.

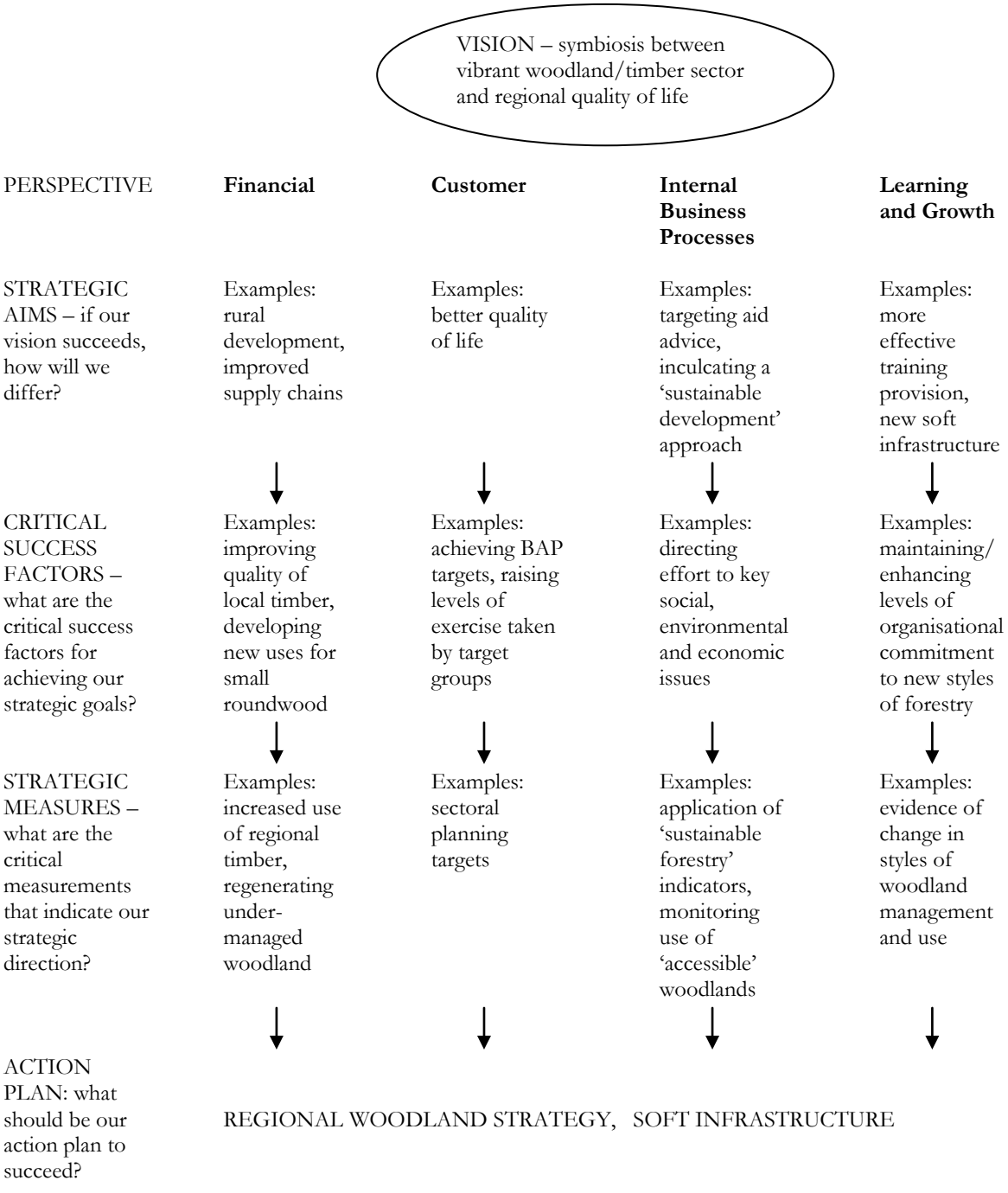


Figure 15 Outline Balanced Scorecard for East of England Woodland Wealth

4.7.5 In order to pursue the objectives of the scorecard, it is necessary to monitor progress against indicators of 'performance', though here we prefer to refer to the continuing accumulation of 'wealth'. Consequently, we offer, by way of conclusion, scorecards that set out the varied woodland wealth of the East of England, and the opportunities for its future expansion (Tables 10, 11). We provide both an audit of existing wealth, and an identification of how wealth might be developed in the future. These measures can be used to indicate ways in which wealth is being accumulated in response to policies and actions. Initially, we had included a synopsis of our valuations of different assets in these tables, but we feel that this point has been clearly made in preceding sections of the report, and that it might be misleading to monetarise each of the items. We are aware of the limitations of valuing non-market benefits and do not wish to give the impression that certain items are necessarily more valuable than others. The message of the tables is clear: woodland wealth is diverse, capable of further development, and essential to the future quality of life of the Region.

Table 10 Woodland Wealth Scorecard 1: wealth audit

CAPITAL		MANAGEMENT OF CAPITAL		
Item	Quantity	Natural	Economic	Social
total woodland	139,112ha	81.3% of resource is in woodlands over 2ha	woodland generally managed for more than one purpose; extensive undermanagement especially in private broadleaved resource	estimated 308m leisure day visits in England (1996)
public woodland	35,060ha	FE softwood resource (xx ha) mainly concentrated in Norfolk and Suffolk; hardwood resource more evenly spread	softwoods managed mainly for commercial production with multiple benefits; hardwoods increasingly managed along traditional lines	FE estate is mainly freehold with good public access
private woodland	78,037ha	up to 40% of private woodland is unmanaged	49% owners state they expect to sell timber on a commercial basis	widespread recreational value, but owners' attitudes and other factors may reduce potential
coniferous	30,699ha	Scots and Corsican pine make up 79% of region's conifers	well geared to local markets	some forests such as Thetford Chase are important recreation sites
broadleaved	83,564 + 15,414ha mixed	main species are oak (25.6%), ash (11.6%), sycamore (7.7%), birch (7.4%), beech (5.9%)	not always well matched to local markets, or to quality standards; problems of undermanagement	multiple benefits for landscape, recreation, biodiversity, etc.
ancient	uncertain	distinct regional variations, e.g. wet woodland, oak-ash, ash-hazel-field maple ; home to many BAP species	some potential for active management	biodiversity, community and other benefits
coppice	1443ha	coppice management has declined over last 100 years; some revival, especially by FE in the west of the Region	problems in promoting commercial management, but potential uses for products	many associations with local history, landscape and ecology
community forests	combined project areas of 42,450ha	Watling Chase, Thames Chase, Marston Vale – woodland cover has been developing for 10 years	intended to generate direct and indirect employment, help diversity farming enterprises and produce commercial crops	aimed at generating multiple public benefits
trees outside woodland	c.13.5m trees	tree density across Region of 710/km^2 including linear features, small groups and individual trees		Bedfordshire has system of parish tree wardens in place to engage communities in planting
infrastructure – transport network	links mainly north-south; limited rail routes and sidings facilities		no major concerns expressed over road network; more concerns about access into some smaller woodlands especially with larger lorries	
sawmills			numbers appear to be declining	some concerns about personnel recruitment
furniture and joinery			tendency to source increasing amounts of imported timber; reliant on timber merchants for sourcing	
fencing			key outlet for FE timber; relatively high employment densities	

power plants	1 (and percentages of others)		biofuel plant being built at Eye; will require 3,000ha of short rotation coppice within 50km	
equipment/ machinery manufacturers			primary reliance on suppliers outside Region	
timber merchants				
firewood		a few large operators but mostly small operations producing firewood as a by-product; total number of part-time operators difficult to estimate	provides part-time employment that is important in the local economy of many areas	
charcoal supplier		mostly small operations, one or two persons working part-time using simple kilns	demand appears to be rising for industrially produced charcoal, but not for more expensive (though higher quality) domestically produced material	
nurseries		no large scale commercial woodland nurseries in Region but significant amenity and horticultural sector		
recreation sites	approximately 70 key tourist destinations in Region significantly characterised by woodland cover	FE sites generally accessible; smaller proportion of private woods with rights of way or general access.	recreation can generate income (e.g. Thetford Forest visitor centre) but often there is no market for the extensive benefits	Ca. 50 tourist sites in region where woodland is of major significance; ca. 20 sites where woodland is of some significant; Thetford Forest one of most visited tourist attractions in Region
employment	approx. 1400 directly created jobs by woodland operations and timber processing, and approx. 1200 indirect/ induced jobs			problems with lack of skilled forest workers in many areas; small firms reluctant to invest time and resources in training
knowledge base			skills base declining as fewer people working with woodlands; some revival of coppicing but most owners cannot afford to bring woodland back into productive management	social capital of regional network of organisations and operators
business support			little support for small businesses	
skills development/ training		lack of local trainers; many firms operating as sole traders and cannot afford time and lost wages to take courses		
access – footpaths, etc		estimate access available to 25-40% of private woodlands; 87 woodlands with access within 0.5km of town edge; 359 with access 0.5-5km of town edge		

Table 11 Woodland Wealth Scorecard 2: indicators of current and potential wealth

Topic	Scope for Future Development	Role of Forestry Commission
direct forestry revenues	• need for improved practical and knowledge skills in certain areas; • need for regional identity/ quality hallmark for East of England timber; • need for improved co-ordination of supply chains and marketing	• co-ordination and promotion of skills training; • promotion of regional timber identity; • assist co-ordination of producers and suppliers
timber processing	• need for major new markets for small roundwood; • desirability of developing large-scale processing facilities closer to region	• feasibility studies of future markets and processing facilities for low grade timber and woodland waste
indirect and induced effects	• need for greater recognition of contribution to rural economy and in farm diversification • improved business support	• promotion of timber production and other woodland uses especially as ways of boosting rural economy and farm diversification
wood products	• scope for 'kitemarking' of regional timber to increase competitiveness as raw material; • improved reliability of supply chains can increase output of firewood and charcoal	• quality assurance and promotion of East of England brand; • assist co-ordination of producers and suppliers
biodiversity value	• specific actions required by Biodiversity Action Plans – increasing native woodland cover, improving traditional management, etc.	• targeting grant aid and advice
recreation values	• improved access to/ within existing private woodlands; • provision of new woodlands adjacent to urban areas; • possible scope for specialist recreation and leisure activities • preparation of recreation 'toolkit' for private woodland owners	• targeting grant aid and advice; • feasibility studies of facilities within FE woodlands
tourist/ visitor expenditure	• provision of woodland tourism facilities, e.g. cabins; • use of woodland images in regional tourism promotion	• feasibility studies of tourist facilities and entertainment events in FE woodlands
specialist recreation expenditure	• potential to promote outlets for specialist equipment; • need for studies of latent regional potential in the light of successes elsewhere in UK	• market research on scope for provision of specialist recreation facilities (e.g. all-terrain biking)
landscape value	• scope to target woodland grants to key landscape areas where woodland cover is definitive or contributory, and possibly in need of renewal	• targeting of grant aid
field sports and game	• need for centralised/ co-operative provision for meeting strict EU hygiene regulations on venison	• making specialist provisions which are available to the private sector

carbon sequestration	• scope to promote woodland as major new land use to help comply with Kyoto commitments; • need for detailed studies of rotation management to maximise carbon sequestration capacity	• contribute to policy development and refine land management practices in line with findings of 'Broadmeadow' report
health and exercise	• promotion of woodland settings for hospitals; • promotion of well-designed, accessible and welcoming woodlands close to towns, with opportunities for light exercise/ green syms; • promotion of woodlands near urban/ industrial areas to help mitigate promotion	• dialogue with regional health providers; • promotion of recreation, uer-friendliness and interpretation within accessible woodlands
local tax base	• promotion of 'development' forestry (i.e. well-designed and carefully located woodland establishment linked closely to urban expansion)	• dialogue with developers; • disseminate lessons from community forests
flood control	• need for further research to establish contribution of e.g. wet woodlands	• collate/sponsor research on role of wet/floodplain woodlands in lowland situations; • target grant aid
education	• need to promote woodlands as sites for school education and adult training; • research indicates potential benefits of woodland settings for schools	• promote educational opportunities through Forest Education Initiative; • promote training opportunities for timber and conservation industries
soils	• need for targeted grant aid to improve woodland cover in 'at risk' areas	• collate/sponsor research on role of woodlands in water pollution and soil erosion prevention in lowland situations; • target grant aid
energy	• need for development of new facilities; • need for secure contracts along the supply and end-use chain; • need for feasibility testing of alternative energy facilities • demonstration sites	• feasibility studies on wood-fired power stations at community/ regional level

APPENDIX 1 Postal Questionnaire Survey of Woodland Owners and Timber-Related Businesses in the East of England

Questionnaires were distributed to the following categories of recipients:

- landowners – 152 spread reasonably evenly across the six counties
- contractors – 21 in Bedfordshire, 33 in Cambridgeshire, 71 in Essex, 38 in Hertfordshire, 101 in Norfolk and 66 in Suffolk (i.e. 330).

Potentially a very long list of businesses could have been included, but on the basis of Yellow Pages and database entries it appeared that many of them were very small enterprises, or enterprises for whom woodland/timber was only a very small part of their activity. Our sample was therefore purposively drawn to ensure inclusion of the major players in each sector, along with businesses whose name or address indicated they were likely to be an SME rather than a sole-trader/micro-business as it was deemed these would be more likely to respond, and supply a greater breadth of information. However, the returns indicate a significant number of micro-businesses, and this mirrors other surveys which characterise the industry in this manner. Useable responses were received from 63 landowners and 74 contractors, or 41 and 22 % respectively.

Realising that detailed completion of the questionnaire could be excessively time-consuming, we asked our recipients to concentrate on questions they could answer rapidly, even if the replies were approximate. Moreover, this was a 'one size fits all' questionnaire, and some of the questions were not relevant to particular types of business. Consequently, most questionnaires were only partially completed.

The initial mailing included the following items:

1. covering letter from the Forestry Commission explaining the project;
2. full questionnaire;
3. pre-paid envelope for return of completed questionnaire.

The initial response was rather disappointing and may well reflect 'questionnaire fatigue', so, after approximately two weeks, a reminder mailing was sent out, comprising:

1. a covering letter from the Countryside and Community Research Unit;
2. an abridged version of the questionnaire; and
3. a pre-paid envelope for return of the completed questionnaire.

An abridged version was sent out for the second mailshot to improve response rates and to concentrate on the more essential pieces of information. It appeared from the initial returns that some respondents were finding the questions too difficult or marginal to their enterprise, and the revised questionnaire improved the response rate considerably.

Although, as noted, questionnaire fatigue meant that we had to mail a second, abbreviated questionnaire to focus on the most important issues, for simplicity only the full questionnaire is reproduced here.

WOODLAND WEALTH APPRAISAL FOR THE EAST OF ENGLAND

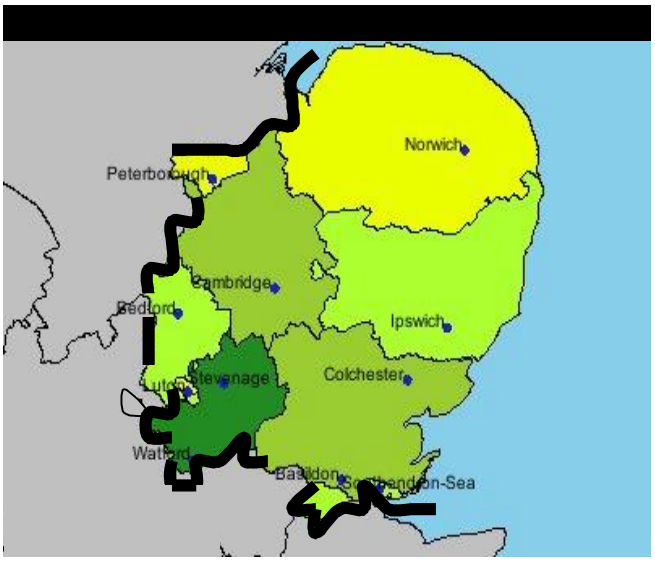
QUESTIONNAIRE

A Research Project being undertaken by the Countryside and Community Research Unit, University of Gloucestershire on behalf of the Forestry Commission (East of England Conservancy)

This questionnaire is an important part of a research project which is concerned with determining the extent and nature of 'woodland wealth' in the East of England. The project aims to demonstrate the importance of the woodland sector within the Region and to form the basis of a case for future investment. We hope that you will be able to answer this questionnaire as fully as possible, so that we can assemble the strongest possible evidence for the current and potential value of the regional woodland sector. If you have any questions about this questionnaire, please do not hesitate to contact one of the research team, whose details are given on the final page.

Some of the data we are requesting from you may not be readily available, but we would prefer an estimate or 'best guess' to no information at all. Please do not spend too much time completing the questionnaire. It should not take longer than half an hour. Some of the questions may not be relevant to you, and you may skip them.

All data on individual enterprises will be held in strict confidence and responses will be analysed anonymously. Processing and retention of data will be in accordance with the Data Protection Act 1998.



The 'Region'

This questionnaire makes reference to the 'East of England Region'. This area comprises: the counties of Cambridgeshire, Bedfordshire, Norfolk, Suffolk, Essex and Hertfordshire; and the Unitary Authorities of Luton, Peterborough, Southend-on-Sea and Thurrock.

General Guidance on Completion

Reporting Period

In this survey you will be asked for employment and financial data for 2001/02.

What is the nearest 12 month period to the 2001/02 financial year for which you are able to give these details?

		mm/yy		mm/yy
Year to which figures apply:	From	__ __	To	__ __

1. POSITION IN ORGANISATION

Please state your position in the organisation on whose behalf you are responding.

…….

2. IS YOUR ORGANISATION / ARE YOU…? *(Please tick one box only. If your business comprises more than one of the following, please tick the box which represents your main business, or the 'other' category)*

A woodland owner	☐
A forestry management company / agent	☐
A forestry marketing company/ agent	☐
A nursery owner	☐
A timber processing company / agent (eg sawmill)	☐
A subcontractor to owners (eg harvesting company)	☐
A subcontractor to management/marketing companies	☐
A timber merchant	☐
A haulage company	☐
Other (please specify)	☐

_____

3. IF YOU ARE A **WOODLAND OWNER**, PLEASE ANSWER THE FOLLOWING INFORMATION ABOUT YOUR ENTERPRISE (otherwise proceed to Question 4)

What percentage of your woodland is coniferous? ……%

And what are the main coniferous species? …….

What percentage of your woodland is deciduous? ……%

And what are the main deciduous species? …….

What % of your woodland is actively managed?:
% primarily managed for commercial production _____
% primarily managed for sporting purposes _____
% unmanaged _____

Do you expect to sell timber from the woodland on a commercial basis?
Yes ☐
No ☐
Don't know ☐

4. IF YOU ARE A **COMPANY USING TIMBER**, PLEASE ANSWER THE FOLLOWING QUESTIONS (otherwise proceed to Question 5)

What percentage of your purchases of timber-based inputs comes from within the East of England region as defined on page 1?

% _____

Do you expect this proportion to increase or decrease in the future and why?

increase ☐
decrease ☐

Please explain _____
_____
_____

5. IF YOU **CURRENTLY SELL TIMBER**, PLEASE ANSWER THE FOLLOWING QUESTION

What percentage of your timber is currently sold INSIDE the region? …….%

And what percentage is currently sold OUTSIDE the region? ……..…%

Please enter in the table underneath the purposes for which your timber is sold. In each cell, enter your answer as:
M = most or all for this purpose
S = some for this purpose
N = none for this purpose

Purpose for which sold	high grade timber (e.g. suitable for furniture)	low grade timber (e.g. suitable for fence poles, firewood)	timber waste (e.g. for pulp)	other
sold within region				
sold outside region				

6. BUSINESS CONFIDENCE (all respondents please answer this section)

We are interested in how you see the future for the timber industry in the East of England.

In general, how do you consider that the economic prospects for the timber industry in the Region will change during the next three years (tick one box only).

Prospects will improve greatly ☐
Prospects will improve slightly ☐
Prospects will remain about the same ☐
Prospects will deteriorate slightly ☐
Prospects will deteriorate sharply ☐

And, over the same period, how do you think your organisation will perform?

Profits will increase ☐

Profits will remain about the same ☐
Profits will decrease ☐

7. **EMPLOYMENT** (**all** respondents please answer this section)

Please give employment details for the 12 month period specified at the top of the second page. **Please exclude contractors and sub-contractors** (reference to sub-contracting is made in Question 8). Include working directors / proprietors / owners / self-employed and employees (those for whom you are responsible for paying wages and National Insurance contributions). This may be answered either in full-time equivalent staff, or actual full-time, part-time etc. staff.

a/ EITHER How many full time equivalent (FTE) persons do you employ?
_____

b/ OR if preferred, give details of numbers of actual employees as follows:

full time _____
part-time (less than 30hours/week) _____
short term F/T (please give estimate of weeks/year) _____
short term P/T (please give estimate of weeks/year) _____

Where do these employees live? (Please give as approximate %s)
local (within 20 miles) ____%
rural within region ____%
urban (town of 10,000+) within region ____%
outside the East of England region ____%

Please split your employment (approximate FTEs) by activity

Activity	**Employment (approximate FTEs)**
Forest establishment, including nurseries	
Forest maintenance, including road/ bridge construction or maintenance	
Harvesting/ extraction	
Coppicing	
Woodland biomass for energy	
By-products of timber harvesting	
Marketing of timber products	
Recreation, game management, wildlife and environmental work	
Haulage of timber	
Sawmilling/ timber processing	
Pulp, paper and paperboard	
Particle board and fibreboard	
Clerical, managerial, research, marketing and other processing	

Other (please specify)	

8. **OUTPUTS AND EXPENDITURE** (**all** respondents please answer this section)

We would like you to estimate the volume of timber which your organisation handles. This may be highly variable, so please provide your best estimate of the year in question, or an estimate for an 'average' year.

What volume of timber (expressed in m^3 or tonnes) does your establishment:

either **produce** _____ (m^3 / tonnes – delete as appropriate)
and/or **process** _____ (m^3 / tonnes – delete as appropriate)
and/or **transport** _____ (m^3 / tonnes – delete as appropriate)

Please estimate the annual expenditure on each of the commodities listed below, in relation to all forestry activities, e.g. new planting, restocking, natural regeneration, ground preparation, processing, manufacturing.

ITEMS	COST £
Goods and services purchased directly	
Forestry goods – include seeds, plants, timber, weedkillers, stakes, tubes, fertilisers, fencing	
Machinery, metal goods, vehicles and parts	
Fuel/oil	
Chemicals and fertilisers	
Other materials	
Other overheads – e.g. legal costs, insurance, fire protection, lease and hire charges	
Use of Contractors	
Forestry subcontractors – include road builders, harvesting, etc.	
Construction – excluding new roads, but including repair and maintenance	
Inward and outward transport – include road haulage, rail, air, sea	

For the expenditure listed in the preceding table, please indicate the location of the companies which you deal with directly. Please enter each response as: **M** = mainly or wholly; **S** = some; **N** = none.

	Local (within 20 miles)	Elsewhere in Region	Outside Region
Goods and Services Purchased			
Forestry goods - include seeds, plants, timber, etc.	___	___	___
Machinery, metal goods, vehicles and parts	___	___	___
Fuel/oil	___	___	___
Electricity, gas, water, fuel/oil, rent	___	___	___
Chemicals and fertilisers	___	___	___
Other materials	___	___	___
Use of Contractors			
Forestry subcontractors - include road builders, etc.	___	___	___
Construction - excluding new roads, including repair	___	___	___
Inward and outward transport	___	___	___

9. GENERAL QUESTIONS (**all** respondents please answer this section)

Do you have any sources of income for your business apart from income generated from sales or provision of services (e.g. grants)? Can you specify these income sources?

……
……
……
……

What are your main sources of business information and market intelligence?

……
……
……
……

Do you feel you have the full range of skills and abilities among the staff of your organisation to be able to compete effectively in your industry? If not, in which areas, in terms of skills and occupations, are there gaps in your workforce?

……
……
……
……

Is there anything preventing you from obtaining the necessary skills, either through recruiting someone or through training of existing staff? How can these problems be solved?

……
……
……
……
……

Ideally, how would you like to see your business develop over the next 5-10 years?

……
……
……
……

Is there anything you need to help your business develop in this way? Are there particular obstacles to this development?

……
……
……
……

Are there any particular issues associated with transport of timber and timber goods, such as availability of hauliers or adequacy of road/rail network?

……
……
……
……

What would you like to see governmental organisations (such as East of England Development Agency or the Forestry Commission) or trade organisations doing to aid growth in the forestry sector?

……
……
……
……
……

Very many thanks for completing this questionnaire.

Please return your completed questionnaire within 14 days of receipt in the enclosed pre-paid envelope.

If you have any further queries, please do not hesitate to contact one of the Woodland Wealth Appraisal team at:

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Swindon Road
Cheltenham
GL50 4AZ
Tel (general office): 01242 544083

or email: jpowell@glos.ac.uk pselman@glos.ac.uk

Appendix 2 Methodology for estimating timber availability

Supplied by Justin Gilbert, FC Woodland Surveys Branch

1. Introduction

This short draft report gives details on the traditional softwood forecast of availability, using the methodology used for the GB forecast (as published/described in Forestry & British Timber in April 2001).

The forecast is then extended to hardwoods. The same methodology as for the traditional softwood forecast has been used. This forecast is not usually published by the FC, as the assumptions required for the private sector are more complex, and the volume predicted as available is much less likely to be close to the volume actually supplied to the market.

The forecast was then further extended to Class 2 and 3 woodlands in the private sector. These are woodlands identified in the National Inventory as being likely to produce lesser quality material, i.e. not sawlogs.

The forecasts above dealt with stem wood to 7cm top diameter. The private sector forecast system has recently been upgraded to allow forecasts of all above-ground biomass (as will the FE system within the year). This has not been called a 'forecast of availability', as there are many factors which are involved in determining how much of the other biomass (apart from stem volume) is actually 'available'.

2. Definitions of Woodland Classes

Within the National Inventory the sampled stands are assessed for timber potential. Three main descriptions are used:

Class 1 ('Normal'):

These are fully productive stands with the potential to produce sawlogs. The FE forecasts are presumed to consist of Class 1 woodlands.

Class 2 ('Small roundwood only'):

These stands are of lower quality than Class 1, their maximum potential is small roundwood.

Class 3 ('Unproductive' - in traditional timber terms)

These stands contain material of lower potential than either of the two previous descriptions and would include ‘firewood only’ stands.

3. High Forest Class 1 (stem volume to 7cm top diameter)

a) Softwood

The published forecasts for England are based on three forecasting zones, North, Central and South. East of England region is mostly within the Central zone with only Hertfordshire falling into South zone. Taking this division into account the private sector softwood forecast was run in two parts, one for each zone and the results combined to give the overall results for the private sector in the East of England. To these figure we then added the Forest Enterprise production forecast to generate the overall wood supply outlook, 'Forecast of softwood availability'.

Charts
Forecast of Softwood Availability
Private Sector Class 1 and Forest Enterprise combined
(1) Volume by Sector
(2) Volume by Species
(3) Volume by Top-diameter Class

The private sector forecast is not a production forecast in the same sense as that for Forest Enterprise because the management of the private sector is divided amongst many owners with many different management intentions and constraints; it should therefore be regarded as a forecast of availability.

The private sector forecast is based on National Inventory data giving us the growing stock for Class 1 High Forest (regional report for 'East of England', Table 10c p.26) and prescriptions derived by a working group of the Supply and Demand Sub-committee of the Forestry Commission Advisory Panel. These prescriptions and the forecast by zone were published in Forestry & British Timber in April 2001.

Amongst these prescriptions are designations of rotation lengths which can be varied within the forecasting system by species, yield class and thinning regime. Inevitably some of the growing stock (Table 10c) will already be older than the defined rotation lengths, sometimes this has been described as 'overmature'. This volume would without further action be omitted from the forecast but this would be unrealistic. The working group decided how much of this volume 'beyond rotation age' should be included within the forecast. In the Central and South forecasting zones 35% of the 'overmature' volume was allocated within the forecast.

Adjustments were also made, based on unpublished National Inventory data, for crops that were deemed by the surveyors not to be extractable and also for deficiencies in stocking. In Central and South zones these reductions were 4% and 5% respectively.

Charts
Forecast of Softwood Availability
Private Sector Class 1
(4) Volume by Species
(5) Volume by Top-diameter Class

Softwood Production Forecast
Forest Enterprise
(6) Volume by Species
(7) Volume by Top-diameter Class

b) Hardwood

Within the data supplied by Forest Enterprise were the forecast volumes of broadleaved timber, but not differentiated by species. From the chart (8) it can be seen that the volumes forecast by Forest Enterprise are relatively small in comparison to the private sector. For this reason for the rest of this report where it relates to broadleaves it will apply to the private sector only.

Forecasting availability for broadleaves is much more involved than for conifers with the quality issues, e.g. stem defects, being of great importance. The attached forecasts are based on Table 10c and some broad prescriptions relating to yield class, thinning regime and rotation length. The volumes forecast should, because of the quality issue and other factors, be regarded as being the maximum volumes that could be theoretically available from the resource - i.e. the volumes are much less likely to be close to the actual timber supply than the softwood forecasts. For this reason none of the volume beyond rotation age has been allocated within the hardwood forecasts given below. Other constraints on production such as conservation and recreation may also reduce the volumes that can be produced as timber products.

Charts
Forecast of Hardwood Availability
Private Sector Class 1 and Forest Enterprise combined
(8) Volume by Sector

Forecast of Hardwood Availability
Private Sector Class1
(9) Volume by Species
(10) Volume by Top-diameter Class

4. High Forest Classes 2 and 3 (stem volume to 7cm top diameter)

The softwood and hardwood forecasts for the Class 2 and 3 woodlands within the private sector can be produced from National Inventory data.

The volumes contained in Classes 2 and 3 are much lower than in Class 1 as can be seen in charts (11) and (12). In the softwood forecast in particular the volumes other than in Class 1 are almost insignificant. As for the Class 1 hardwood forecast, none of the 'overmature' volume has been allocated within the forecasts for Class 2 and 3 woodlands.

Charts
Forecast of Availability
Private Sector Classes 1-3
(11) Softwood – Volume by Class
(12) Hardwood – Volume by Class

5. High Forest Classes 1-3 (total above-ground biomass)

Recently the private sector forecasting system was enhanced to produce estimates of the above ground biomass. The yield models for this are not yet fully validated and the results given below should be treated with caution; they are firstly, only indicative and secondly, very provisional.

The forecasts can be broken down to give 'stem volume' (to 7cm top-diameter), and 'other biomass volume' (which includes the volume of material in tops, branches and foliage). A table is attached showing for each timber potential class stem volume, other biomass volume and total volume; softwoods and hardwoods are shown in separate sections of the table. Charts are attached for each of the six sections of the table.

Tables
Private Sector Classes 1-3
(1) Volumes beyond Rotation Age ('overmature')
(2) Stem Volume and Other Biomass Volume
by Class and Softwood/Hardwood

Charts
Biomass Prediction by stem volume to 7cm top-diameter
and other biomass volume
(13) Softwoods – Class 1
(14) Softwoods – Class 2
(15) Softwoods – Class 3
(16) Hardwoods – Class 1
(17) Hardwoods – Class 2
(18) Hardwoods – Class 3

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