

Present opportunities for sustainable and multifunctional forest management for the development of rural areas

The principles of sustainability and multifunctionality underpin forest policy in Europe. Other principles such as the ecosystem services approach are increasingly used to explore sustainable natural resource management under conditions of multifunctionality. The enhanced contribution of European forests to rural development will come more from innovation in response to the current need to decarbonise economic activity and wider innovation than the formal application of any of these principles. This paper reviews the organising concepts of sustainability and multifunctionality and points out some critical issues in the delivery of enhanced opportunity, recognising the need for enhanced innovation to support the necessary transition to a low carbon economy and thereby better support rural development

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Introduction

This paper explores the present opportunities for sustainable and multifunctional forest management for the development of rural areas, with particular reference to Europe. It argues that the opportunities for the forest sector to contribute to sustainable rural development are perhaps greater than at any time in the last fifty years. Nonetheless, sectoral path dependencies, policy inadequacies, slow innovation processes, the absence of management of the necessary transitions and competition for land from agriculture may limit potential. These factors point to a need to create more supportive framework conditions for developments in innovation, policy and practice to unlock the potential of this most sustainable of land uses. The twin principles of sustainability and multifunction-

ality underpin European forestry, but the application of these principles varies greatly from place to place. The six principles of sustainable forest management are articulated in the work of the Ministerial Conference on the Protection of Forests in Europe (MCFPE) and provide the context for national level action by state, private and third sector forest owners. The principles draw on the fundamental tenets of sustainability based on the Brundtland definition of sustainability as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED 1987). Multifunctionality, in contrast, implies the delivery of more than one function/benefit/service from a particular land use, and, in normal European use, implies the presence of both market and non-market benefits. Forestry's positive future is framed by the major challenges as the economic forces of global market capitalism and the demographic forces of population growth combine to create an unprecedented demand

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for natural resources. Natural and man-made capital stocks are threatened by climate change; technological potential for increasing food yields appears to have stalled somewhat; and the stock of critical non-renewable natural resources is being depleted. This has created a context for an impending global crisis but also a boost for induced innovation. It is leading to significant efforts to decarbonise both production and energy systems and lifestyles. Stern (2007) has argued that climate change is the greatest negative economic externality ever to confront mankind. The pervasive but spatially variable impact of climate change, its insidious character, and the fact that it confronts head-on the established *modi operandi* of industrial and consumer activities mean that it cannot be ignored.

In the post-war period, European nations have seen unprecedented economic growth. More recently, globalisation has extended the reach of market economies and is producing a new global order with the rise of Asian economies with growth rates markedly exceeding those of western countries. Globalisation has also generated enormous stresses, arising from restructuring of economic activity, the emergent raw materials shortage, rising external costs of production and consumption and the specificities of the recent financial crisis. The pace of growth and its impacts have also promoted critical reflection on the nature and impact of contemporary material demands (Jackson, 2009) and the extent to which narrowly conceived economic metrics measure societal well-being effectively (Fitoussi, Sen and Stiglitz, 2009). Given this sombre context, and the critical opportunity it creates for renewable natural resources, the exploration of how forests can contribute to solutions is an urgent task.

Forests' contributions to development are wide ranging and can be seen in terms of contributions to both livelihoods and to 'liveability'. Livelihoods result from forests' capacities to support material wellbeing, through access both to the products derived from forests and through wages and income derived directly and indirectly from the exploitation of forests. This

is essentially the market-based dimension of forests' economic usefulness. Here, forests contribute to the most basic of human needs such as warmth and shelter. Equally, forests also contribute to creating attractive 'green infrastructure' and have important cultural and spiritual values (Schama, 1995). The term 'liveability' is used to describe the need for high quality environments as living space (Shaw et al., 2004) and forests contribute to these. Especially in more lightly forested countries, trees create a premium on living and recreational space (Slee et al., 2004). 'Liveability' can be used to describe the enhanced non-material quality of life created by the existence of trees, woods and forests (Slee, 2011). These are still economic benefits, but of a non-market character. In delivering both enhanced livelihoods and enhanced liveability, forests provide significant support for rural development.

Given the urgency of the task to decarbonise the energy system (Mackay, 2009) and the search for a 'new energy paradigm' (De la Torre Ugarte, 2005), wood ought to be a highly favoured commodity. Oil prices are two to three times higher than they were in the early part of the last decade. This ought to shift the energy mix to favour wood energy developments. The market for bio-composites ought to be enhanced too for the same reason because of the high hydrocarbon content of many alternatives. Climate change also creates scope for new afforestation to sequester carbon in cost-effective ways. In addition, avoided deforestation should benefit developing country forests through the REDD mechanism.

In spite of these apparent advantages, there are parts of Europe where under-management of the forest resource is the norm. Land abandonment from agriculture is a phenomenon in many parts of Eastern and Southern Europe, although estimating the extent is problematic (Keenleyside and Tucker 2010). Particularly on poorer quality land in remote rural areas around the Mediterranean, scrub woodland is a widespread if unmanaged form of land cover. In other places, such as South-west England, a majority of the privately owned woodland has no active management

for wood production. For all the rhetoric from bodies such as the UK Committee on Climate Change (2010), which has promoted wood energy, progress in developing woodland for fuel remains rather slow.

Concepts

The key organising concepts of the title of this paper, sustainability and multifunctionality, are convenient explanatory concepts relating to natural resource management. They are, however, distinctly different. Sustainability is a normative social construction, given particular meaning in a European forestry context through the Sustainable Forest Management Principles and their articulation into European practice by the MCPFE. Sustainability represents a socially desirable end-state, in forestry's case associated with a set of criteria and indicators that can assess progress and trends. In contrast, multifunctionality is an uncontested fact; it is a feature of certain types of natural resource the management of which generates joint products.

Sustainability has been defined by the MCPFE in relation to forests as:

“the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems.”

http://www.forest-europe.org/eng/What_we_work_for/Sustainable_Forest_Management/

This definition of sustainability necessitates a holistic view of environmental (ecological), social and economic functions, but gives no guidelines as to how trade offs between different functions might be negotiated. In practice, there is a tendency to explore direction of trend in relation to a suite of indicators that reflects the multiple dimensions of sustainability. This is the basis of the Criteria and Indicators approach to sustainable forest management, which establishes a

framework but which by-passes the awkward questions about trade-offs.

According to the OECD (2008), the key elements of multifunctionality are the existence of multiple commodity and non-commodity outputs jointly produced by land use—and the fact that some of the non-commodity outputs exhibit the characteristics of externalities or public goods for which markets do not exist or function poorly. Multifunctionality had already been articulated as a central feature of the European model of agriculture at an EU council meeting in 1997 (Council of the European Union, 1997) and has now become culturally embedded in the European way of looking at rural land use.

There is also need to be sensitive to new conceptual schema. At present, many policy analysts look at natural resource management using the ecosystem approach and the idea of ecosystem services (Millennium Ecosystem Assessment, 2005, Defra, 2007, UKNEA 2011). The MCPFE has also explored this approach (MCFPE, 2004) and it is also being picked up at European Commission level. It identifies four types of ecosystem service (provisioning; supporting; regulating and cultural). It builds on the idea of multifunctionality but, at the same time, constitutes a subtle step away from an exclusively economic perspective towards more ecocentric thinking. Yet, in its recent use in the UK Ecosystem Assessment, the economic value of ecosystem services is still very much to the fore. In the case of forestry, the multiple ecosystem services are often manifested in high levels of provision of supporting or regulating services.

A further reconfiguration of old concepts is found in the idea of payments for ecosystem services (PES), built around the design of mechanisms which reward the provider of public goods. Public policy measures, especially in the farm sector, have often been the principal arena of PES. The concept has been explored by the OECD (2005) and, given tight public sector budgets, the scope for private and voluntary PES schemes in forestry looks attractive.

Behind these concepts there are some fundamental

organising concepts that should not be neglected and which may be especially important in the case of forestry. There are two critical connected concepts that need to be recognised. The first is the concept of a public good. The second is the idea of internalising externalities. Public goods are defined as non-rival, non-excludable goods/services. Many of what are now routinely described as supporting and regulating services in the new ecosystem services terminology are public goods or have at least some of the attributes of public goods. For example, flood control or protection forest functions, carbon storage, biodiversity protection and landscape services are all examples of the multifunctional goods and services provided by forests with some public good characteristics.

The idea of internalising externalities arises from the realisation, articulated by Mantau et al. (2001), that market opportunities often depend on institutional innovation. So, rather than looking for market failure, institutional innovation should be sought to create that market. Slee (1995) had argued somewhat earlier that there is scope for indirect marketisation of some public goods. Although no-one has to pay for access to the iconic pine forests of Eastern Scotland because of Scottish access laws, the landowner can (and in one case does) charge a fee for parking a car in the vicinity of those iconic views. There may be many different forms of secondary marketisation, and these merge almost imperceptibly with conventional enterprise diversification into normal market-based activities by forest owners. The attribution of value to forests may be problematic if the forests sit in a wider range of land uses with positive externalities.

Issues in the development of new rural development possibilities

A number of issues stand in the way of realising the opportunities that forestry could contribute to sustainable rural development. At a practical level, these include characteristics of the owner and the resource. At a theoretical level, the ability to generate spatially ex-

plicit benefit measurements with respect to public goods is problematic. The scope for realising new benefits by redefining property rights and the challenge of trying to optimise the multifunctional outputs of forests, especially the trade offs with regard to global, national and local benefits comprise further challenges. Finally, multifunctionality opens up forestry to a range of new policy arenas, creating complexity and uncertainty.

Forest owners may have rather specific views about what they want from their forests. As landowners, they have rights to act, subject to various laws and regulations. Their preferences may not coincide with what is socially and economically optimal. In parts of the UK, woodland is used widely for sport shooting, which is often not marketed formally, but represents a form of landowner/manager recreation. Such forest landowners tend not to want to manage their forest for timber production or woodfuel. Decisions are not driven by any profit maximising motive but by social customs and preferences which may not optimise development outcomes (Urquhart et al. 2009). In other parts of Europe, there are evident tensions between the now-urban-based owners of farm forests and the rural population.

In some parts of Europe the structure of forest ownership is inimical to the rational and sustainable use of forests. In Eastern and South-eastern Europe there are many tiny plots of restituted forest. The average size of private forest holdings in some Balkan countries is below 1 hectare. Absentee ownership is common. Sustainable management is impossible. Large industrially run forests with highly focused wood production objectives may also make multifunctional delivery difficult because of the over-riding desire to strip costs out of the wood supply chain.

Ownership structures for forests are highly varied. Italy contains some of the oldest community forests in Europe and they provide interesting examples of sustainable support for their rural communities. Some have adapted to new demands, especially tourism and generate substantial revenues therefrom. In the UK,

new charitable bodies such as the Woodland Trust have acquired woodlands. The public sector is often a major forest owner and it can manage forests multifunctionally for the public good, but the remote location of many state forests means that development opportunities are limited.

One of the great obstacles associated with public goods is the measurement of their value. The recent National Ecosystem Assessment in the UK has recognised a broad-ranging suite of public goods but has held back from valuing most of them (Valatin and Starling, 2011). A decade ago Willis et al. (2003) estimated the annual value of the public goods associated with UK forests at £1 billion. Other work has shown how the value of these public goods varies over space (Willis and Benson, 1989). The public goods and multifunctional outputs are highly significant. Benefit estimation has advanced, but few are confident about the ability to generate spatially explicit values for non-market ecosystem goods and services.

Property rights with respect to forests may seem fixed in long-settled advanced market economies, but they can be significantly renegotiated as a result of culturally constructed demand changes. An obvious example of this is the clear difference that has emerged between rights of public recreational access in different parts of the UK. Since a new law of access in Scotland in 2003, the public in Scotland can freely access forests as in the Nordic *Allemansretten* system. In contrast, English and Welsh access is limited to historic linear rights of way. Property rights can be contentious. They also vary significantly across Europe. Where exclusion can occur is contingent on property rights. It is easier to think of property rights as complex evolving institutions reformulated in the light of societal values and which in different contexts may create or negate commercial economic opportunities. Slee (1995) has noted how indirect valorisation can arise as a result of the ability to exploit views, car parking or accommodation in or near to attractive forests. A considerable impediment to rural development arises where the forest owner is unable to derive

any value from his forest property which has high public good characteristics. Given the evolutionary nature of the EU Rural Development Programme and the scope for revision of property rights, there is a range of possibilities regarding the creation of quasi-markets and the development of schemes for the Payment for Environmental Services.

Multifunctionality seems a desirable characteristic for a forest, but it is by no means impossible to end up in a multifunctional muddle which serves neither the forest owner nor rural development well. Nijnik et al. (2011) note how multifunctionality can be horizontal or vertical. But delivery requires careful management and navigation of the policy field. The transaction costs of creating and sustaining multifunctionality may be considerable and what is the optimal mix today may be sub-optimal tomorrow. The policy environment may change. Long production cycles can produce path dependencies from which it can be costly to ‘unhitch’.

The forest sector connects to a range of policies at multiple scales, from sub-national to national to international. To a degree, supra-national and sub-national policies now have greater importance. Conventional forest policy provides the foundation policies, but forest owners also now draw on a range of policies for support from energy, to climate change, to biodiversity, to health, to recreation, to rural development, to agriculture, to regional development, enterprise and innovation. Foresters must confront a multiple array of possible support and regulation with the obvious transaction costs in a complex policy maze.

Framework conditions

The development of opportunities is contingent on a combination of markets, human capacities, governance structures, and a supportive institutional milieu, including well-targeted public support. Many approaches derived from management science, regional geography and regional economics explore innovation processes. In the cluster model and many other

sectoral or regional innovation models, the public sector and research and educational institutions combine with industry in what has been termed a 'triple helix' to provide supportive framework conditions. Other researchers have advocated an innovation system model which similarly recognises the need for collaboration among a range of actors and institutions (Weiss, 2011).

One problem that confronts those exploring innovation in the forest sector is the boundaries drawn around the wood production sector. In Weiss' COST E51 action, the forestry industry included not just the wood supply chain and the actors along it, but all those directly and indirectly connected to the forest for their wellbeing. This exposes a potential tension between the search for efficiency and innovation in the wood supply chain and the move to a more multi-functional forestry linked to public goods and environmental services. Where there is a strong production forest sector, this may actually comprise a barrier rather than an opportunity to enhancing sustainable forest management and rural development (Slee 2011).

The market drivers are central, if perturbed occasionally by policy 'biases' which emerge from effective rent seeking by sectional interests. Markets will be crucial in realising new opportunities. The rising price of hydrocarbons is perhaps the most important of these in recent years, with impacts on the demand for woodfuel. When there are matching policy drivers, the scope for rapid sectoral development may arise. However, the demand for food is also rising. Inevitably there will be competition for land for food production. In Scotland, where government policy is committed to expanding the forest cover, farmers feel threatened. There is a need to research the optimal land use mix intelligently.

Rural development policy is strongly shaped by the CAP. In the future Pillar 2 may begin to better address more thoroughly issues including water quality and climate change, with the Commission asserting that 'the future CAP should contain a greener and more

equitably distributed first pillar and a second pillar focussing more on competitiveness and innovation, climate change and the environment' (CEC, 2010).

Three examples of breaking away from traditions provide illustrations of the opportunities. First, as part of COST E51, Weiss et al (2011) have indicated the possibilities of transformational change in the forest sector. In response to earlier hydrocarbon price rises in the 1970s, Austrian farmers' organisations and municipal authorities collaborated in the development of wood-fuel supply chains, including community heating schemes and combined heat and power developments. This revitalised a mature industry facing low returns and engaged the farmers as major forest owners. This example may not be repeatable everywhere, but the preconditions are by no means unique and sustainable and profitable wood energy supply chains have become well established. Second, the UK Forestry Commission has developed world class mountain biking centres. These developments began in North Wales. Within a few years of a £200,000 investment, the development was drawing in between £3 and 4 million of expenditure into the local economy. This represents between up to 100 full-time equivalent jobs in an area with high unemployment. These are figures that regional development agencies would regard with enormous envy. Mountain biking developments have subsequently been rolled out more widely. The third example is Italian and is articulated at theoretical level by Pettenella and Maso (2011). In the Borgotaro region of Northern Italy, a range of institutional actors including municipalities, forest owners, restaurateurs and tourist providers have linked together to develop forest based tourism, building on the highly valued porcini that are found in the area. Whether we are dealing with wood-based forest products or non-wood forest products and services, the case for innovation with respect to processes, products, services and markets is strong. At EU level, the case for innovation was first articulated in the Lisbon strategy and has subsequently been reinforced in the

Europe 2020 strategy for smart, sustainable growth. The assumption that because forestry is a low-tech industry it has limited potential for innovation is untenable. The breadth of products and services provided by forests creates a context ripe for innovation. However, path dependencies may limit future innovation.

Particularly where there is scope for transforming predominantly monofunctional forestry into something more multifunctional, there may be a need for new modes of governance and new policy instruments to bring the relevant stakeholders together. This is most necessary in the predominantly monofunctional forests of North America and some parts of western Europe (Galicia, Portugal, Ireland, the UK) but transformation costs may be large. Kelly and Bliss (2009) articulate a new 'healthy forests healthy communities paradigm' in the aftermath of failed industrial forestry in the US. They argue that a local example 'can point a way to restoring forest health, overcoming the jobs versus-environment debate, building community capacity, and developing a local forest restoration workforce.'

There is a growing body of work in Europe built around the idea of transition management and the need to create participatory processes involving visioning of regime changes towards more sustainable outcomes. This work has been pioneered by Kemp and Martens (2007) and Loorbach (2007). They assert that many established regimes (e.g., of energy, water management) are proving increasingly unsustainable. These sectors are the settings of open-ended complex and difficult to resolve 'wicked' problems that hinge around the breakdown of socio-technical systems. Loorbach (2007) argues that niche innovations can become a testing ground for alternative ways of addressing these challenges.

Conclusions

There is a need to explore the scope for forestry's contribution to rural development. Its achievement will be contingent on innovation but may also be framed by major policy changes for example in relation to climate change. However, the framework conditions may not always be appropriate to realise enhanced opportunities. The nature of forestry is that it is highly multifunctional and requires well-designed policy and regulation to ensure the delivery of numerous public goods. Some of these public goods are hugely important in underpinning global not just rural prosperity and sustainability. However the realisation of more positive effects is contingent on a transition in terms of governance and policy to help unlock the enormous opportunities offered by forests.

It is not inconceivable that we have adopted an overly ecocentric model of sustainable forest management. We may need to cease to see forests as objects to preserve and instead treat them as places for the delivery of an enormous raft of goods and services which create scope for new employment and for new and more sustainable products. These are examples of niches that need up-scaling in regionally sensitive ways to realise the multiple opportunities. Yet, the prospects are still hedged with uncertainties, but as we face what Sir John Beddington, the UK's chief scientist calls the threat of a 'perfect storm' the realisation of that opportunity and the rural development outcomes that it can and should engender depend on creating and nurturing the preconditions in which renewable natural resources such as forest products can assume their rightful importance as the world searches for low carbon growth.

- [1] Committee on Climate Change, (2010), *Scotland's path to a low-carbon economy*, CCC, London.
- [2] Council of the European Union, (1997), Council- Agriculture, Press Release, Brussels (19-11-1997) press 343, Nr: 12241/97, Brussels.
- [3] Defra, (2007), *An introductory guide to valuing ecosystem services*, Defra: London.
- [4] De la Torre Ugarte, D., (2005), The contribution of bioenergy to a new energy paradigm, *EuroChoices* 4, 6-11.
- [5] European Commission, (2010) The CAP towards 2020. COM(2010) 672 final.
- [6] Fitoussi, J-P., Sen, A., and Stiglitz, G., (2008), Report by the Commission on the Measurement of Economic Performance and Social Progress, Paris.
- [7] Jackson, T, (2009) *Prosperity without growth*, Earthscan, London.
- [8] Keenleyside, C. and Tucker, G. M. (2010) *Farmland Abandonment in the EU: an assessment of trends and prospects*. Report prepared for WWF, Institute for European Environmental Policy, London.
- [9] Kelly, E.C. and Bliss, J.C., (2009), Healthy Forests, Healthy Communities: an emerging paradigm for natural resource-dependent communities? *Society & Natural Resources*, 22, 519-537.
- [10] Kemp, R. and Martens, P., (2007), Sustainable development: how to manage something that is subjective and can never be achieved? *Sustainability Science, Practice and Policy* 3: 1-10.
- [11] Loorbach, D., (2007), *Transition management: new mode of governance for sustainable development* Utrecht, International Books.
- [12] MacKay, D.J.C. (2009), *Sustainable energy without the hot air*, UIT, Cambridge
- [13] Mantau, U., Merlo, M., Sekot, W. and Welcker, B., (2001), Recreational and environmental markets for forest enterprises : a new approach towards marketability of public goods. CABI Publishing, Wallingford.
- [14] MCFPE, (2004), *Sustainable forest management and the ecosystem approach*, MCFPE, Warsaw.
- [15] Millennium Ecosystem Assessment, (2005) *Ecosystems and human well-being: synthesis*. Island Press, Washington. The UK National Ecosystem Asses
- [16] Nijnik, M., Slee, B., and Pajot, G., (2011) Opportunities and challenges for terrestrial carbon offsetting and marketing, with some implications for forestry in the UK, *South-East European Forestry* (SEEFOR) in press.
- [17] OECD, (1998), Meeting of the Committee for Agriculture at Ministerial Level. Agricultural policy: the need for reform, *Discussion Paper AGR/CA/MIN(98)2*, OECD, Paris.
- [18] OECD, (2008), *Multifunctionality in agriculture, evaluating the degree of jointness, policy implications*, OECD, Paris.
- [19] Pettenella, D., and Maso, D., (2011) Networks of Small-Medium Enterprises operating in Forestry; Some theoretical concepts and empirical evidence, Ch 3 of Weiss, G., Pettenella, D., Ollonqvist, P. and Slee, B. eds. (2011), *Innovation in forestry: territorial and value chain relationships*, CABI, Wallingford.
- [20] Schama, S., (1995) *Landscape and Memory*, Harper Collins, London.
- [21] Shaw, K., (2004) Liveability in NDC Areas: Findings from six case studies, New Deal for Communities, The National Evaluation, *Research Report 22*, Sustainable Cities, The Neighbourhood Renewal Unit, London.
- [22] Slee, W, (2011), Governance, multifunctional forestry and economic literacy, *Scottish Forestry*, 65(2) 18-23.
- [23] Slee, W., Roberts, D. Evans, R. (2004), Forestry in the rural economy: a new approach to assessing the impact of forestry on rural development, *Forestry* 77 (5) 441-453.
- [24] Slee, R.W., (1995), Market-led Environmental Provision : a Case Study of the Cairngorms. In Symes D and Jansen A J Eds. *Agricultural Restructuring and Rural Change in Europe*, Agricultural University: Wageningen.
- [25] Slee, B., (2011) Innovation in forest-related territorial goods and services, Ch 8 of Weiss, G., Pettenella, D., Ollonqvist, P. and Slee, B. eds. (2011), *Innovation in forestry: territorial and value chain relationships*, CABI, Wallingford.
- [26] Stern, N (2007) *The economics of climate change: the Stern Review*. Cambridge, Cambridge University Press.
- [27] UK National Ecosystem Assessment (2011) *Synthesis of the Key Findings*. UNEP-WCMC, Cambridge, UK.
- [28] Urquhart, J., Courtney, P. and Slee, B. (2009). Exploring the relationship between private ownership and public good provision in English woodlands, *Small Scale Forestry*, 9, 1-20.
- [29] Valatin, G. and Starling, B., (2010), *Economic assessment of ecosystem services provided by UK woodlands*, The Economics Team of the UK Ecosystem Assessment, Forest Research.
- [30] Weiss, G., Pettenella, D., Ollonqvist, P. and Slee, B. eds. (2011), *Innovation in forestry: territorial and value chain relationships*, CABI, Wallingford.
- [31] Weiss, G., (2011), Theoretical approaches for the analysis of innovation processes in the forest sector, Ch 2 of Weiss, G., Pettenella, D., Ollonqvist, P. and Slee, B. eds. *Innovation in forestry: territorial and value chain relationships*, CABI, Wallingford.
- [32] Willis, K.G. and Benson, J., (1989), 'Recreation value of forestry.' *Forestry* 62(2): 93-110.
- [33] Willis, K.G., et al. (2003). *The social and economic benefits of forests in Great Britain*. Centre for Research in Environmental Appraisal & Management (CREAM), University of Newcastle, UK.
- [34] World Commission on Environment and Development, (1987), *Our common future, report of the World Commission on Environment and Development*, (The Brundtland Commission), Oxford University Press, Oxford.