

# A review of forest recreation and human health in plantation forests

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## Abstract

The importance of forests, including plantations, for outdoor recreation and human health is being increasingly emphasized in numerous policy and research documents all over Europe. This paper gives a brief overview of, for example, how urban forests (and afforestation in general) can contribute to the health and well-being of the general population. In addition, the paper explores the role of forests in outdoor education and learning, and presents some ideas for the resolution of access problems. Some of the future challenges for forest planning and management are outlined. It is foreseen that more collaboration with other policy sectors is needed, and it is stressed that the many opportunities for physical exercise in (urban) forested landscapes should not be forgotten in today's political context.

## Introduction

Forests and other natural areas are important for outdoor recreation. This is increasingly being emphasized in most European policy and administrative bodies (e.g. Hörnsten 2000, Jensen and Koch 2004, Bell et al. 2009). Also, society is prepared to bear relatively high costs to cater the public need for outdoor activity. In Denmark, for example, expenditures for outdoor recreation and nature interpretation constituted 10-15% of the total expenditure of the Danish Nature Agency in the late 1990's and now, 10 years later has increased to become the main activity of the Agency. Likewise, the Danish afforestation policy aims to double the forest area over the next 100 years. In accomplishing this, consideration of public outdoor activity has been very important in planning and establishing new forests (Jensen and Koch 2004).

We are now confronted with accelerating challenges, which impact upon the present and future use of the forest for recreation. These changes include:

- Changing demography: Recreational demands change with a changing, elderly and ethically more diverse society;
- Alienated urban society: Recreational demands in urban forests and plantations increase. The same for forest schools;
- New recreational technology: Recreation planners and land owners have to deal with and service a range of new activities, which in some cases are not compatible with other recreational activities;
- Health and welfare: A fast increase in health-related activities in forests and plantations, demands cooperation between sectors.

The aim of this paper is to provide a brief overview of the current use and yields of plantation forests for forest recreation and human health. Moreover, the potential

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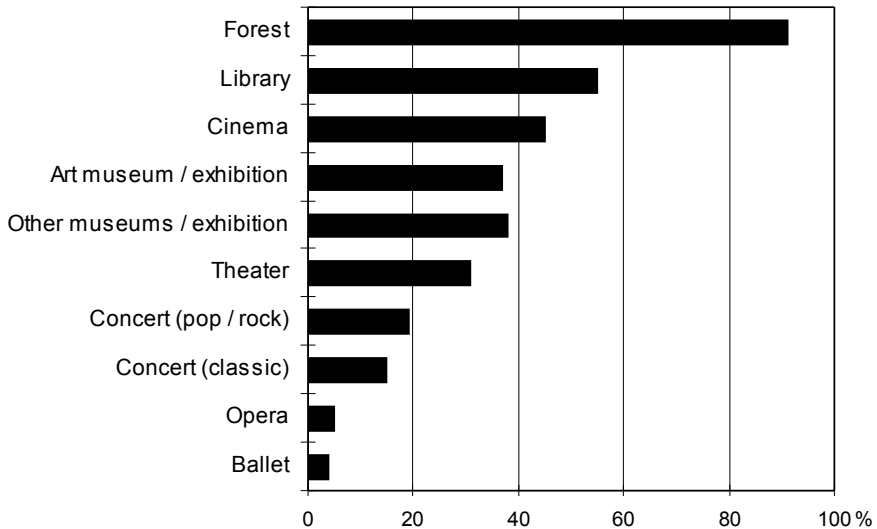
near-future trends in the demand for activities and expectations related to public use of plantation forests are evaluated. The overall trends are supplemented by a selection of cases and examples, and the paper geographically focuses on European forests at large.

### Outdoor recreation

Outdoor recreation, and specifically forest recreation has been an important leisure activity for over a century, but with significant changes in terms of transportation, societal movements, choice of recreational areas and which groups participate. The overall trend changes from organised outings by non-motorised or public transport over expeditions to individualised activities based on specialised equipment and private transport (Figure 1). Today, forest recreation holds the position as an important leisure activity. Surveys in Sweden and Denmark show that forest recreation comes very high on the list, with a visitor rate of approximately 90% (Jensen and Koch 2004, Fredman et al. 2008) (Figure 2). At the European scale, it is difficult to compare visitor numbers between countries, due to heterogeneous methodology (Sievänen et al. 2008, 2009), but in most European countries more than 2/3 of the population visit the forest yearly.

<i>Year</i>	<i>Development in transportation</i>	<i>Movement in society</i>	<i>Recreation area</i>	<i>Groups of participants</i>
1800	Railway system	Conservation organisations	Beach / archipelago	
	Bicycles	Tourism organisations	Mountains	Expeditions
		Skiing clubs	Forests	Organized interest groups
	Public buslines			
	Private cars	Rambling associations		Families
		Jogging movement		Special interests
2000		Equipment industry		

**Figure 1:** Outdoor recreation has changed markedly course of the last two centuries, from organised outings by non-motorised or public transport to individualised activities based on specialised equipment and private transport. Based on Kardell 1979 and Jensen 1999.



**Figure 2:** Data from Danish surveys show that Danes, when asked about which leisure activities they undertake, rank forests highest on the list. Over 90% of all Danes visit the forest at one or more occasions annually (Jensen & Koch 1997).

In Denmark, as an example, people seem to want to maintain or even increase their visitation to the forest, but research results have also revealed a change in behaviour in this respect. The main change is that to be able to manage that visitation rate in a more and more busy everyday life, the average duration of the visits has decreased (Jensen and Koch 2004). Another trend is in relation to the more traditional activities – in Sweden, as an example, wild berry picking in Swedish forests has changed significantly over the period 1977-1997. Here, a 70% decrease in the total amount of berries picked was observed (Hörnsten 2000), and the same tendency is found in Norway (Odden 2008). One probable reason for the decrease in berry picking is a decline in “traditional” Nordic forest recreation activities (such as walking in the forest, berry and mushroom picking, and cross-country skiing), where “earlier generations who were taught to appreciate these activities will be replaced by generations with a different or at least a more diversified basic attitude” (Jensen 1995). Overall, it seems that the forest has been able to hold its position as a very attractive location for leisure activities – although a number of new leisure time attractions have become available over the last decades (e.g. more television channels, computer games etc.).

### **Human health**

The literature indicates a number of positive relationships between people’s forest use and their health, e.g. reducing stress, insomnia, hypertension and consumption

of medicines, as well as improved spirit, concentration and motor function, or just a general increase of well-being. A number of public forest agencies around Europe are currently focussing on the possible use of forests as “green fitness centres”, especially in relation to obesity campaigns.

Obesity is a growing problem. For example, obesity levels have doubled in the last 10 years for six-year olds and trebled for 15-year olds in the UK and obesity costs the national economy £7 billion each year (Philips 2008). Combined with the fact that children are twice as likely to play outdoors where there is rich vegetation rather than on barren land (Philips 2008) it is evident that forests are important as combined playgrounds and health facilities for children. The trend towards using the forest as a “Green Fitness Centre” is seen in most European countries, e.g. the “Health Walk Project” from Natural England, “Hälsospåret” in Sweden, the “GetMoving Campaign” in Denmark and the fact that doctors now prescribe outdoor/nature exercise programmes for patients.

Another example is the exploitation of the benefits of therapeutic interactions forests present, where the long tradition of horticultural (garden) therapy (e.g. Stigsdotter and Grahn 2003) now extends into silvicultural therapy, with regular visits to nearby green spaces. Recent projects addressing this theme include “GreenSteps” in Norway and Sweden. There is a high need for further research in this subject, to answer e.g. what the health outcomes related to different settings (garden, forest) are, and how the results compare to clinical therapy (Nilsson et al. 2007). The need for further investigations has been acknowledged, e.g. the establishment of the IUFRO task force on Forests and Human Health (2007-2011).

In the future, we will see an increasing need for developing some plantation forests to serve the public health and welfare sector – together with all the other functions which are currently in demand from forests. There is no doubt, that many plantation forests can excellently fulfil welfare demands from society. However, one concern is how to do this without urbanising the more or less natural environment, maintaining the contrast between the forest and the urban environment – a contrast which is highly appreciated by most people.

There is a lack of concrete information on the best practice to be followed for handling such planning and management problems. One thing is certain, however: easy access and proximity to green space, including plantation forests, are very important for the public. For example, Danish research has concluded that the number of forest visits is more than halved if the distance from the home to the nearest forest is increased from 2 to 4 km (Jensen and Koch 2004). Therefore, with respect to recreation, human health and forests, existing local plantation forests and urban afforestation will play a key role.

In addition, it is worth mentioning that the forest also provides a number of health-related products, e.g. xyloitol (dental health), sitosterol (cholesterol reducer), pycnogenol (antioxidant) and HMR lignan (inhibitor of certain cancer forms) (Nilsson et al. 2007). There is currently scant information regarding the bioactive potential of products derived from European forest ecosystems.

### **Outdoor education and learning**

In recent years there has been an increased interest in using the outdoors, and in particular the natural environment, as a setting for education and learning. Forest School is a particular approach to outdoor learning, originating in Scandinavia, but now spread to numerous other countries. In the UK it has been used since the mid 1990s, and a UK review by Lovell and Roe (2009) concluded that outdoor education makes an important contribution to students' physical, personal and social education. This includes increased physical activity, and better mood and lower anger levels. The same benefits were found in a Danish research project (Mygind 2005, 2007, 2009). Moreover, Forest School has beneficial impacts on concentration, motivation and communication skills, but also provide opportunities for the improvement of physical motor skills. Finally, those children participating in Forest School developed more positive attitudes towards the forest environment. It is possible that this will have far reaching impacts, with the increased likelihood of the continued use of forests and woods in adulthood, for physical activity pursuits and to restore psychological wellbeing (Lovell and Roe 2009).

### **Access and legislation**

Throughout Europe there are laws or regulations pertaining to recreational use of forests and the regulation of public access to forests is a major issue in most countries. At the European scale, there are two main approaches towards public access: private land being inaccessible or private land being subject to a "Right of Common Access". In many countries in the Nordic and Central-European region (except France) the public has, independent of public or private ownership type, a right of free access to forested areas, but must respect the environment, and the rights of landowners and other visitors. In Scandinavia, the traditional "Right of Common Access" includes berry picking, mushroom collection and free access for recreation activities. In contrast, many other countries in the Eastern and Mediterranean regions of Europe, public forests are freely accessible, while private forests have limited access (Pröbstl et al. 2009). It appears that forest recreation has an especially strong tradition in those European countries, where the abundance of forested areas is combined with a common right of access or similar access legislation.

There is a trend towards stimulating private forest owners to open up their forests to the public and it is probably not legislation that is preventing the forest from playing a more important future role in recreation and human health. On the contrary, some new forest owners like to restrict access to their newly acquired property. These new situations and attitudes towards private ownership and access to private forest land do cause problems and seems to be a growing issue. However, there is yet no scientific data on the motive, magnitude and effect of these developments.

For the forest visitor, the access legislation can be rather complicated in some situations, for instance where local ownership status is difficult to determine, and where detailed local regulations come into play for different types of activities. Therefore, with the current demand for increased public access to forests, and a strong

diversification of forest recreation activities, it is necessary to plan for public access and recreation when designing new plantation forests.

### **Preferences for afforestation and forest management**

Afforestation is high on the agenda in a number of European countries and can create multiple societal benefits (e.g. Præstholt et al. 2002), but care is needed also when planning new afforestation projects in a traditionally open landscape (O’Leary et al. 1998). Here, we focus on three aspects of afforestation; 1) the distance to a forest from the urban dwellings; 2) forest preferences; and 3) welfare economics of afforestation.

When planning for new forests and plantations, it is important to bear in mind that from a recreational perspective, the public generally appreciate the opportunity to visit a forest nearby. Urban-fringe afforestation projects therefore play an important role in providing recreational opportunities. In Denmark for example, it was found that people who live close to a forest area (< 500 m) on average visit a forest 90 times per year, and 86% of these visits are to the local forest. When the distance exceeds 3 km to the nearest forest area, the number of visits drops to 20 or fewer times of which only half are to the local forest area (Jensen and Koch 2004). Studies from the UK and Belgium show the same trend: the closer the home is to a forest, the higher is the frequency of visits (Roovers et al. 2002, Coles and Bussey 2000). Other aspects of distance to a forest area are: 1) the cost of transportation, where people with restricted budgets have possibilities for access to forests nearby; 2) preference by user groups, where local, urban forests are considered safe and thus provide access to, for example, the elderly, children, and school groups; and 3) the opportunities for volunteer projects and partnerships, which are presently very common pursuits in the USA, but also emerging in Europe, especially in the UK.

The public attitude towards afforestation is generally very positive, especially in countries with low forest cover. However, specific landscape planning control and design guidelines are needed for different landscape types, e.g. in areas with distinct and historically open landscapes like the Irish landscape (O’Leary et al. 1998) (Figure 3). The suitability of different forest types and the preferred forest management options for each type have been examined in a number of studies (e.g. Koch and Jensen 1988, Jensen 1993, Jensen 1999, Lindhagen 1996, Gundersen and Frivold 2008). Regarding forest type, the results of a Danish study showed that both broadleaved and coniferous forests received high scores, with 90% stating that new broadleaved forests are a ‘good’ or ‘very good’ idea, and 62% stating that coniferous forests are a ‘good’ or ‘very good’ idea – even Christmas tree plantations are perceived as a relative good “forest” type in former agricultural areas (50%) (Table 1). At the European level, a review study of forest preferences across Europe (entitled: “Public Preferences for Forest Attributes: Towards a European Synthesis”), conducted by the EU-funded EFORWOOD-project, is underway.



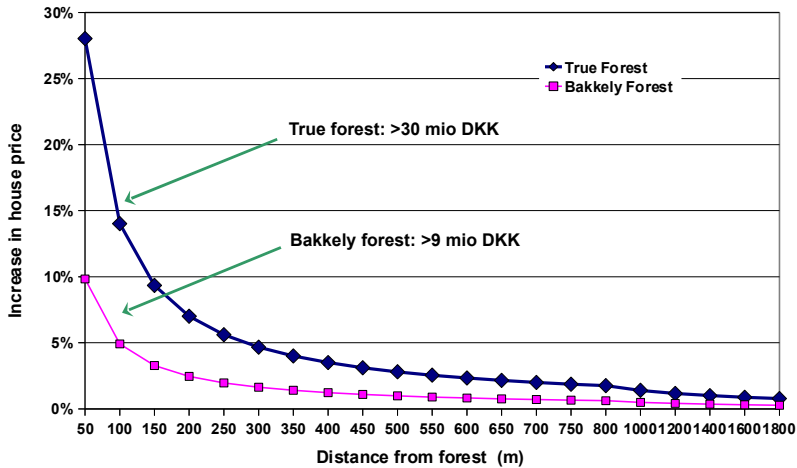
**Figure 3:** Illustration of a Danish landscape today (left) and the potential forest landscape 80-100 years from now (right), as it may develop with the present afforestation policy. (Illustration by Granby).

**Table 1:** Results of a Danish survey on the public perception of three different types of afforestation (Jensen 1998).

	Very good idea	Good idea	Don't care	Bad idea	Very bad idea
Broadleaved forest	40	50	7	3	0
Coniferous forest	13	49	17	17	4
Christmas tree plantation	9	41	22	21	7

Information is a key tool when dealing with – especially high impact or controversial – planning and management issues. The results of a number of studies have shown that the availability of relevant information for a forest can affect significantly the willingness to accept a given management practice. An example is the question of fencing: When for instance the general Danish population is asked to rank the simple statement: “a fence”, the statement is placed no. 62 among 100 different issues in relation to a particular management regime for a forest. If additional information is given: “...around some young trees” the statement moves up to no. 44 and finally, if even more information is given: “... to protect them from the deer”, the statement moves 14 places to no. 30 in the rankings (Jensen 2000).

The welfare economics of afforestation has become a focus area and it is well-documented that new forests have high economic value for the local communities, maybe more than was believed earlier. Moreover, the value of the forests will increase, for the benefit of generations to come (Anthon et al. 2005). The implicit price of proximity to the forest, measured as its impact on the price of a specific house, depends on the distance from the house to the forest edge (Figure 4). When more than 1000 m away from the forest edge, price impacts are likely to be negligible (Anthon 2003).



**Figure 4:** New forests are worth millions to local communities, maybe even more than we believed before (Anthon 2003). All prices are in Danish Kroner (100 DKK ~ €13.42; December, 2010).

### Discussion and conclusion

We are facing accelerating challenges, for example: a changing demography, with more older people, more ethnic diversity and societies that feel alienated from their surroundings and the broader environment. Here the forest sector can play an important role in relation to future generations' nature/forest knowledge and appreciation, where for example a more close collaboration with the school system would be beneficial. In Denmark, approximately 14% of the 2000 primary schools currently are active in outdoor learning/outdoor schools (Bentsen et al. 2009). In this context urban forests are especially important.

What is the future of recreation and human health in plantation forests? The current trend of increased and diversified recreational and health-related use of forests will continue and will probably become even stronger, with higher expectations from individuals, organised groups and the public at large. In addition, there is likely to be an interest in increasing the diversity of activities and other pursuits offered in forests (i.e. the “experience economy”), including the development of more health-obesity-physical exercise programmes. There might be a risk of the forests and plantations being turned into amusement parks in a green setting. This calls for strategic planning on how to handle an increasing number of different “technology driven” activities (mountain-biking, gps/geocaching, tree-climbing, off-road (motorized) skateboards etc.) and an increasing amount of “hardware” (exercise constructions, shelters, separate horseback/mountain-bike/skiing trails, health measurement equipment, art and light installations etc.). Moreover there is a need for balance among the different types of recreational and health benefits offered by forests. To many people the forest provides a valuable contrast to the urban environment – a natural, quiet and dark environment.



We suggest that forest owners and managers – in addition to “playscapes” – also start planning for more tranquil forest landscapes, such as “soundscape” (e.g. Manning et al. 2006) and “darkscapes”, where the visitor can experience the forest without getting a feeling of being located in a green fitness room or entertainment centre.

Finally, the health/welfare/physical exercise issue provides opportunities (and needs) for the forest sector to cooperate with other administrative bodies and policy sectors, e.g. social, health, culture and sport. This however, can be a challenge, not only in communication and planning but also in relation to budget negotiations – should the forest sector or the health sector pay for health-recreational facilities in forests?

## References

- Anthon, S. 2003. The value of urban afforestation: A hedonic pricing case. In *Recent Accomplishments in Applied Forest Economics Research*. Eds. Helles, F.F., Strange, N. and Wichmann, L., Kluwer Academic Publishers, Dordrecht, The Netherlands, pp 81-90.
- Anthon, S., Thorsen, B.J. and Helles, F. 2005. Urban-fringe afforestation projects and taxable hedonic values. *Urban Forestry and Urban Greening* 3: 79-91.
- Bell, S. Simpson, M., Tyrväinen, L., Sievänen, T. and Pröbstl, U. (Eds.) 2009. *European forest recreation and tourism. A handbook*. Taylor and Francis, London /New York. 237 pp.
- Bentsen, P., Mygind, E. and Randrup, T.B. 2009. Towards an understanding of udeskole: education outside the classroom in a Danish context. *Education 3-13* 37: 29-44.
- Coles, R.W. and Bussey, S.C. 2000. Urban forest landscapes in UK – progressing the social agenda. *Landscape and Urban Planning* 52: 181-188.
- Fredman, P., Karlsson, S.-E., Romild, U. and Sandell, K. (Eds.) 2008. Vilka är ute i naturen? Delresultat från en nationell enkät om friluftsliv och naturturism i Sverige. *Forskningsprogrammet Friluftsliv i förändring. Rapport nr 1*. Östersund, Sweden.
- Gundersen V. and Frivold, L. 2008. Public preferences for forest structures: A review of quantitative surveys from Finland, Norway and Sweden. *Urban Forestry and Urban Greening* 7: 241-258.
- Hörnsten, L. 2000. Outdoor recreation in Swedish forests – implication for society and forestry. *Acta Universitatis Agriculturae Sueciae. Silvestria* 169. Doctoral thesis.
- Hörnsten, L. and Fredman, P. 2000. On the distance to recreational forests in Sweden. *Landscape and Urban Planning* 51: 1-10.
- Jensen, F.S. 1993. Landscape managers' and politicians' perception of the forest and landscape preferences of the public. *Forest and Landscape Research* 1: 79-93.
- Jensen, F.S. 1995. Forest recreation. In *Multiple-use forestry in the Nordic countries*. Ed. Hytonen, M. Finnish Forest Research Institute. Vantaa, Finland. pp 245-278.
- Jensen, F.S. 1998. Friluftsliv i det åbne land 1994/95. *Forskningsserien nr. 25-1998*, Forskningscentret for Skov and Landskab, Hørsholm, Denmark. pp 151.
- Jensen, F.S. 1999. Forest recreation in Denmark from the 1970s to the 1990s. *The Research Series No. 26*, Danish Forest and Landscape Research Institute. No. 26. pp 166.
- Jensen, F.S. 2000. The effects of information on Danish forest visitors' acceptance of various management actions. *Forestry* 73: 165-172.
- Jensen, F.S. and Koch, N.E. 1997. Friluftsliv i skovene 1976/77 - 1993/94. *Forskningsserien nr. 20-1997*, Forskningscentret for Skov and Landskab, Hørsholm, Denmark. pp 215.
- Jensen, F.S. and Koch, N.E. 2004. Twenty-five years of forest recreation research in Denmark and its influence on forest policy. *Scandinavian Journal of Forest Research* 19: 93-102.
- Kardell, L. 1979. Farfars friluftsliv – om han havde något. *Sveriges Skogsvårdsförbunds Tidsskrift* 1: 6-21.

- Koch, N.E. and Jensen, F.S. 1988. Skovenes friluftsfunktion i Danmark. IV.del. Befolkningens ønsker til skovenes og det åbne lands udformning. (Forest Recreation in Denmark. Part IV: The Preferences of the Population). *Forstl. Forsøgsv. Danm.* 41 (1988): 243-516 and secondary appendix, pp 400.
- Lindhagen, A. 1996. Forest recreation in Sweden. Four case studies using quantitative and qualitative methods. *Rapport 64. 1996.* SLU, Dep. of Environmental Forestry, Uppsala, Sweden.
- Lovell, R. and Roe, J. 2009. Physical and mental health benefits of participation in forest schools. *Countryside Recreation Network* 17: 20-23.
- Manning, R., Valliere, W., Hallo, J., Newman, P., Pilcher, E., Savidge, M. and Dugan, D. 2006. From landscapes to soundscapes: Understanding and managing natural quiet in the national parks. *Proc. of the 2006 Northeastern Recreation Research Symposium.* pp. 601-606.
- Mygind, E. (Ed.) 2005. Udeundervisning i folkeskolen. Et casestudie om en naturklasse på Rødkilde Skole og virkningerne af en ugentlig obligatorisk naturdag på yngste klassetrin i perioden 2000-2003 (Outdoor teaching in the public school). *Museum Tusulanums Forlag* and Department of Exercise and Sport Sciences, Copenhagen.
- Mygind, E. 2007. A comparison between children's physical activity levels at school and learning in an outdoor environment. *Journal of Adventure Education and Outdoor Learning* 7: 161-176.
- Mygind, E. 2009. A comparison of children's statements about social relations and teaching while being taught in the classroom and in an outdoor environment. *Journal of Adventure Education and Outdoor Learning* 9(2): 151-169.
- Nilsson, K., Baines, C., and Konijnendijk, C. 2007. *Health and the Natural Outdoors.* COST Strategic Workshop, Larnaca, Cyprus, April 2007.
- Odden, A. 2008. Hva skjer med norsk friluftsliv? En studie av utviklingstrekk i norsk friluftsliv 1970-2004. *Doktoravhandlinger ved NTNU 2008:* 289. Trondheim, Norway. pp 318.
- O'Leary, T.N., McCormack, A.G. and Clinch, J.P. 1998. Tourists' perceptions of forestry in the Irish landscape – an initial study. *Forest and Landscape Research* 1: 473-490.
- Philips, H. 2008. Green infrastructure. *Countryside Recreation Network* 16: 6-7.
- Præstholm, S., Jensen, F.S., Hasler, B., Damgaard, C. and Erichsen, E. 2002. Forests improve qualities and values of local areas in Denmark. *Urban Forestry and Urban Greening* 1: 97-106.
- Pröbstl, U., Elands, B. and Wirth, V. 2009. Forest recreation and nature tourism in Europe: context, history and current situation. In *European forest recreation and tourism. A handbook.* Eds. Bell, S., Simpson, M., Tyrvalinen, L., Sievänen, T. and Pröbstl, U., Taylor and Francis, London/New York. pp 12-32.
- Roovers, P., Hermy, M. and Gulink, H. 2002. Visitor profile, perceptions and expectations in a forest from a gradient of increasing urbanisation in central Belgium. *Landscape and Urban Planning* 59: 129-145.
- Sievänen, T., Arnberger, A., Dehez, J., Grant, N., Jensen, F.S. and Skov-Petersen, H. 2008. Forest Recreation Monitoring – a European perspective. *Working Papers of the Finnish Forest Research Institute, No. 79.* pp 245.
- Sievänen, T., Arnberger, A., Dehez, J. and Jensen, F.S. 2009. Monitoring of forest recreation demand. In *European forest recreation and tourism. A handbook.* Eds. Bell, S., Simpson, M., Tyrvalinen, L., Sievänen, T. and Pröbstl, U., Taylor and Francis, London /New York. pp. 105-133.
- Stigsdotter, U. and Grahn, P. 2003. Experiencing a garden: A healing garden for people suffering from burnout diseases. *Journal of Therapeutic Horticulture* 14: 39-48.