



Human Health and Sustainable Forest Management

Edited by:

Ľudmila Marušáková and Markus Sallmannshofer



**Forest
Europe** growing life

Ministerial Conference on the Protection of Forests in Europe

Human Health and Sustainable Forest Management

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Executive summary

Why the question of human health is so critical today?

European society is currently becoming influenced by global trends and demographic changes: rapid urbanisation, globalisation, digitalisation, ageing of the population as well as a sedentary and stressful modern lifestyles. Urbanisation is often associated not only with mental stress, but also with physical threats and adverse environmental exposure, such as noise and air pollution. Nervousness, stress and burn-out as well as associated physical diseases are serious issues of the times we live in. Contemporary lifestyles bring a large reduction in occupational, domestic, and transportation-related physical activity on the one hand, combined with changes in dietary intake on the other which has led to high rates of obesity and associated health risks. Many associated physical and mental diseases, depression, obesity and diabetes are becoming severe civilisation diseases today.

Increasing numbers of urban dwellers do not have easy access and contact with forests and other natural areas that is fundamental to human health and well-being. These factors influence the quality of life and health care costs; it is apparent that these trends will continue in the future. It seems that current health care systems alone cannot solve these problems. In some countries, e.g. in Scotland, doctors now can prescribe spending time in nature to help patients with conditions from depression to diabetes. Recently, the potential of natural spaces including forests in enhancing human health and well-being has been recognised in a new way. In consequence, at a European level there is a need for new types of inter-sectorial policies and a stronger focus on the use and the creation of health-promoting environments that encourage physical activity, active transport and healthy living environments and workplaces.

Challenge or an opportunity for the forest sector?

Health and well-being benefits and other social functions of forests, such as recreation, tourism, forest education, aesthetic appreciation or spiritual experience, are today an increasingly important part of the values people derive from forests. Forests and trees supply an abundance of ecosystem services that help in creating healthy living environments: forests play an important role in mitigating floods, droughts, the effects of noise, purifying water, binding toxic substances, maintaining water quality and soil fertility, helping erosion control and protecting drinking water resources. Forests and trees have a positive impact on air quality through the deposition of pollutants to the vegetation canopy, reduction of summertime air temperatures, and a decrease in ultraviolet radiation. Moreover, ecosystems and biodiversity provide many plants used as traditional medicines and raw materials for the pharmaceutical industry.

These multitudinous societal and ecological demands and expectations put new pressures on forest resources. This requires forest managers and forest owners to search for trade-offs between maintaining timber production and the provision of other ecosystem services, such as those promoting human health and well-being. These might, on the other hand, bring new opportunities to the forest sector enabling diversification, creation of new green jobs, new types of services, new value chains, new profitable investments enhancing the competitiveness of the forest sector in the coming decades. However, these aspects should be taken into consideration and integrated into forest management planning which will represent, in the majority of cases, modification of forest management as well as improving participatory process involving various stakeholders and organisations. New financial sources of payments for ecosystem services, incentives or compensations for increased costs resulting from the provision of such benefits should be sought whenever possible.

Forest policies shall respond accordingly to these global trends, challenges and demographic changes and increase preparedness of the forest sector to meet the needs of the growing urban populations for a healthy green environment. Building on former initiatives and current experience in signatory countries and organisations, FOREST EUROPE addresses this highly topical issue, which is also in line with the UN Agenda 2030 for Sustainable Development, UN Strategic Plan for forests 2017 - 2030 and the EU Forest Strategy.

Summing up current knowledge on health benefits of forests and integration of social aspects of forests such as recreation, tourism, human health and well-being into sustainable forest management is a main focus of the study *“Human health and sustainable forest management”*. The reports are prepared by the team of authors led by the FOREST EUROPE Expert Group on Human Health and Well-being. This publication represents a contribution to the future discussion on role and importance of health benefits of forests in the context of forest landscape management. The mandate to conduct this work comes from the FOREST EUROPE Work Programme for the period 2016-2020 following the outcomes of the Seventh Ministerial Conference in Madrid implementing also the previous ministerial commitments (Oslo Ministerial Decision “European Forests 2020” and Vienna Resolution 3 “Preserving and Enhancing the Social and Cultural Dimensions of Sustainable Forest Management in Europe”).

The study aims to integrate human health aspects and other social values into forest management and to enhance their acknowledgement and implementation within the forest sector. Chapter 2 sums up research evidence and synthesises knowledge from literature linked to the health benefits of forests, namely the impact of forests on mental, physiological and physical health, and also deals with social benefits from forests. Chapter 3 provides an insight into forest management planning to investigate how forest management could cope with societal demands related to human health and well-being. Chapter 4 illustrates a vast range of concepts for utilising the beneficial effects of forests and describes approaches that focus on forests for health promotion or therapeutic interventions. Moreover, the chapter takes stock of various programmes and interventions that primarily follow objectives other than health promotion, but are broadly recognised as providing indirect health benefits as synergy effects or are integrated in other fields, such as education, recreation and tourism in forests.



What the scientific review revealed about the health benefits of forests?

The contribution of forests and other types of natural and semi-natural habitats to human health and well-being is increasingly understood within science. In the literature, five key mechanisms for the health benefits of forests have been identified and discussed within the research field:

- **Reduced exposure to noise and air pollution**
- **Stress reduction and psychological and physiological restoration**
- **Strengthening the immune system through contact with nature**
- **Increased physical activity and reduction in obesity rates**
- **Better social contacts**

There is strong evidence that forest visits have a positive impact on restoration and psychological well-being, improve mood and attention and enhance psychological stress recovery. It has also been proven that walking in natural environments produces stronger short-term cognitive benefits than walking in a residential urban environment. There is also substantial evidence of the potential benefits of contact with nature for avoiding health problems attributable to chronic stress and attention fatigue. Similarly, there is increasing evidence that visits to forest environments have positive physiological effect such as lower blood pressure and pulse rate, reduce cortisol levels and suppress sympathetic nervous activity. Even short repeated visits to a green environment may lead to positive changes in cardiovascular risk factors as a result of stress recovery.

As for social benefits, it is acknowledged that social connections enjoyed during a forest trip may encourage or enable people to repeat their activity and keep engaging with forests in the future. Socialising with friends and strengthening social relationships was found to be important in a forest based physical activity programmes. Social contacts among children during outdoor play may positively impact their socio-emotional development and help to establish social cohesion. Several studies demonstrated that, in rural natural environments, children displayed positive social behaviours. Three categories were identified in which social connections were an important part of a forest visit bringing benefits to health and well-being: (i) strengthening social relationships, (ii) developing new social relationships, and (iii) participation and community capacity building.

To sum up, scientists have examined direct effects of exposure to forests for physical health (for example, as measured by blood pressure, body mass index, recovery rates after surgery, morbidity and mortality), mental well-being and life satisfaction, and mental distress, or recovery from it. The overall messages from these studies are positive, although some have been criticised for inadequate research design and methodologies and their focus on short-term effects, and therefore more research is needed in the future.

What are the concepts and approaches of using the health benefits of forests?

Numerous interventions and programmes have been already created and developed in different European countries to encourage populations to use forests for health and well-being. Some of these interventions focus on promoting health, while others target those who have some sort of existing problem; either mental, physical, emotional or behavioural. For the purpose of this study, concepts for utilising the health benefits of forests were divided into four categories and each of these concepts embraces a broad range of various programmes, activities and interventions:

- **Forests for human health promotion and disease prevention.** This concept includes healing forests and spas, healing forest trails, regeneration and wellness paths, forests for mindfulness walks and programmes, forest bathing, trails for the soul and anti-stress programmes.
- **Forests for therapy and rehabilitation.** This concept is associated with providing forest therapies, wilderness therapy programmes, forest therapy walks, forests in rehabilitation centres and hospitals (with forest sofas, barefoot, moss and wellness paths), forests for social prescribing addressing social isolation, therapeutic handcrafts and horticultural activities.
- **Forests for education providing indirect health benefits.** This concept implies various educational outdoor programmes such as field trips, thematic excursions, observational trips, workshops, kindergartens, forest play groups, forest day nurseries, forest school, clubs and camps.
- **Forests for recreation and tourism.** This concept includes, for example, guided walks, educational trails, thematic excursions, horse trails, mountain-bike and Nordic walking trails, ski tracks, orienteering programmes, adventure parks, forest rope courses, treetop walks, houses and hotels in trees, viewpoints and hides, tree climbing, playing grounds, forest holidays, forest cabins, picnic sites with fire areas, nature trails and forest open-air museums. etc.

In the future, new opportunities associated with human health promotion, rehabilitation, therapy interventions, education, sport and tourism, may unleash the potential to boost the creation of new green jobs in the forest sector. For exploitation of these possibilities, support from new incentive systems targeting amenity values of forests will be needed. This aspect is a relevant issue also in the ongoing policy discourse regarding sustainable European forest-based bio-economy, highlighting the potential of non-wood forest products, as well as cultural/recreational forest ecosystem services. To address untapped synergies and resources, in terms of combining traditional forest goods with new types of services in new attractive “packages”, might develop a “win-win” solution for both the forest sector and society.

Recommendations for the integration of human health aspects into sustainable forest management

European and national forestry policies should address modern public health agendas and the potential role of forests in health promotion and prevention of ill-health. Forest policies shall increase the preparedness of the forest sector to meet the needs of growing urban populations for a healthy green environment.

Encouragement of public participation and inclusivity

Forest management planning (usually based on a forest inventory and evaluation of the obtained data) is a fundamental component of sustainable forest management. The forest management planning currently applied in the pan-European region is based on a long-established tradition being institutionalised and implemented at different levels in each country, especially considering economic and environmental aspects. Modern forest management planning, however, has to consider more objectives including societal demands of local communities and stakeholders. Management of forests near urban areas is in particular under pressure from citizens who feel they should have a right to influence the management of their favourite places in surrounding forests. These aspects should, therefore, be, integrated into forest management planning which represents, in the majority of cases, **a participatory process involving various stakeholders**, citizens, businesses, organisations and other interested parties in and around the forest being managed.

Public involvement and the multitude of demands and expectations inevitably generate conflicts. These conflicts put new pressures on forests and forest managers. Some of the most difficult decisions in sustainable forest management concern the trade-offs between maintaining timber production and creating areas suitable for nature-based tourism, sports and health promotion and rehabilitation. Managing forests to satisfy the expectations and needs of various interest groups (forest owners, forest managers, other stakeholders) represents a global challenge for the future. Existing planning tools and practices could be implemented more extensively and further developed, including, for example, designing more creative and customised management plans that would include a spectrum of locally relevant aspects. New tools supporting the decision-making process as well as various technological advancements and geographic information systems could be used to address complex planning tasks in the future.

Enhancement of cross-sectoral cooperation

When speaking about human health and well-being, forest owners and managers should engage with local communities and intensify cooperation with professionals from other sectors. More specifically, cooperation with experts from public healthcare systems, education systems, sport, recreation and tourism sectors will be inevitable. Therefore, more cooperation is needed between forestry experts, planners, landscape architects, public health professionals and others involved in supporting healthy living. There is a wide range of opportunities for the forest sector using forests for human health promotion but development of successful programmes and interventions is usually based on cross-sectoral cooperation.

In fact, **the most important of all challenges will be to foster the development of genuine collaborative practices**, which might improve knowledge transfer, and create synergies and shared responsibilities in providing these new types of services. Cooperation among policy makers, researchers, public and private sectors will boost innovation and research and will help to develop public/private partnerships and investments in the forest sector.



Mechanisms and funding of provision of forest ecosystem services

The concept of SFM has, on a pan-European level, made remarkable progress, based on the three pillars of sustainability covering economic, ecological and social aspects, matching public demand for all ecosystem services. Nowadays, multifunctional forest management is envisioned increasingly as a viable alternative to a simple focus on timber production, however, assessing the relative economic value of and level of demand for various forest products and services is difficult because many of them are not marketed or their markets are undeveloped. Human well-being is a central component of the ecosystem services concept. While in private forests the decision on the incorporation of ecosystem services into management goals depends on forest owners, in public forests the priority to deliver a wide range of ecosystem services is, in many countries, automatically expected.

Mechanisms and funding for the long-term provision of forest ecosystem services for social and health benefits will need to be developed and applied. Valuation of ecosystem services is used as a tool that enhances the ability of decision makers to evaluate trade-offs between alternative ecosystem management regimes. It may also help in establishing finance/incentive systems, such as payments for ecosystem services (PES). PES covers a variety of financing arrangements through which the beneficiaries of PES pay the providers for the service. It is important to search for innovative options of PES systems targeting amenity values of forests in the future. The implementation of PES schemes would also require an effective legislative and institutional framework that would facilitate and promote payments for ecosystem services, including their monitoring and flexible adaptation to the changing economy and environment. Successful implementation of PES schemes would aid the diversification of forest production and could increase acceptance of forestry by the public.

Monitoring and necessary data acquisition

From the perspective of landscape planning, one of the challenges is the monitoring of forest visitors and their recreational demands. Therefore, **schemes for monitoring of outdoor recreation and associated health benefits should be developed and carried out.** Demands for recreation in forests are changing with the demographic structure and global development. This also affects the willingness of visitors to accept different types of forest management. The monitoring of visitor numbers and identification of spatial and temporal patterns of recreational use are crucial for strategic and operational forest management planning. Moreover, indicators measuring the supply of forests and other natural areas should be developed and applied in land-use and urban planning.

Investment in research, innovation and development of new skills

At the European level, a significant step in increasing knowledge about the contribution that forests, trees and natural places make, or might make, to the health and well-being of people in Europe was made through the European Commission funded COST Action E39 and Action E33 “Forest Recreation and Nature Tourism”. **More research is, however, still needed**, for example, to study the dose-response relationship and long-term health effects of rehabilitation and recovery from illnesses. Moreover, there is still a gap in scientific knowledge that hinders the economic valuation of the health benefits of forests. There is also a need to identify the main beneficiaries and main providers of human health and well-being related services and integrate health, social and forest sectors better in this task in the future.

By integrating social and health aspects into SFM, the forest sector gains more opportunities to provide new green jobs and income for households, particularly in rural areas. Training and education needs to embrace and facilitate a comprehensive view of the multiple functions of forests to exploit the full potential of their role. **Research, innovations and corresponding new skills will be a key for the future development of the forest sector.** Forestry education should apply holistic approaches and cross-sectoral perspectives as well as cross-cutting skills (e.g. communication, conflict management, public participation in policy making, etc.). Policy instruments supporting pilot projects, research, education, monitoring and communication are needed to put current evidence-based theories into practice.

Better accessibility of forests

Health benefits are best achieved through regular visits to forests. Therefore, an easy access to and availability of health beneficial forests needs to be enhanced and secured for all European populations. In this regard, urban and peri-urban forests should be given increased attention. The improvement of the willingness of private forest owners to make their forests accessible for public use is one of the major challenges of the coming years and shall be stimulated by funding, incentives, assistance and encouragement.

Communication is key

Good communication improves public understanding of decisions related to forests and helps to minimise conflicts in the use and management of forested areas. Interaction with all stakeholders and the local community is essential for the development of any interventions and programmes encouraging populations to use forests for health and well-being. Media communication and various public awareness campaigns, realised by the forest sector in a bid to promote sustainable forest management and achieve full public recognition of the ecosystem services delivered by forests, shall become an integral and regular activity of forest enterprises and other forestry institutions.



1

Introduction

As a society we suffer from sedentary behaviour and an absence of physical activity which has been considered fundamental for avoiding problems with weight and obesity. High levels of air pollution, noise and peculiarities of the urban microclimate, as well as thermal discomfort, lead to substantial increases in illnesses and diseases, such as cardiovascular disease, diabetes and cancer. Chronic stress and burn-out syndrome have an adverse impact on human health and well-being and are associated with mental diseases and depression, which are becoming serious issues of the times in which we live. Reasons behind this are considered to be global trends and demographic changes, such as: rapid urbanisation, globalisation, digitalisation, ageing of the population as well as modern lifestyle. According to the United Nations (World Urbanisation Prospects, 2014), the proportion of the population living in urban areas is projected to rise to over 80% by 2050 in Europe which assumes a continuation of these trends in the future.

Public health care professionals warn us and call for a change of lifestyle. In some European countries, doctors now prescribe spending time in nature to help their patients. Besides nature-based tourism being popular in the past, in Europe and around the globe, new movements are arising (shinrin-yoku -"forest bathing" in Japan or friluftsliv -"open-air life" in Scandinavia), highlighting a reconnection with nature since, in our everyday life, we have distanced ourselves from the great outdoors. New trends such as "forest therapy" and "forest bathing" have arisen, advocating why getting back to nature is critically important for our well-being. New publications on how trees can help improve health and happiness through forest-based activities are spreading across Europe providing guidance and practical steps to improving health, finding happiness, and inspiration to tap into "nature's restorative power".

Since these modern trends concern forests and their ecosystem services, it is legitimate to question how the forest sector will react and how forest policies will respond to the needs of growing urban populations for a healthy green environment enabling health promotion, disease prevention and therapy. Will these societal demands be considered only a challenge generating inevitable conflicts of interests and putting new pressures on forest resources? Or do these provide opportunities for us to create new green jobs, new types of services, new value chains and new profitable investments enhancing the competitiveness of the forest sector in the coming decades?

The study "Human Health and Sustainable Forest Management" seeks to provide answers to these questions and outlines possibilities as to how the social aspects, such as recreation, tourism, human health and well-being might be integrated into sustainable forest management. In the pan-European region, Ministerial Conference on the Protection of Forests in Europe, known as FOREST EUROPE, addresses this highly topical issue and included it into its Work Programme for 2016-2020.

This publication represents a contribution to the ongoing discussion on the health benefits of forests in the context of forest landscape management and provides signatory countries, not only with research evidence and synthesises knowledge from literature linked to the health benefits of forests, but also with a wide range of concepts and approaches for utilising the beneficial effects of forests. The study aims at the integration of human health aspects and other social values into forest management and enhancement of their acknowledgement and implementation within the forest sector. It is believed that new opportunities related to human health promotion, therapy interventions, education, sport and tourism may unleash the potential to boost the creation of new green jobs in the forest sector. They might also support establishment of new funding schemes, incentive systems, and develop "win-win" solutions for both the forest sector and society.

This document is intended for a global audience, primarily for decision-makers, policy advisors and other stakeholders to assist in integrating human health aspects into forest management as a way of meeting the present and future needs of a healthy environment and the provision of forest ecosystem services. The study will also help increase awareness of the contribution that forests and forest management are making now and can make in future to improving quality of life and its fundamental role in sustainability.

Chapter 2 sums up research evidence and synthesises knowledge from literature linked to the health benefits of forests, namely the impact of forests on mental, physiological and physical health, and also deals with social benefits from forests. Chapter 3 provides an insight into forest management planning to investigate how forest management could cope with societal demands related to human health and well-being. Chapter 4 illustrates a vast range of concepts for utilising the beneficial effects of forests and describes approaches that focus on forests for health promotion or therapeutic interventions. Moreover, the chapter maps various programmes and interventions that primarily follow other objectives, but are broadly recognised as providing indirect health benefits as synergy effects or are integrated in other fields, such as education, recreation and tourism in forests.

The study was prepared by a team of authors led by the FOREST EUROPE Expert Group on Human Health and Well-being comprising 25 experts from European countries and international organisations. Knowledge gathered and good practice examples cover the 46 FOREST EUROPE signatory countries and the EU.

European forests in a nutshell

Forests cover approximately 215 million ha in Europe (without Russian Federation), accounting for 33% of total land area. An additional area of 36 million ha is classified as other wooded land. The Scandinavian countries have the largest share of forests, the smallest being within the states of Benelux and some Mediterranean countries (Figure 1).

Europe's forests expand over the majority of European bio-geographical regions, namely Atlantic, continental, boreal, alpine, Mediterranean, Pannonian, Black Sea and even Steppic (Eurostat, 2016A).

Almost 113 million ha of forests are coniferous and more than 90 million ha are broadleaved forests. The remaining area is covered by mixed forests. 165.9 million ha of these forests are intended for wood supply.

The total growing stock of forests in Europe is almost 35 billion m³, which is above the world average and still increasing (from 126 m³/ha in 1990 to 163 m³/ha in 2015) (FOREST EUROPE, 2015).

The forests serve not only for - timber production but they also provide many other very important ecosystem services which directly or indirectly contribute to human well-being, mainly provisioning, regulating and other services.

Forests in Europe are a major carbon sink. Just between 2005 and 2015, the average annual sequestration of carbon reached 719 million metric tonnes in the European region. The total amount of carbon sequestered in living biomass of European forests accounts for around 13 billion tonnes of carbon - nearly the same amount as is stored in soil and litter.

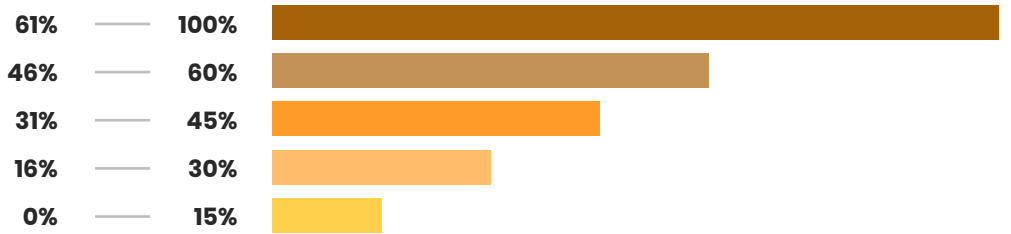
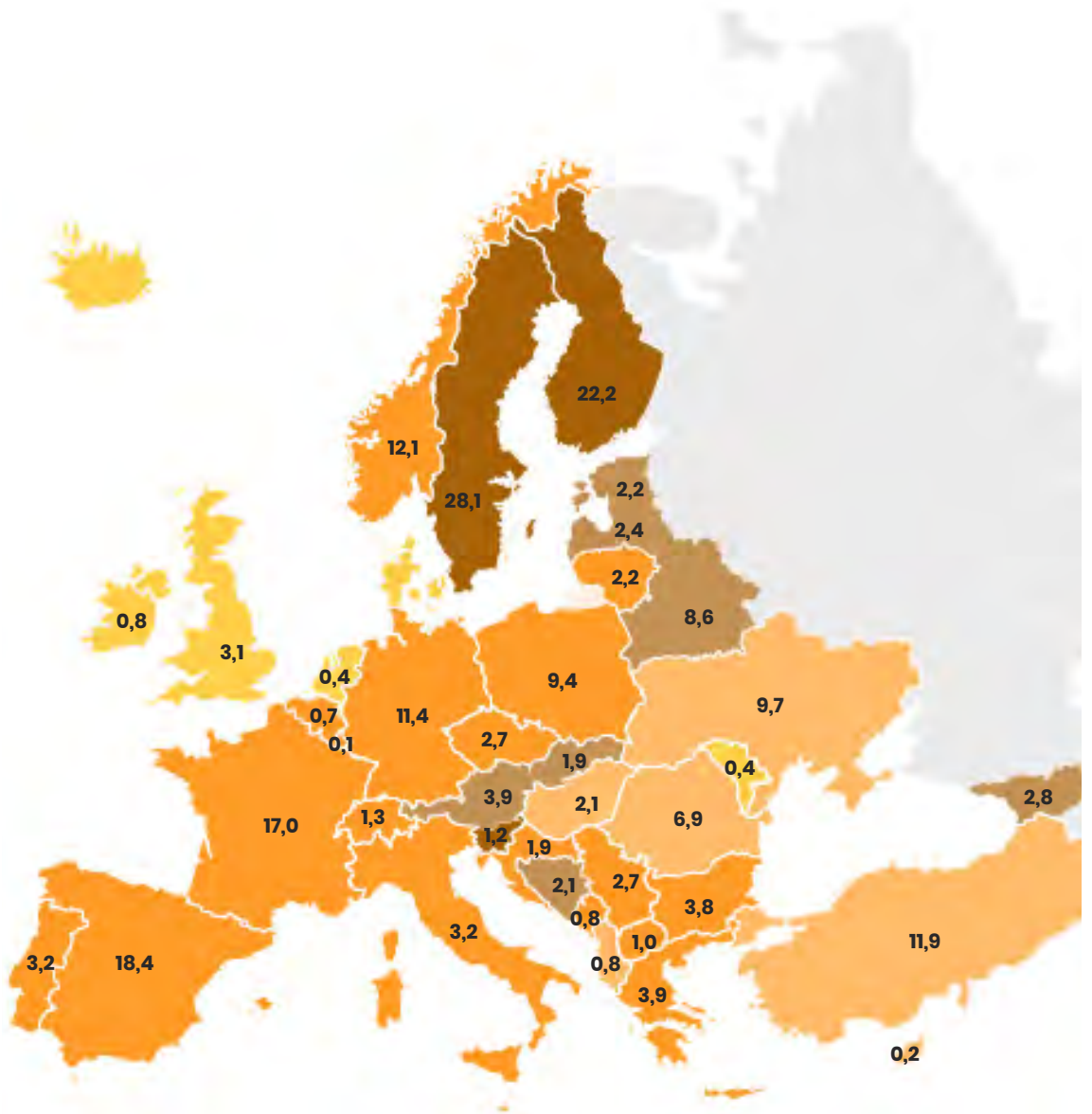


Figure 1: Forest area (million ha) and share (percentage) of land area by country, 2015.

More than 30 million ha of forest in Europe are protected to conserve biodiversity since the forests are an important habitat for many plants, fungi, lichens, birds, mammals, amphibians and invertebrates. An amount of 25 million hectares (12%) of the forest area in Europe provide protection to soils, water and other ecosystem components. A further 3.3 million hectares protect infrastructure and other natural resources.

The total value of marketed non-wood goods is almost €2.3 billion (plant products, wild game, raw honey and other food, decorative foliage, raw material for medicines, aromatic products, essential oils, colourants, hides, skins, trophies, etc.).

The total value of other marketed forest ecosystem services is around €619 million, including social services (e.g. hunting and fishing licenses, hut rentals, sporting activities), provisional services (e.g. provision of water), biospheric services (e.g. carbon sequestration), and other services (wind farm licenses, gravel extraction).

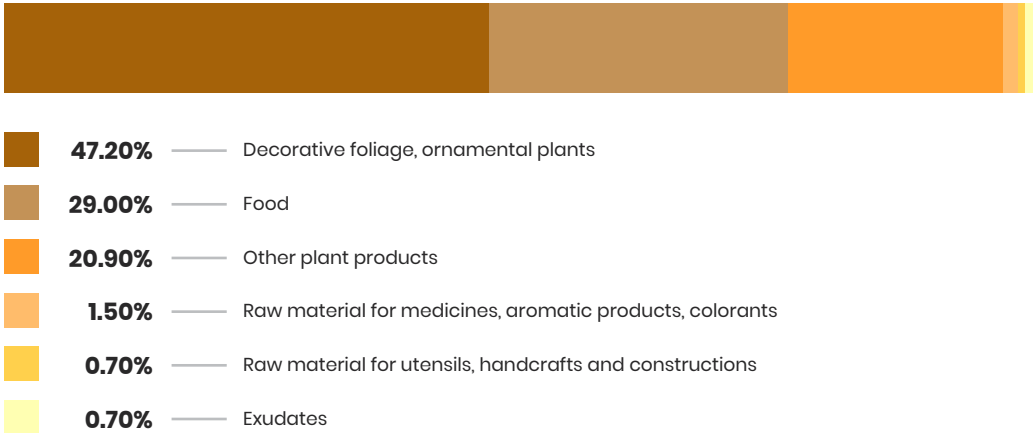
Today, forests provide a full income to 620 000 people in Europe, mostly in rural areas. The whole forest sector provides jobs to at least three million people and is the basis for several value chains in rural areas. Moreover, 90% of forests and other wooded land are reported as being available for recreation. (FOREST EUROPE, 2015). The rate of recreational use of forests is highest in Central Europe and lowest in Southern Europe. Forests have traditionally been linked to many folklore traditions, customs and events and by protecting them we are also protecting our cultural heritage, traditions and identity.



— Non-Wood Goods

Total value of marketed non-wood goods reached **2.3 billion €** in Europe in 2010, of which:

1.68 billion € (73%) came from marketed plant products



0.62 billion € (27%) came from marketed animal products



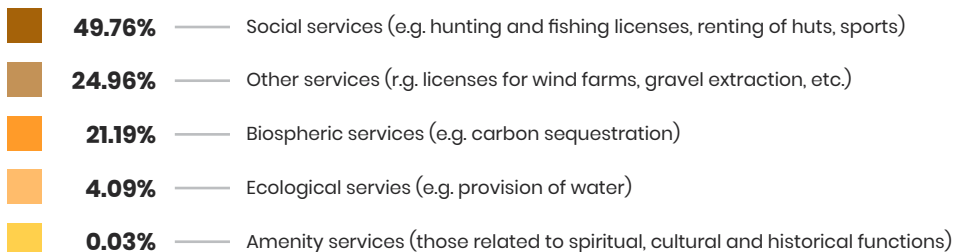
(FOREST EUROPE, 2015)



— Forest Services

Even if data on marketed services are very limited, it is clear that they represent a non-negligible income for forest owners.

Total value of marketed services was about **723 million €**



(FOREST EUROPE, 2015)

— Social well-being

Forests are a major resource for social welfare:

- **Forests protect us and our infrastructure** (roads, railways, settlements, buildings, etc.) against natural and human induced hazards (such as avalanches, floods, landslides, and rock falls).
- Forests provide us with wood for a wide range of uses and many other goods.
- **Energy from wood** resources contributes significantly to achieve the renewable energy targets.
- **Woody biomass is the most important single source of renewable energy in Europe:** wood accounts for almost as much energy as hydro, wind, solar, geothermal, municipal and industrial waste and other biomass put together.

Forests offer us countless opportunities for recreation:

At least 90%

of the forests in Europe are accessible to the public for recreational purposes.

And the benefits to health (physical and mental) provided by forests are innumerable.

(FOREST EUROPE, 2015)

2

Impacts of forests on human health and wellbeing

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2.1 Introduction

Recent changes in economic, societal, environmental and political conditions in Europe put pressure on the re-evaluation of current policies for public health promotion. Countries across Europe face a large number of health and social challenges such as obesity, mental health problems, cardio-vascular diseases, type 2 diabetes and social exclusion (e.g. WHO, 2016; ten Brink et al. 2016). Many such illnesses, named as preventable non-communicable diseases, are linked to chronic stress and other lifestyle factors, such as insufficient physical activity (e.g. Shortt et al. 2014; Nilsson et al. 2011). These problems concern a large share of European populations, affecting not only the health and well-being of citizens, but also driving up the cost of healthcare and reducing workforce productivity. Moreover, health problems often disproportionately affect socio-economically disadvantaged and vulnerable groups and add pressure to already overstretched healthcare budgets. Therefore, at the European level there is a need for new types of inter-sectorial policies and a stronger focus on the use and the creation of health-promoting environments that encourage physical activity, active transport and healthy living environments and workplaces (D'Angelo et al. 2016).

The contribution of forests and other types of nature to human health and wellbeing is increasingly understood within science. Since the 1990s, a growing number of studies on the effect of nature on human health and wellbeing have been conducted many of these have been focussed on a comparison of green (natural) and grey (urban, built up) environments.

Long before the first scientific studies, however, the idea that spending time in a nature area away from an everyday urban environment would facilitate therapeutic processes was generally accepted. Since the 1600s, people suffering from nervousness or some somatic illnesses were offered the possibility to attend a spa located in a natural environment (Hartig et al. 2011). From the 1800s on, tuberculosis was treated in sanatoria that were built in the countryside in order to isolate the ill from the healthy, to prevent the diseases from spreading, and to provide patients with clean air and pleasant views (Hartig et al. 2011). After the development of the antibiotic cure, tuberculosis sanatoria were not needed any more but other uses of natural surroundings have persisted e.g. asthma and allergy clinics, psychiatric hospitals, rehabilitation centres and detox centres are still located in a natural environment outside urban areas. In addition, the gradually growing openness to alternative or complimentary therapies currently leads to an increased use of nature-based interventions, e.g. the use of horticultural therapies or therapeutic walks in the forest.

Today, health and wellbeing benefits are an increasingly important part of the values people derive from forests. These benefits have important economic and social implications that are not yet fully understood (Jäppinen et al. 2014; Nilsson et al. 2011). In practice, health benefits can be received from various types of nature areas including urban and peri-urban forests, recreation and protected areas as well as rural forests used for multiple purposes, such as timber production. The received benefits, however, differ to some extent depending on individual preferences and needs, activities performed, duration of the visit, access to suitable spaces, as well as the size and quality of the forest areas. Long-term benefits are suggested to be received from repeated, regular use and from prolonged exposure to nature, e.g. in the living environment.

This chapter sums up research evidence linked to the health benefits of forests and their possible pathways as currently understood. In this review we have included studies focusing on forests, woodlands and large urban parks with trees contributing to human health and wellbeing. As for some topics, such as physiological studies, the number of studies is limited regarding specifically forests. We have complemented the review with studies focusing on greenspaces as these areas often include woods and trees as an important component of the space.

The following sections of this chapter synthesise knowledge from literature reviews and meta-analyses on the topic as well as individual studies published in peer reviewed journals. We have included outcomes associated with medical diagnoses as well as the general measures of perceived health or wellbeing used in psychological research. Moreover, we have included research knowledge based on preventive as well as on curative effects regarding both short and long-term effects. As the cultural perception and meaning of forests, as well as the characteristics of forests are diverse and differ in different regions of the world, we have focused on forests in Europe. In case of limited information or evidence concerning a specific theme or research approach, we have referred to studies from North America and Asia.

Definition of health

In this chapter we follow the holistic definition of health by the World Health Organization, describing health as a “state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity. [...] Attaining the highest possible level of health is a basic right of every human being, regardless of race, religion, political convictions, economic and social status” (WHO 1948). This definition has often been criticised as unrealistic but for our purpose it has some advantages: it stresses the subjective character of health as wellbeing has a strong subjective aspect and the definition implies that health is multi-dimensional. This means that a person may e.g. be physically and mentally healthy but still have poor health as he/she is socially isolated. Additionally, this definition (by referring to wellbeing rather than to the absence of symptoms) stresses the importance of prevention as well as of curative measures. One of the implications of this definition is that ill health prevention is not only delegated to professionals but is also within the responsibility of the individual.

2.2 How forests affect human health and wellbeing

Health enhancing qualities of forests are a result of multiple benefits that reinforce each other. In general, the most discussed mechanisms are environmental quality (enhanced microclimatic conditions), stress recovery, enhanced social ties/integration and physical activity (e.g. Hartig et al. 2014). It seems, however, that there are some differing views concerning what actually are the key pathways that deliver the health benefits of nature. A synthesis article by Kuo (2015), for example, suggested strengthened immune functioning to act as one of the key pathways between nature and health. In this article, four key pathways suggested were environmental conditions (sounds, phytoncides, negative air ions, mycobacterium vaccae, biodiversity, air pollution, high temperatures), physiological states (immune systems NK, blood glucose), psychological states (relaxation, vitality, attention restoration) as well as behaviours and conditions (physical activity, obesity, sleep and social ties) as the main influences on health. Moreover, Villanueva et al. (2015) has proposed a model emphasising respiratory health and resilience to heat-related illnesses, social capital and cohesion, and physical activity.

Somewhat different views of key pathways may be due to the fact that in different parts of Europe forests and other health benefits of nature have a different role in promoting health and wellbeing due to climatic differences, regional distinctions in accessibility and quality of forests as well as cultural differences. Therefore, also, the importance of individual mechanisms may vary across regions. For example, in southern Europe, mitigating hot summer temperatures through shading and improving microclimate may have higher priority than in northern parts of Europe, where being physically active and the restoration from stress in forests and other nature areas is very important.

In conclusion, five key mechanisms can be identified that are widely discussed in the research field (Figure 2). Firstly, the health effects of forests are partly caused by reduced exposure to air pollution and noise caused by traffic or other sources. A large share of green areas in a residential area typically implies less traffic, reducing exposure to air pollution and noise both indoors and outdoors near home. Vegetation may decrease pollutant levels locally by affecting dispersion and removal (e.g. Jang et al. 2015; Tyrväinen et al. 2005). Both long-term and short-term exposures to traffic-related air pollution and noise have been associated with deteriorations in cardiovascular health (Vienneau et al. 2015; Brook et al. 2010). It seems that large forest areas in particular provide health promoting environments through their ability to reduce wind speed, abate noise, improve air quality and opportunities for nature experiences and restoration.

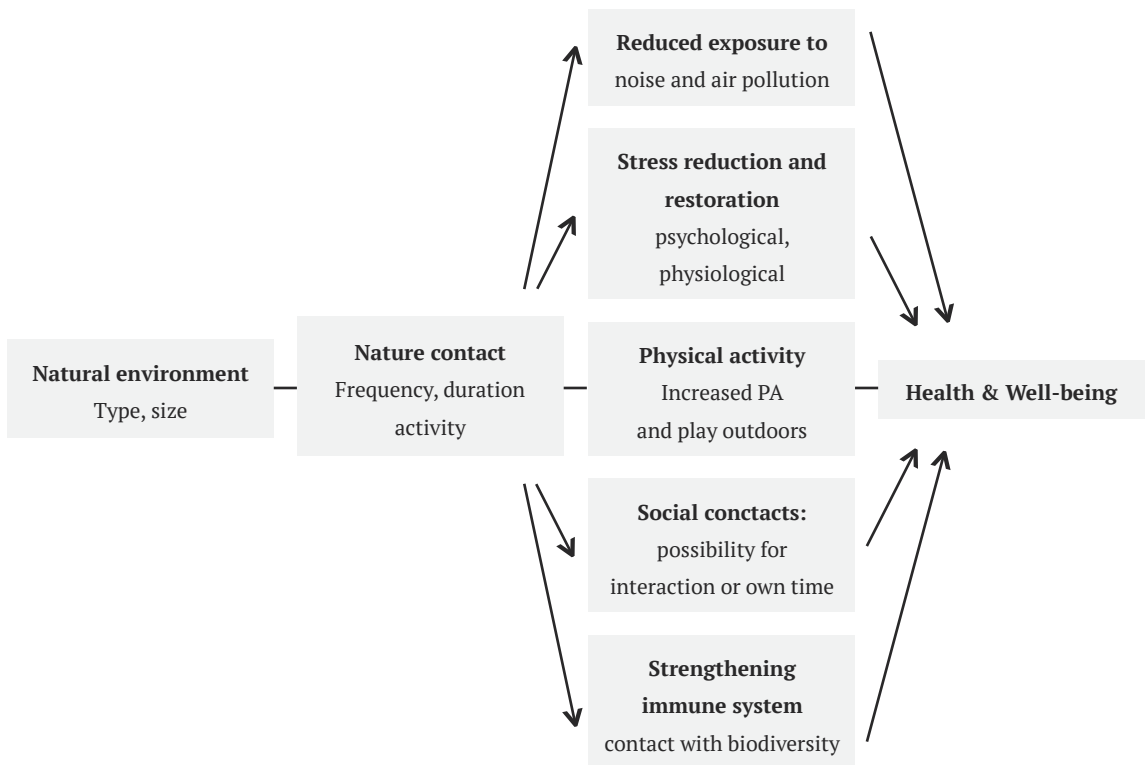


Figure 2: Suggested mechanisms for health benefits (Tyrväinen et al. 2018, adapted from Hartig et al. 2014)

Other proposed mechanisms may require both the active and passive use of nature such as viewing the landscape and are both shown to deliver health benefits. A visit to a forest has direct positive effects on health and wellbeing explained by restoration of attention as a result of escaping daily routines and the constant need of concentration (Kaplan 1995), or by innate triggering of positive emotions (Ulrich 1984). A review of experimental studies by Bowler et al. (2010) reported that short visits to parks, urban woodlands, and forests improve mood and attention, and enhance psychological stress recovery. Moreover, visits to large urban parks and forests are shown to be associated with increased feelings of restoration, vitality and positive mood (Tyrväinen et al. 2014). It is also found that walking in natural environments produces stronger short-term cognitive benefits than walking in residential urban environments (Gidlow et al. 2016). In conclusion, there is substantial evidence of the potential benefits of contact with nature for avoiding health problems traceable to chronic stress and attention fatigue (e.g. Hartig et al. 2014). Most conducted studies have, however, demonstrated short-term restorative benefits of a visit to forests or other nature areas and less is known about dose-response relationship. Long-term health benefits have been mainly analysed in epidemiological studies looking at how living in a green environment effects health at a population level.

Moreover, urban forests and forested recreation areas offer opportunities for physical activity which is a well-acknowledged preventive life-style factor against cardiovascular disease and depression (WHO 2010). Adequate physical activity (PA) is shown to reduce public health costs by reducing the risk for both physical and mental diseases, such as coronary heart disease, type 2 diabetes, depression, and breast and colon cancer (Teychenne et al. 2008; Lee et al. 2012). At a population level one possibility to promote PA is to enhance green exercise i.e. physical activity that takes place in natural environments, such as in forests. It has been proposed that green exercise has additional health benefits compared to PA indoors (Thompson et al. 2011). Studies have reported that living in proximity to green areas increases the likelihood of frequent exercise (e.g. Neuvonen et al. 2007; Richardson et al. 2013; Calogiuri and Chroni 2014; Pietilä et al. 2015). All studies, however, have not found evidence of an association between the supply of nature areas and level of physical activity (e.g. Ord et al. 2013; Hillsdon et al. 2006), which might be caused by cultural differences in using forests and other nature areas or the supply and the quality of the areas.

Moreover, forests and other nature areas have also been suggested to enhance social interactions (Maas et al. 2009a; de Vries et al. 2013), which may or may not involve exercise, but the health relevance of this has not yet been widely studied (e.g. Ruijsbroek et al. 2017; Hartig et al. 2014).

More recently, studies suggest that growing up and living in microbe-rich environments can reduce the development of allergies, a tendency to become sensitised and produce antibodies in response to ordinary exposure to allergens (Findley et al. 2016; Haahtela et al. 2013; Hanski et al. 2012; Ege et al. 2011). Researchers suggest that exposure to specific microorganisms, such as those found in green environments, may positively influence the human immune response (e.g. pollen allergy). The availability of green areas and rich biodiversity in the living environment nearby can decrease the incidence and prevalence of allergies.

2.3 Forest contribution to human health and wellbeing

2.3.1 Impact of forests on mental health

During recent years, the number of articles related to studies on the impact of greenspaces on human health and wellbeing has increased considerably. Many of these studies include experiments with before-after design combining the assessment of short-term mental health benefits and physical health outcomes. Very few studies, however, evaluate long term effects and analyse e.g. disease states or measures of mortality.

While most of the existing studies have focused on the preventive character of nature exposure and on changes in emotional states and cognitive capability, only a few studies specialise in subjects with clinical diagnoses (e.g. depression, exhaustion disorder) or symptoms. There are many more peer reviewed publications analysing the effect of greenspace than studies focusing exclusively on forests or woodlands. Therefore, we need to complement the existing evidence base on forest and woodlands with literature that covers greenspace or nature more broadly as they often include small woodlands and forests too.

Theories linked to nature and psychological health

In general, the evidence of short-term mental health benefits from contact with nature is well documented. There are two main theories that try to explain the positive impact on human health and wellbeing:

- Attention Restoration Theory (ART) - restorativeness, mainly PRS According to ART, nature readily provides restorative environments that help individuals to recover from mental fatigue and improve performance in cognitive tasks (Kaplan and Kaplan 1989). This theory states that people have two types of attention: the directed attention requiring effort which is depleted by the demands of everyday life, and the involuntary attention that is facilitated in natural environments and can help to restore the directed attention and is therefore associated with improvements in cognitive functioning (Bratman et al. 2012). The measures associated with ART are mainly the measures of restorativeness of nature and measures on cognitive capacity.
- Stress Reduction Theory (SRT)
It holds that nature contact can very rapidly evoke positive emotions for those with high levels of stress. Exposure to natural stimuli triggers a response of the parasympathetic nervous system leading to an enhanced wellbeing. The measures used in this context are physiological (e.g. cortisol) as well as mood/wellbeing measures.

Accordingly, in the studies on the effect of nature on mental health and wellbeing we can differentiate between psychological restoration and mental wellbeing /stress-reduction/mood.

Mental health measures

Similarly, to social aspects of health, the psychological aspects, such as emotional wellbeing, cannot be observed directly but have to be assessed indirectly by measuring e.g. stress hormones, the performance on standardised tests (cognitive function), or by using self-assessment scales. In order to measure the outcomes of contact with nature there are different standardised scales widely used in the studies.

Restoration

The effect of nature on restoration is often measured by the Perceived Restorativeness Scale (PRS) (e.g. Hartig et al. 1996; Berto 2005) and the Restorative Outcome Scale (ROS) (e.g. Korpela et al. 2008) and often combined with tests on cognitive performance as nature is hypothesised to have a positive impact on the regeneration of directed attention (e.g. d2-R test of attention). There is more diversity concerning the measures used for measuring mood or psychological wellbeing: some of the measures used very often are the Profile of Mood States (POMS) (McNair and Lorr 1964; including e.g. measures of tension, anxiety, depression, anger and fatigue) and the Positive and Negative Affect Schedule (PANAS) (Watson et al. 1988; positive and negative affect scale including 10 items for the positive and the negative affect, e.g. interested, strong, attentive and nervous, scared, irritable).

Another measure often used is the General Measure of Health Related Quality of Life SF-36. It measures eight dimensions (e.g. physical functioning, social functioning, vitality, mental health, role limitation because of emotional problems and general health). Another way to assess the effect of forests on humans is qualitative studies using in-depth interview or focus group techniques or observations.



Empirical evidence for the impact of forests on psychological health

The evidence of short-term mental health benefits from contact with nature in general and with forests or woodland is well documented. Forest visits are reported to have an influence on positive emotions and decrease subjective stress and negative emotions such as depression, fatigue, general anxiety, uncertainty and tension (e.g. Meyer and Kotsch 2017; O'Brien et al. 2014; Tyrväinen et al. 2014; Martens and Bauer, 2013; Morita et al. 2007) and are reported to lead to improved attention restoration (e.g. Berman et al. 2008; Berto et al. 2005; Hartig et al. 2003; Laumann et al. 2003).

Greenspaces and forest environments are perceived as having more positive effect on restoration from stress and wellbeing and stronger short-term cognitive benefits than comparable experiences in urban surroundings (e.g. Stigsdotter et al. 2016; Gidlow et al. 2016). Many studies show that visits to nature increase positive and decrease negative mood states, increase perceived restoration, vitality, and support the renewal of directed attention capacity (e.g. Tsunetsugu et al. 2013; Barton et al. 2010; Korpela et al. 2008).

Most studies of the psychological effects of nature on wellbeing have focused on comparing the recreational values of built environments and greenspaces, often through physical exercise in these environments (Li et al. 2008; Plante et al. 2007; Bodin and Hartig 2003) or by viewing pictures or videos of these environments in laboratory conditions (Ulrich et al. 1991; van den Berg et al. 2003).

Findings from correlational and cross-sectional data that inform about the long-term effects are less frequent and less consistent. Several studies have found that individuals living in urban areas with more greenspace have a reduced level of stress and improved wellbeing (e.g. White et al. 2013a; Beyer et al. 2014; Pope et al. 2015; van den Bosch et al. 2015). Other studies found similar results independently of the degree of urbanisation (Triguero-Mas et al. 2015). In some studies, the associations were more consistent for surrounding greenness than for access to greenspaces (Triguero-Mas et al. 2015).

While most of the studies are conducted on healthy adults and the results can be interpreted as proving the benefits of nature contact for ill health prevention, there are relatively few studies analysing the curative effect of nature/forest stays on patients/people with confirmed clinical diagnoses.

Residential surrounding greenness and the use of greenspaces has been linked to a reduced rate of Attention Deficit Hyperactivity Disorder (ADHD) in children (Amoly et al. 2014) and some studies have demonstrated the positive impact of greenspace/forest exposure on ADHD (e.g. Markevych et al. 2014; van den Berg and van den Berg 2011).

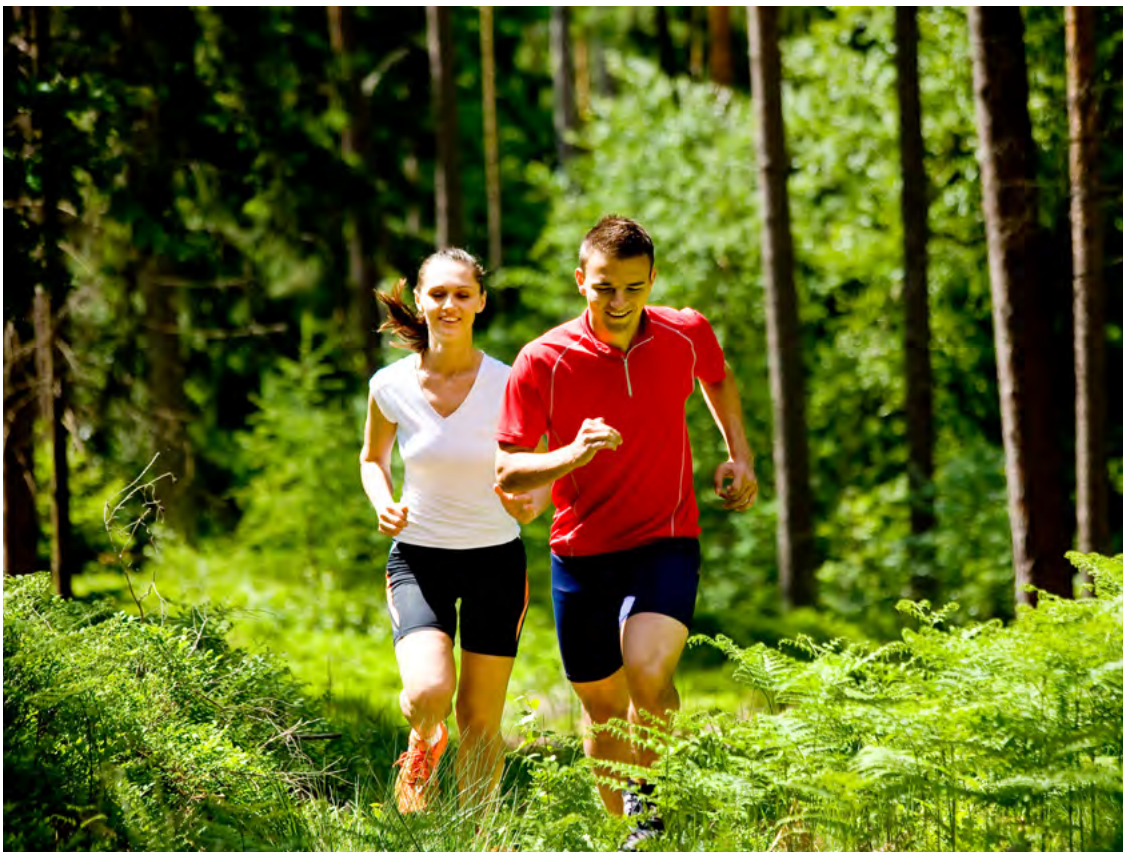
Depressive symptoms are suggested to be alleviated by contact with nature (Bratman et al. 2015; Bowler et al. 2010; Townsend 2006) and therapeutic benefits among people with autism have also been shown (Faber Taylor and Kuo 2006). Furthermore, there are some studies stating that therapeutic programmes in forest environment relieve participants' psychosocial stress (e.g. Sonntag-Öström et al. 2011).

Conclusions

In general, we can say that there is relatively strong evidence that forest visits have positive effects on restoration and psychological wellbeing. However, there is a lack of correlational studies analysing long-term effects of living near a forest and existing studies reach different results. One reason for this might be that forests are often not as close to the settlements as other greenspaces and a direct influence on health is therefore less probable. Another reason for the few studies on this topic might be that urban greenspaces are accessible to everyone while the free/unlimited access to forests and woodlands differs substantially between countries and the mere presence of forested areas near settlements does not imply that they can be used for recreation.

Furthermore, there is a lack of studies focusing on the curative effect of greenspaces and forests. This might be caused by design and/or ethical problems (random assignment to treatment and a control group without treatment) and the difficulties of including patients with certain diseases (e.g. depression) in research settings that could be considered as very demanding.

To summarise, we can say that the evidence on the effect of forests on psychological health is not yet good enough to say when, where, and for whom given effects will occur or how long they will last. Positive effects may not be experienced equally by different groups of people (e.g. age, preferences, diseases) and not all types and sizes of forests might be equally effective.



2.3.2 Physiological and physical health effects

This subchapter discusses what is known about the physiological effects of visits to forests, the benefits of living in a green environment and the role of forests for being physically active.

Links between mental and physical health for cardiovascular diseases over the last few decades have been increasingly demonstrated. For example, chronic depression, anxiety, and working stress have been associated with increased cardiovascular disease (e.g. Gan et al. 2014). Moreover, acute psychosocial stress, worry and inadequate recovery from stress has been shown to be associated with negative changes in the levels of cardiovascular risk factors such as blood pressure, heart rate, and heart rate variability (HRV), a measure of autonomic nervous control of the heart (e.g. Pieper et al. 2007).

In addition, short-term exposure to air pollution, such as experienced during commuting in a city centre with busy traffic, has been found to be associated with the same risk factors (e.g. Sarnat et al. 2014). In contrast, large forests and other nature areas provide a health promoting environment for relaxation and various types of activities. However, the effect of a reduction in air pollution and noise exposure during visits to green environments has been taken into account in only few studies (Triguero-Mas et al. 2017; Lanki et al. 2017).

For physiological recovery, there is somewhat less evidence of an effect compared to psychological effects of nature exposure. There are studies, in particular, from Japan, Korea and China showing that forests environments lower blood pressure and pulse rate, reduce cortisol level, suppress sympathetic nervous activity, enhance parasympathetic nervous activity (e.g. Lee et al. 2014; Mao et al. 2012; Park et al. 2010) and there is even evidence of improved natural killer cell count (Horiuchi et al. 2013; Li et al. 2008, 2011). Drawing solid conclusions from earlier studies has been hampered by the heterogeneity of study designs and results (Bowler et al. 2010). Moreover, a large number of experiments conducted in Japan (Song et al. 2014; Tsunetsugu et al. 2013; Lee et al. 2011 2014; Li et al. 2011) have evaluated effects of visits to forests, in comparison to visits to built-up urban areas, on blood pressure, heart rate and heart rate variability (HRV). Several of the studies have reported positive effects, most often on HRV. In these studies, the sample size has, however, often been rather small and most of the comparisons in Asia have been made between largely used and popular recreation forests in comparison to built-up urban environments. Cultural differences in the valuation of forests as well as the different composition of the forests between Asia and Europe might influence the health outcomes. Therefore, it would be necessary to replicate these studies in Europe in order to validate their results in different cultures.

There is also an increasing number of studies in Europe and US (Arnberger et al. 2018; Hofmann et al. 2018; Triguero-Mas et al. 2017; Lanki et al. 2017; Gidlow et al. 2016; Grazuleviciene et al. 2015; Sonntag-Öström et al. 2014; Hartig et al. 2003) that have evaluated physiological effects of visits to various types of green areas. These studies have demonstrated that the quality of vegetation and size of the nature areas also matters. Although a visit to a small park can promote health and wellbeing, larger forested areas provide higher environmental qualities such as clean air, tranquillity, biodiversity, as well as adequate space for larger numbers of visitors.

The review by Markevych et al. (2017) concludes that various measures of long-term exposure to residential parks, gardens and forests are beneficial for multiple measures of health for urban populations in relatively high-income countries (e.g. Gascon et al. 2015, 2016; James et al. 2015; van den Berg et al. 2015; Dzhambov et al. 2014; Hartig et al. 2014). In particular, beneficial associations with greenspace have been observed for outcomes such as general health (e.g. Davdand et al. 2016; Sugiyama et al. 2008), obesity (e.g. Ellaway et al. 2005), birth weight (e.g. Markevych et al. 2014), childhood behavioural development (e.g. Balseviciene et al. 2014) and mortality (e.g. Villeneuve et al. 2012; Mitchell and Popham 2008). However, not all studies find evidence of a beneficial association between greenspace and the health outcomes considered (e.g. Mowafi et al. 2012; Potestio et al. 2009). Differences in studies depend on people's behaviour, preferences and social cultures to use nature as well as the supply and accessibility of nature. Moreover, these studies do not, however, give an answer to what is the mechanism that delivers the benefits.

One recent study line focuses on nature's possible role in strengthening human immune response. A study by Ruokolainen et al. (2015), for example, concludes that a reduced contact of children with environmental biodiversity, including environmental microbiota in natural habitats, has adverse consequences on the assembly of human commensal microbiota and its contribution to immune tolerance. They found in a study in Finland that living within a distance of 2 to 5 km from forest and/or agricultural areas significantly reduced the chance of atopic sensitisation in children of 6 years or older, suggesting that early-life exposure to nature is very important. Other studies confirmed these findings, and showed a lower prevalence of atopy and atopic diseases in children living in rural areas compared to those living in urban areas (von Hertzen et al. 2015). The key explanation suggests that children in rural areas are more exposed to soil microorganisms, whereas these microorganisms in urban areas are limited due to less greenspace.

Moreover, nature areas are suggested to provide a safe and an attractive setting in which to conduct physical activity (Pyky et al. 2018; James et al. 2015; Astell-Burt et al. 2014; Mytton et al. 2012), although there are again individual and cultural differences how, for example, forest environments are perceived and used. There is even evidence to suggest that physical activity performed in green environments produces greater psychological and physiological benefits than physical activity performed in other settings (Pasanen et al. 2014; Mitchell 2013; Thompson Coon et al. 2011; Pretty et al. 2005). Moreover, most studies in PA research focus on only the amount (duration, intensity) of physical activity conducted, and not whether the activity was performed in a greenspace or another setting. Studies that have used mediation analysis to investigate whether physical activity lies on the causal pathway between greenspace and health have yielded somewhat mixed findings: some studies observed an indirect effect (James et al., 2015; Richardson et al. 2013; de Vries et al. 2013; Sugiyama et al. 2008), while others did not (e.g. Davdand et al. 2016; Triguero-Mas et al. 2015). One of the conclusions is that only the presence of greenspace does not necessarily imply its use. In particular, not all greenspace is attractive for physical activity due to characteristics such as size, available facilities and the environment.

Previous work has reported larger greenspaces with well-maintained paths are likely to be more attractive to adults for physical activity than smaller "pocket parks," which may be more attractive for more sedentary forms of recreation (e.g. Giles-Corti et al. 2005). A recent study by Pyky et al. (2018) demonstrated that larger, often forested nature areas in suburbs attract residents for green exercise. Short distance to at least a middle-sized, often forested green area and a high degree of nature relatedness were found important for

green exercise. In this study, active commuting and being satisfied with the quality of green areas nearby increases the likelihood of people exercising in green areas.

It appears possible that at least some greenspace health associations are mediated by stress/restoration qualities or social contacts that are fostered by green physical activity (de Vries et al. 2013). Information on physical activity intensities as well as the settings (and their accessibility and quality) where the physical activity is being conducted is needed.

Conclusions

In conclusion, there exists increasing evidence that visits to forest environments lower blood pressure and pulse rate, reduce cortisol level and suppress sympathetic nervous activity. Based on the previously reported associations between mental state and cardiovascular physiology, it can be suggested that even short visits to green environments may lead to positive changes in cardiovascular risk factors as a result of stress recovery. More research is, however, needed on the long term health benefits and dose-response relationship. In addition, relatively little information is available regarding the effect of different type and size of forests as well as effects of their management. More scientific evidence is also needed about individual differences in nature exposure.



2.3.3 Social benefits

One of the potentially important mechanisms explaining the health benefits of forests has been suggested as social engagement and social connections which have been mentioned in a number of studies (e.g. Hartig et al. 2014; Baum et al. 2009). There is an increasing amount of literature that suggests that social isolation and loneliness can impact health: both physical and mental (Hawkley et al. 2010; Cacioppo et al. 2006). However, there is a relatively small amount of peer reviewed evidence specifically related to social connections and forests, and therefore we also draw on literature that covers greenspace or nature more broadly to supplement the forest studies; as the greenspace and nature studies often include small woods/forests or individual trees. This section focuses on social benefits from forest or greenspace use as an outcome of people's visits rather than the motivation for their visits. However, we acknowledge that social connections enjoyed during a forest visit may encourage or enable people to repeat their activity and keep engaging with forests in the future. For example, someone joining a weekly health walk may be more likely to keep attending due to the company and people they engage with while on the walk (Morris and O'Brien 2011). We outline three categories identified by O'Brien and Morris (2013) in which social connections may be an important part of a forest visit and in which there is some evidence of benefits to health and wellbeing.

Strengthening social relationships

Shared experiences with other people can be an important source of benefit from people's use of forests (e.g. O'Brien and Morris 2013). Socialising with friends was also found to be important in a forest physical activity programme and for those visiting peri-urban forests (O'Brien et al. 2014). A large scale study of adolescents in Iran found that more time spent in forests and parks improved self-satisfaction and social contacts (Dadvand et al. 2019). The study found stronger associations for boys and older adolescents and those in rural areas, as well as those from the lower and higher socio-economic groups. For women, going to the forest with friends and family can be important as they might not always want to visit alone due to concerns about safety, and feelings of being insecure (Morris et al. 2011). A study of Staats and Hartig (2004) suggests that solitude is more effective than company in regaining the capacity for directed attention, if the safety is guaranteed; and if safety is not guaranteed, company enables restoration through its effect on safety.

An improvement in pro-social behaviours (i.e. supporting and helping others) was found in a Forest School study in England (O'Brien 2009). While, a school garden study found the majority of children engaged in social interactions with only 3% of these interactions being negative (Bates et al. 2018). Social contacts among children during outdoor play may positively affect socio-emotional development and help to establish social cohesion, which may also extend to the parents. Flannigan and Dietze (2017) found that in rural natural environments children displayed positive social behaviours. Maas et al. (2009a) in a study of health and social contacts of over 10,000 residents in the Netherlands found less greenspace coincided with a perceived lack of social support and feelings of loneliness. In another study in the Netherlands of over 80,000 people Maas et al. (2009b) found that more greenery in the neighbourhood was associated with greater feelings of social safety, except in very urban areas. De Vries et al. (2013) found that the greenery and health relationship in the Netherlands was strongly mediated by stress and social cohesion, the feeling that people in the neighbourhood know and respect each other. Markevych et al. (2017) found

in their review of current literature that in most, but not all (Triguero-Mas et al. 2015) studies social cohesion is related to human health, especially to general and mental health (e.g. Dadvand et al. 2016; de Vries et al., 2013).

Urban and recreation forests and trees can also provide settings for contact with neighbours, which can potentially increase social cohesion within a neighbourhood: the feeling that the people in the neighbourhood know and respect each other, pose no danger and may help if needed (e.g. Weinstein et al. 2015; Kuo and Sullivan 2001). One way to maintain feelings of safety in publicly used forests is to keep up an adequate level of maintenance that includes good quality recreation trails, signs, lightning as well as the removal of dangerous trees and management of understorey for visibility. In highly urbanised areas, residents' perception and the relationship with nature may be complicated, and enclosing vegetation may reduce the sense of safety and contribute negatively to community interaction (Maas et al. 2009b).

Developing new social relationship

Numerous interventions and programmes have been developed and created in different countries to encourage populations to use forests for health and wellbeing. Some of these interventions focus on promoting health, while others target those who have some sort of existing problem; either mental, physical, emotional or behavioural. Evaluation of some of these interventions highlights that social interaction can be an important outcome of the intervention along with any physical or mental health benefits. O'Brien (2018) found this to be the case for young people and adults with specific addiction and behavioural problems participating in an intervention in a forest programme in England. Research on environmental volunteering found that people can make new contacts through volunteering when they move to a new area (O'Brien et al. 2010). Maller (2009) found social engagement benefits from children being involved in nature based activities. Social interaction can be a reason why people adhere to activity in the forest, knowing they will meet new people (Morris and O'Brien 2011; O'Brien et al. 2006). A study of urban greenspace in Zurich found that these public spaces provided opportunities for children and young people to make new friends and to be with existing friends (Seeland et al. 2009). Another study in Switzerland (Home, Hunziker, Bauer 2012) showed that the most important motivations for visiting nearby greenspaces were related to restoration, with social bonding as a desirable side benefit. Older people, especially, were motivated to visit nearby greenspaces by the wish to seek social contact. Brief social contacts in forests were identified by dog walkers and others as a pleasant way to socially engage with other people (O'Brien et al. 2014; de Vries 2013; O'Brien, 2005), and social contact benefits related to a variety of green infrastructure have also been identified (O'Brien et al. 2017). Shinew et al. (2004) suggest that inter-racial interaction can be enabled via use of greenspace.

Participation and community capacity building

Forests and greenspaces can also provide opportunities for communities and individuals to come together and participate in community focused activities such as events, volunteering or getting involved in decision making about their local forests and greenspaces. Social cohesion can be linked to the physical layout of the residential environment (Hartig et al. 2014) and is related to human health and wellbeing (e.g. Fone et al. 2014) and it is thought to account for a considerable extent of the relationship between greenspace and health, especially mental and general health (Dadvand et al. 2016; de Vries et al. 2013; Maas

et al. 2009). However, a mediating effect has not been observed in all studies (Triguero-Mas et al. 2015), which may be attributable to the selection of the social cohesion indicator (Maas et al. 2009a and b). Cox (2018) found that those who spent longer in greenspaces had greater positive perceptions of social cohesion. Participation in environmental volunteering can provide meaningful social contact for older adults and those who are retired (O'Brien et al. 2011). Programmes in forests and greenspace that help to reduce social isolation can also contribute to health and wellbeing. In deprived communities' involvement in community activity in the local urban forest can give people opportunities to come together to improve their local neighbourhoods (O'Brien 2006 and 2005).

Conclusions

While the majority of studies report that forest areas are positively associated with social benefits, they also note the complexity of this relationship. These benefits may not be experienced equally by all social groups. Not all forests or greenspaces are equally suitable for positive social contacts, and thus more refined forest and greenspace measures are required. Well-managed larger forest areas with good infrastructure provide high quality areas for the use of various social groups. Moreover, social contacts are not equally important for different population groups and regions as – e.g. in the North of Europe – a typical motive for being outdoors is finding peace and quietness and solitude. For example, forests and greenspaces suitable for social development and outdoor play for young children may not necessarily be the same as those for the elderly. Current research suggests that neighbourhood social cohesion is especially important for the elderly, but this may partly be due to the fact that other segments of the population have not yet been adequately investigated.

Data on actual contacts with neighbourhood members (frequency and type of contact) and social function-oriented greenspace assessments will help to assess to what extent social cohesion is responsible for the link between greenspace and health in different population groups. Almost all the quantitative studies have been conducted in highly urbanised, often deprived housing environments. New methods such as the use of smartphone data or GPS-tracking may aid a more detailed assessment of social contacts in green environments as an alternative or compliment to using questionnaires and qualitative approaches.



— 2.4 Conditions influencing health effects of forests

Duration and frequency of the visit

Characteristics and qualities of the forest as well as ways to use them influence perceived health benefits. The length of the visit and the frequency of use have been shown to influence gained benefits. Van den Berg et al. (2017) found in their study in four European cities that time spent in greenspace near home was a weak but significant mediator for the relation between greenness and mental health. Similarly, a study in Lithuania showed that for regular users of a park, the proximity to the park was associated with reduced likelihood of depression (Reklaitiene et al. 2014). Moreover, White et al. (2013b) found in a study in England that restoration was positively associated with visit duration (dose-response effect), and that visits with children were associated with less restoration than visits alone.

Activities performed in forests

In addition, activities performed in forests, e.g. walking, jogging, sitting and viewing influence the effects. Statistics regarding visits to nature and forests are poorly developed in Europe. Monitoring of outdoor recreation is conducted in very few countries. This prohibits forming a comprehensive view of the role of outdoor recreation in promoting public health in Europe.

While the positive effect of walking on physical health is uncontested, there are contradictory results concerning the effect of physical activities on mental restoration. While some studies report no influence of the performed activities on health effects (Triguero-Mas et al. 2015) or their intensity or suitability to the special interests (Morita et al. 2007), other studies found that different activities or even different intensities (e.g. walking, exercising) were associated with differences in restoration. Shin et al. (2013) found that meditative walking had a greater effect on the psychological aspects than athletic walking in the same environment and that the forest was more effective for restoration than the gymnasium.

Individual differences

Although scientific literature about nature's positive effects on humans is growing, there is little research available about the individual differences in experiencing urban nature. There is some evidence that not all people perceive nature and its potential benefits in a similar way (e.g. Faehnle et al. 2014; Tyrväinen et al. 2003) and in consequence different types of nature areas such as forests could influence individuals differently. Factors such as age, health, status, psychological characteristics, fitness, and education level likely influence the effect of nature exposure. The results linked to influence of national and cultural background remains limited, as does the effect of environmental education across the life course (Africa et al. 2014). Another issue that is discussed is the modification of health benefits by socio-economic status, some studies show that groups with lower SES profit more (e.g. Mitchell and Popham 2008, 2007; Maas et al. 2006).

The life situation and personal characteristics are found to influence the appeal of natural environments and their health effects. Older aged groups seem to report a more positive mood in a natural environment than younger age groups (McMahan and Estes 2015). The beneficial effect of greenspace in the living

environment was reported to be stronger in senior adults, children and housewives than in the general population (Maas 2006; de Vries et al. 2003) possibly due to more time spent in the local living environment. Education and working environment is suggested to effect benefits; forest professionals, for example, do not report as much feeling of restoration after forest visits as non-forest professionals (von Lindern et al. 2013), and children who perform working-like activities in rural areas report experiencing less restorative experiences than do children who spend only their free time in these areas (Collado, Staats and Sorrel 2016). Conversely, the importance of positive nature experiences as a child is related to restorative experiences as adults (Korpela et al. 2008) as well as professional choices (Chawla 1998). Important aspects for urbanised people is the familiarity and safety of natural areas that is found as an important factor in enhancing restoration in nature (e.g. Tyrväinen et al. 2005). In some experiments that manipulated the need for restoration of the subjects, researchers found that a forest walk was more preferred than a walk in the city when the subjects had a greater need for restoration (e.g. Staats and Hartig 2004; Staats et al. 2003). Even more important in these studies was the result that the subjects' preference ratings for the different walks was strongly associated with the perceived likelihood that they would experience attentional recovery during the given walk. This means that people can learn that some environments are more beneficial for their recovery and that they may be able apply this knowledge in their everyday life (Korpela and Ylén 2009).

Moreover, connectedness with nature is suggested to be linked to the personal need to visit forests and other natural areas. The feeling of the connection to nature is discussed as an important factor influencing the restorative experience in nature. Mayer & Frantz (2004) developed the connectedness to nature scale (CNS), the CNS score is related to overall satisfaction and happiness and the feeling that an individual is part of a force "greater than oneself" may have a positive influence on mood by lifting a person out of rumination (Mayer et al. 2009).

Berto et al. (2018) could show in a study in which individuals assessed three parks that the perceived level of restorativeness is associated with the sense of connection to nature, as well as the biophilic quality of the environment: individuals with different degrees of connection to nature seek settings with different degrees of restorativeness and biophilic quality. Similarly Tang et al. (2015) found that a stronger connection to nature was associated with the assessment of a forest setting as having a stronger restorative potential. This result was found to be independent of the individuals' familiarity with the natural settings assessed. A study of Wyles et al. (2017) provided evidence for a bidirectional association between connectedness and restoration. In a study in Australia, Dean et al. (2018) looked at different aspects of nature relatedness: they found that the aspects of nature relatedness reflecting enjoyment of nature are associated with reduced ill health, but the aspects of nature relatedness related to self-identification with nature are linked to increased depression and stress.

Additionally, there is a need for more evidence on how place of residence or other personal characteristics influences perceived experiences from nature (e.g. urban-rural). We do not currently know how perceived benefits from nature differ between rural inhabitants and urban dwellers.

Dangers and risks

Forests and other nature areas can pose risks to human health in some cases, and both the scientific and policy promotion literature is comparatively still limited in these matters. Such so-called “ecosystem disservices” include allergenic reactions caused by gaseous and other emissions from some tree species, or the pests and pathogens that inhabit them, the risk of falling limbs or entire trees, especially during storms, and more evidently in recent years, the risk of death or life changing circumstances from wildfire, especially at the rural: urban interface. Analysis of human health and safety already forms an important management tool for urban trees, and this is likely to increase in the future, taking into account more severe extremes of weather that climate change is causing.

One of the most typical risks linked to forest visits are tick-borne diseases that are increasingly found also in the Nordic countries due to climate change, the most common diseases being Lyme disease and the tick-borne encephalitis.

Recently the prevalence of other health-threatening arthropods has increased due to climate change as well (e.g. *haemetopoea processionea*) and human contacts with some of these can result in direct body injury and/or allergic reaction (Tomalak et al. 2011). Alien plant species migrating into new habitats or regions can cause allergic reactions or dermic burns as well (e.g. *Ambrosia*, *Giant Hogweed*).

As many species of mushrooms and plants are poisonous, the risk of picking up a toxic species is high (Tomalak et al. 2011). Especially due to climate change there is a shift in species and some species that are not yet common in European countries and that resemble the common edible species may lead to problems of botanical identification of edible species. The situation is similar for many potentially dangerous plant species that can cause serious illness.

The exposure to pollen is another issue in relation with forest visits; climate change contributes significantly to increasing allergy prevalence and new allergenic pollen and spatial shifts in pollen occurrence will increase sensitisation (Damialis et al. 2019).

Another risk associated with forest visits is encounters with predators, such as wolves and bears that were probably the most feared animals in Europe for a long time (Tomalak et al. 2011). After a significant reduction of the populations there has been an increase in numbers recently and when an area of human activity overlaps with the territory of a predator, conflicts can occur. Fear of being alone in a forest environment, of attack from another human being and concerns about getting lost can also impact on people’s use and enjoyment of accessing forests and gaining benefits from them (Morris et al. 2011).

— 2.5 Conclusions and policy implications

Scientists have examined direct effects of exposure to forests for physical health (for example, as measured by blood pressure, body mass index, recovery rates after surgery, morbidity and mortality), mental wellbeing and life satisfaction, and mental distress, or recovery from it. The overall messages from these studies are positive, although many have been criticised for poor research design and methodologies and their focus on short-term effects.

A recent review study regarding health benefits of forests published by the Finnish Medical Society Duodecim concludes that the research evidence regarding healthy adults is already relatively strong, but there is little evidence on forests' effect on recovery from sicknesses (Tyrväinen et al. 2018). Forests are suggested to have considerable potential in public health promotion and disease prevention. More research is, however, needed to study the dose-response relationship, individual differences in benefits, long-term health effects as well as effects in rehabilitation and recovery from illnesses. Moreover, there are still gaps in scientific knowledge that hinder economic valuation of the health benefits of forests, but this should be one of the aims of future research.

Systematic studies employing critical appraisal used to evaluate medicinal and medical interventions are somewhat guarded in their conclusions regarding the role of greenspace and forests (Kondo et al. 2018; WHO 2016). Some point out that the potential mechanisms underlying the associations between exposure to forests and physical and mental health are yet to be established (Pearlmutter et al. 2017). Others suggest that there is difficulty separating ecological effects from socio-economic and cultural factors (Hartig et al. 2014).

Previous studies have looked mainly at urban forests and greenspace benefits more broadly. In general, we can conclude that the limited focus on forests in health research challenges drawing detailed conclusions of their health effects.



Policy implications

- European and national forestry policies should address modern public health agendas and the potential role of forests in health promotion and the preventative aspects of ill-health.
- Policies focusing more on forests and woodlands in and around towns and cities are needed to deliver significant benefits for urban societies.
- Health benefits of forests are gained through repeated use. Therefore, easy access to and adequate supply of health promoting forests needs to be enhanced and secured for all European populations.
- Monitoring of outdoor recreation and associated health benefits should be developed.
- Indicators measuring the supply of forests and other nature areas should be developed and applied in land-use and urban planning.
- More collaboration is needed between forestry experts, planners and landscape architects, as well as public health officials and others responsible for supporting healthy living.
- Policy instruments supporting pilot projects, research, education, monitoring and communication are needed to put current evidence-base into practice.
- Mechanisms and funding for long term provision of cultural forest ecosystem services for social and health benefits will need to be developed (Use of Payments for Ecosystem Services (PES))
- Disbenefits of forests to public health will become more severe in the future including wildfires, storms and vector-borne diseases. New policies are required regarding these risks where they are considerable for public health.

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3

Human Health and Sustainable Forest Management

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— 3.1 Introduction

The requirements and demands of society for forests and forest managers have changed over the past few decades. Due to global changes and demographic trends, social functions of forests such as recreation, tourism and human health aspects are becoming an important objective of forest management in many European countries. Despite a long-standing ambition to introduce the concept of social values into international and national forest policies, these aspects remain the least developed part of sustainable forest management. For different reasons, socially targeted measures are perceived as very challenging to govern (Boström, 2012). Social sustainability is an often overlooked aspect of sustainability in general, as sustainable development discussions often focus on the environmental or economic aspects of sustainability.

Social considerations in forest management are, however, crucial to sustainable development. Management that considers aspects such as recreation can help to improve the diversification and competitiveness of marginal rural economies. It can enhance both ecological conditions and the appearance of landscapes, and can eventually help communities to achieve a higher quality of life (Agnoletti et al., 2008). Current societies, especially urban dwellers, look for forest environments suitable for recreation services, sport, human health promotion and health restoration. It is envisaged that in the future these forest associated industries might generate additional jobs and income. This shift in societal demands for forests requires a proper reaction not only at the political level, but also necessitates a need to adjust long-established forest practices with the aim to integrate these social aspects into sustainable forest management.

A plethora of policy instruments may be employed to achieve societal goals. Policy instruments span sectors ranging from government ownership, legal framework, strategies, such as national forest programmes or the equivalent; to financial and economic instruments, subsidies, communication, education, capacity building and research; to private markets and new public/private mixes of these sectors. Almost all North European countries seem to have governmental policy documents, which include some consideration of nature-based recreation and tourism in the context of natural resources, tourism, land use planning or health and well-being affairs. Most of the documents reported were strategy statement reports, but also some development plan documents were reported. The most typical type of document was a National Forest Programme or strategy. Only four countries (Denmark, Finland, Norway and Sweden) have a specifically focused strategy program for outdoor recreation and/or nature-based tourism. Norway seems to have the strongest legislative basis for outdoor recreation (Sievänen, 2008).

Besides many other countries, the United Kingdom is an outstanding example scaling-up efforts to improve people's health and well-being focusing on the value of trees and woodlands. The white paper *Choosing Health* published in 2004 for England sets out how the government will provide opportunities, information and support to enable people to choose health and adopt healthier lifestyles (Department of Health, 2004a). To enhance these benefits, in 2005 the Forestry Commission (the government department responsible for forestry in Great Britain) signed a health concordat with a range of countryside agencies in England. It outlined specific activities that these organisations will undertake to promote the use of the outdoors for health purposes. The Forestry Commission has also launched, early in 2005, an "Active woods – naturally

good for you” campaign which aims to establish an association in people’s minds between health and well-being and woodlands, to promote physical activity among forest users and to help foster healthier lifestyles. Forestry Commission England and Sport England launched 8 year and possibly longer programme on 18 sites in England titled: “Active Forests Programme – England” or in collaboration with NHS Scotland initiated “Branching out programme” with the aim to improve the mental wellbeing of patients using mental health services (O’Brien, 2006). The UK has also national programs promoting outdoor exercise, evaluated by Oxford Brookes University.

We have also learned of several other initiatives across Europe. For example, in Sweden there is a long-established network of therapeutic gardens, and in Finland, Norway and Sweden there are programme for taking children into forests and the natural environment as part of their normal schooling. Similar programmes have been identified in Denmark, Estonia, Austria, Germany, Slovakia, Poland, the Czech Republic. We have included the collection of good practice examples from several European countries in Chapter 4 of the study. At European level, a significant step in increasing the knowledge about the contribution that forests, trees and natural places make, and might make, to the health and wellbeing of people in Europe was achieved within the European Commission–funded COST Action E39. COST (Co-operation in the field of Scientific and Technical Research) Action programme is an intergovernmental framework that allows for coordination at a European level of nationally funded research. Publication: “Forests, Trees and Human Health and Wellbeing” is a comprehensive European textbook on the role of forests and trees on human health and well-being, incorporating the latest results of research and examples of good practice reflecting work carried out over four years by scientists from 25 countries.

Our study focuses on the integration of human health aspects into forest management to be better acknowledged and implemented within the forest sector. Reflecting main scientific knowledge accumulated within chapter 2, this chapter provides an insight into forest management policies and planning to investigate how forest management should cope with societal demands related to human health and well-being. The chapter starts with the definition of sustainable forests management and its policy framework highlighting all three pillars of sustainability covering economic, ecological and social aspects. In the second section, the basic principles of sustainable forest management and necessary changes in the paradigms of the current forest management to fulfil the human well-being and health aspects, are briefly presented. Based on this introductory part, main key factors influencing forest management planning and practices were derived. In the third section, one can find information about the steps needed for the better integration of social aspects into forest management to be sustainable from the human health viewpoint and to meet the needs and expectations of society.

— 3.2 Sustainable Forest Management

3.2.1 International political framework of Sustainable Forest Management

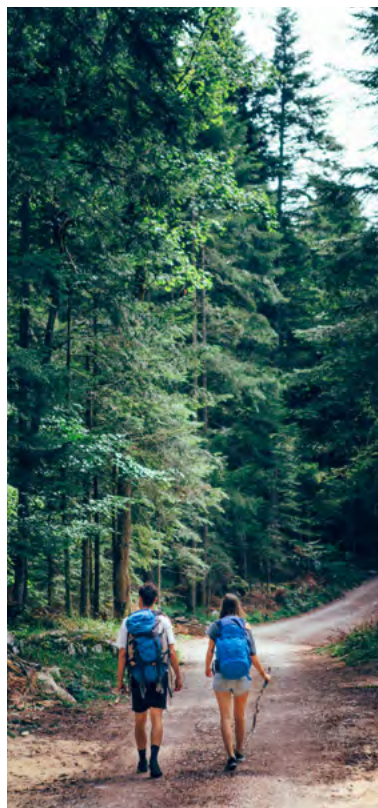
The most acknowledged definition of Sustainable Forest Management (SFM) was introduced by the Ministerial Conference on the Protection of Forests in Europe (FOREST EUROPE), and has since been adopted by the Food and Agriculture Organization (FAO). It defines sustainable forest management as: “the stewardship 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” (MCPFE, 1993).

The above mentioned definition was based on the Forest Principles approved by the United Nations Conference on Environment and Development (UNCED) in 1992 that were a reaction to the unsustainable use of forests for industrial purposes which was prioritised in some countries and faced great criticism in the 1980s. The concept of SFM has, on a pan-European level, made remarkable progress, based on the three pillars of sustainability covering economic, ecological and social aspects, matching public demand for all ecosystem services (Rametsteiner, 2009). Therefore, SFM is a term highlighting the management of forests that secure all required services in a continuous and balanced way (Marusakova and Vizslai, 2017). Successful implementation of the principles of SFM provide integrated benefits to us all, ranging from safeguarding local livelihoods to protecting the biodiversity and ecosystems provided by forests, reducing rural poverty, mitigating some of the effects of climate change and providing environments for recreation and tourism. From a long term perspective, the social and cultural potential of forests has to be preserved through SFM (Nowacka et al., 2017). In simpler terms, it is all about attaining the balance between society’s increasing demands for forest products and services, and the preservation of forest health and biodiversity. This balance is vital for the survival of forests and forest-dependent communities. At the pan-European level, the concept of SFM has been defined and continuously developed through the FOREST EUROPE commitments and the gradual development of the set of Pan-European criteria and indicators for sustainable forest management.

The six Pan-European criteria for SFM are:

1. Maintenance and appropriate enhancement of forest resources and their contribution to global carbon cycles
2. Maintenance of forest ecosystems’ health and vitality
3. Maintenance and encouragement of productive functions of forests (wood and non-wood)
4. Maintenance, conservation and appropriate enhancement of biological diversity in forest ecosystems
5. Maintenance, conservation and appropriate enhancement of protective functions in forest management (notably soil and water)
6. Maintenance of other socio-economic functions and conditions.



Another step towards SFM was the development of the guidelines for forestry practice. The “Pan-European Operational Guidelines for Sustainable Forest Management (PEOLG)” endorsed at Lisbon Ministerial Conference in 1998 were formulated to translate international commitments to the level of forest management practice and planning and became a basis for the forest certification programmes. All six Pan-European criteria for SFM directly or indirectly concern human health and well-being and are associated with the quality of life of urban as well as rural societies. Whether it is enhancement of forest resources significantly improving the quality of air and water, preventing soil erosion and, at a local scale, reducing risk of floods or, by absorbing and storing millions of tons of carbon, contributing to climate change mitigation and protecting the wildlife habitats and improving biological diversity, which is the key element for healthy environment.

Within the PEOLG, the sixth criterion (Maintenance of other socio-economic functions and conditions) refers in particular to the multiple functions of - forests highlighting new opportunities for employment in connection with the socio-economic functions of forests. As for forest management planning, the guidelines call for adequate public access to - forests for recreation purpose and protecting specific historically, culturally or spiritually significant sites. Forest management practices should support all socio-economic functions, including recreational function and aesthetic values. This could be achieved by encouraging attractive trees, groves and other features such as colours, flowers and fruits (Resolution L2, 1998).

These guidelines comprise a common framework of recommendations to be applied at a forest stand level that can complement national and/or regional instruments for SFM. Their implementation would improve communication with the public, stakeholders’ participation, raising awareness and good practices at a practical level, contributing to sustainable development.

A vital role of forests in ensuring human well-being and a healthy environment was acknowledged by the ministers responsible for forests in Europe at the 6th Ministerial Conference on the Protection of Forests in Europe in 2011 in Oslo, where the Ministerial Decision “Goals and 2020 Targets for European Forests” was adopted. The shared vision for forests in Europe: *“To shape a future where all European forests are vital, productive and multifunctional. Where forests contribute effectively to sustainable development, through ensuring human well-being a healthy environment and economic development in Europe and across the globe. Where the forests’ unique potential to support a green economy, livelihoods, climate change mitigation, biodiversity conservation, enhancing water quality and combating desertification is realised to the benefit of society”* confirmed the importance of the multifunctionality of forests and also the need to integrate human well-being into future forest management.

Although the aim of sustainable forestry, as given by the political commitments since 1998, is to maintain or improve the quality of life by preserving and improving, inter alia, social and cultural dimensions of forests and forestry, there is still a challenge for forest managers. The biggest issue for forest managers is to identify how to manage forests to ensure all necessary benefits and services with a wide range of often conflicting factors and needs (commercial and non-commercial, environmental, societal). The multitude of demands and expectations inevitably generate conflicts. These conflicting demands put pressure on forests and forest managers and it is envisaged that the search for trade-offs between maintaining wood production and creating areas suitable for recreation, sport and rehabilitation from stress-related diseases,

will be very important in the future. These aspects should, therefore, be assessed and integrated into forest management planning, which represents, in the majority of cases, a participatory process involving citizens, businesses, organisations and other interested parties in and around the forest tract being managed.

— 3.3 Forest Management Planning

A forest management plan is “a long-term [...] plan, aimed at defined management goals and is periodically revised”. This plan “must include adequate detail on operations planned for individual operational units (stands or compartments) but may also provide general strategies and activities planned to reach management goals”. Forest management is the process of planning and implementing practices for the stewardship and use of forests and other wooded land targeted at specific environmental, economic, social and cultural objectives. Forest management planning (usually based on a forest inventory and forest evaluation data) is a fundamental component of SFM, and it may be required at various levels, from local to national. The role of forest management planning is to determine and express the objectives of forest management in a specified area of forest and to set out the steps to be taken to achieve those objectives. (FAO, 2015; Dennis-Perez et. al, 2012).

The forest management planning currently applied in many countries of the pan-European region, is based on a long-established tradition being institutionalised at different levels in each country.

Some of the most difficult decisions in sustainable forest management concern the trade-offs between different forest products and services. It is not feasible for a single forest stand to meet every demand, and so the needs have to be balanced. In today’s society, the trade-offs are frequently based on economics. The economically most valuable use of the forest (which is usually extraction of timber) had priority in the past. However, there is an increasing demand from society that other products and services should be given greater attention, and this is particularly the case when stewardship of the forest is changed from a centralised authority to local control.

Therefore, there are strong arguments in favour of multifunctional forest management. Multifunctional forest management and the implementation of social aspects into SFM have to take place on the strategic level of forest management planning, as well as at an operational level of forest management practices adjusted for this purpose.

Although multifunctional forest management is envisioned increasingly as a viable alternative to a singular focus on timber production, assessing the relative economic value of and level of demand for various forest products and services is difficult because many such services are non-marketed commodities or have undeveloped markets. From the above-mentioned it is clear, that SFM must deal with different ecosystem services as much as possible. However, the concept of ecosystem services is multidisciplinary by nature and requires collaboration between different disciplines, combining the natural and social sciences (McDonough et al., 2017). For more information, see chapter 3.3.1.2.1 and 3.4.4.

Moreover, managing forests in such a way that interest groups, forest owners, forest managers and various stakeholders all agree to, is not easy. For any reliable consensus, viable landscape design procedures, through which multiple functions (production, environmental protection, social aspects and recreation) may

be coordinated by means of innovative planning, there is a need to negotiate a set of common objectives and shared responsibilities.

Such a change of the forest management paradigm towards more multifunctional management, is a demanding task and many issues can be identified to be addressed when a policy change is being implemented in forest management practices (Bell et al. 2009).

Although multifunctional forest management and integration of social values of forests is still a challenge, some authors claim that societies and the forest sector are now better equipped to govern and manage forests for multiple purposes. There is a considerable interest in forests' social values and numerous ideas about planning tools and silvicultural regimes to promote them. Existing planning tools and practices could be implemented more extensively and further developed, including, for example, by formulating of more creative and customised management plans that include a spectrum of locally relevant aspects. However, application of many of these methods currently relies on voluntarism and thus also on the degree to which they coincide with the forest owners' interest (Stén et al., 2016).



3.3.1 Factors influencing forest management planning and practices

While focusing on human health aspects, several factors influencing SFM were recognised and taken into account for the purpose of this publication. These factors are forest ownership structure and associated legal rights and accessibility of forests on one hand, and various societal demands with often conflicting interests requesting provision of multiple forest ecosystem services on the other. To the best of our knowledge, these factors are not sufficiently reflected in the forest management practices in many countries of Europe. However, this reflection is necessary for the achievement of SFM and must be of interest to both scientists and policy makers.

3.3.1.1 Forest ownership and accessibility of forests

Ownership is assumed to be one of the key factors influencing the forest management (Siry et al. 2010) and thus influencing also the potential of forest areas to be utilised for recreation and health promotion and rehabilitation. The FAO Forest Resources Assessment defines forest ownership as “the legal right to freely and exclusively use, control, transfer, or otherwise benefit from a forest. Ownership can be acquired through transfers such as sales, donations, and inheritance” (FAO, 2018).

The complexities of property ownership are often explained using the “bundle of rights” framework (Schlager and Ostrom, 1992). The bundle of rights framework essentially explains how a property can be simultaneously owned by several entities and characterises the property rights system into five distinct categories:

- **Access rights (rights to enter forest land);**
- **Withdrawal rights (rights to harvest or remove timber, firewood and non-wood forest products (NWFPs));**
- **Management rights (rights to plan internal forest activities and transform the forest);**
- **Exclusion rights (rights to prevent others from accessing and harvesting wood or NWFPs);**
- **Alienation rights (rights to sell forestland and forest products as well as to lease or sell management and exclusion rights) (UNECE, 2019).**

Forest ownership conveys exclusive legal rights over the forest resource, such as the right to fully utilise, manage, control the forest, and/or transfer those rights to others which entail a certain influence over the decision on management. Decisions associated with the above-mentioned property rights, such as on when and where to plant or harvest, might affect the forest landscape and the recreation possibilities for the local population as well as tourists. However, forest owners seldom have the full range of exclusive legal rights to “use, control or transfer” when it comes to benefiting from their forest, in particular, since ownership rights pertaining to forests are always, to a lesser or greater extent, restricted by legal regulations and social customs associated with the forest land in question.

The same applies when talking about the objectives of forest management. While in private forests the decision on the incorporating of ecosystem services into management goals depends on forest owners, in state/public forests the priority to deliver a vast range of ecosystem services is, in many countries, automatically expected and forest management should include society-orientated strategic goals within their guiding principles.

In Europe, overall forest ownership (excluding the Russian Federation) is balanced. 44% of Europe's forest is publicly owned, whereas 56% of forests are under private ownership (UNECE, 2019), however, this ratio varies across countries (see Figure 3).

The legal accessibility of forests is, in many countries, closely related to the ownership, as described earlier. In the majority of European countries, the public has access to at least 90% of that country's forest and other wooded land for recreational purposes. As for the forest area having recreational use as a main management goal, Latvia reported that over 47% of its forest is primarily designated or managed for recreation and is followed by Bulgaria (21%), Iceland (18%) and Belarus (17%). Conversely, Serbia, Sweden and Denmark reported that less than 0.5% of their forest area has recreational use as a main management goal (FOREST EUROPE, 2015). However, due to different countries' standards, it is quite difficult to interpret these figures.



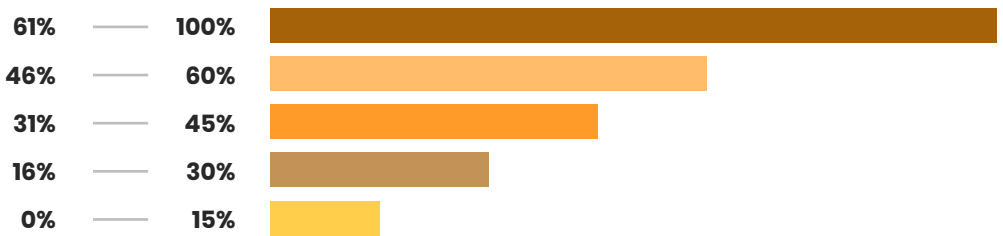
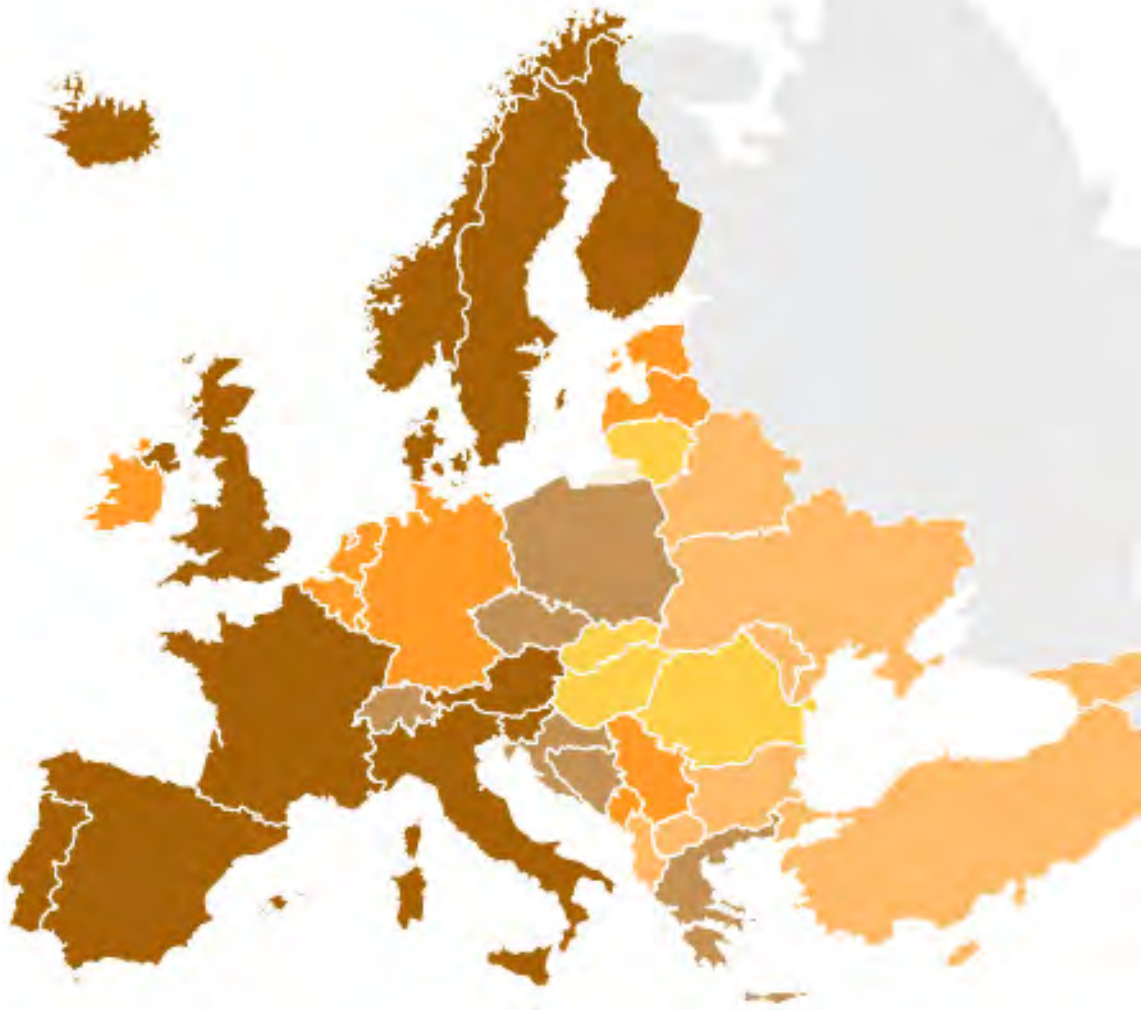


Figure 3: Area of privately owned forest as a percentage of total forest area in 2010 (FOREST EUROPE, 2015)

The willingness of forest owners/managers to make forests accessible for recreation and leisure activities also varies. As an example, among Danish forest owners and managers, the attitude towards forest visitors differs between public and private land. In general, owners of private forests show a much more adverse mind-set. The improvement of the willingness of private owners to make accessible their forest areas is one of the major challenges of the coming years and has to be stimulated by funding, incentives, assistance and encouragement (Andersson, 2017).

Within the many countries of Europe there is a national legislation granting people access to all forests as long as they do not disturb or destroy forest while spending time on the forest owner's property. Generally, the major part of protected areas is located in municipal and state forests. These areas often offer recreational infrastructure and tourism opportunities (Fredman and Tyrväinen, 2010). But the use of commercial forests for recreation is increasing because some outdoor activities are not allowed in protected areas or the spatial location of commercial forests is more attractive than that of protected areas, which is a reason to adopt forest management (e.g. Tyrväinen, 2008; Tyrväinen, 2016).

Due to significant demographic changes, there are new phenomena which impact the management decisions in the private forests. The first one is so called "rural-to-urban migration" of forest owners in many countries (Gallemore et al., 2018). This leads to the management of a large part of forests being governed by people who do not live near their forests, have no practical experience and only use it for recreation during the weekends and holidays. The second one is a change in the forest-owner structure which is suspected to have led to the increasing number of owners without any specific management objectives for their forests, thus neglecting the multifunctionality of forests. In addition, the advancing fragmentation of the forest holdings is increasing the threat of the passiveness related to forest management (Lahdesmäki et al., 2016). As for management objectives, several studies revealed that while male owners are usually interested in trees for commercial purpose, female owners are more inclined to favour tree products for subsistence, such as food, medicine, well-being and healthy life style. Female forest owners focus more on environmental and recreational values than males, hence, with more female forest owners the forest management is more multifunctional. However, the differences between male and female visitors of forests are usually not so significant in this respect.

When speaking about accessibility of the forests, besides legal accessibility to forests there is also physical accessibility of forest sites which is related to the remoteness/distance of the forest from the visitors' residences, terrain, the availability of the transport connection and infrastructure (roads and paths, parking, camping sites, amenities, etc.) which play an important role for forest visitors.

Traditional forest management practices support healthy and resilient forests that are safe for visitors and retain their natural values. The construction and maintenance of forest roads (vital for forest management) also provides access to the protected area for visitors and ensures accessibility to forests in case of fire. Forests are valuable parts of traditional rural landscapes. To utilise them for recreation, human health promotion and rehabilitation they need to be easily and safely accessible through a network of forest roads, paths, way-marked walking and biking trails. Forest visitors do usually not realise that all of this infrastructure is provided for and maintained by foresters and forest owners and comes at a cost. In many European countries this network of forest roads and paths is used and purposely maintained all year round

to cater for cross-country skiers, dog sledding enthusiasts, snowshoers, hikers, walkers, runners, mountain and other bikers, horse-riders, bird watchers and other visitors. Without being accessible, the public would have only limited opportunities to enjoy the beauty, tranquillity and diversity of forests in their surroundings.

3.3.1.2 Societal demands

Similar to other parts of the world, European society is becoming increasingly urban, both in a physical as in an economic and socio-cultural sense. As a result, the relationships between society and nature, including forests, are changing, and forestry as structural intervention in forest ecosystems has had to adapt itself to changing societal pressures and demands. Forest management planning has to consider more than one objective and very often includes several stakeholders and decision-makers who often have very diverse, sometimes even contradictory interests requesting provision of broad range of ecosystem services.

3.3.1.2.1 Forest ecosystem services

Human well-being is a central component of the ecosystem services framework and is in fact its major endpoint in terms of what the ecosystem services concept aims at. The relationship between human health and well-being, biodiversity, ecosystems and their services, and climate change has in recent years received increasing attention in international discussions and policy processes. MAES - Mapping and Assessment on Ecosystems and their Services (2013) defines ecosystem services (ES) as the benefits that people obtain from ecosystems - the direct and indirect contributions of ecosystems to human well-being. The concept “ecosystem goods and services” is synonymous with ecosystem services.

There are several systems of ES classification. MAES (2013), according to the Common International Classification of Ecosystem Services (CICES v4.3), classifies ES into three groups: Provisioning, Regulation & Maintenance and Cultural services. TEEB initiatives (2010) added to the three above mentioned groups of ES also Habitat or supporting services. However, for the purpose of this publication, a simple classification is used, distinguishing between direct and indirect services or contributions of ecosystems to human health and well-being.



However, there is no “one fits all” classification of ES, since it strongly depends on its use. For the purpose of this publication, we focus on those ES that provide direct benefits for human health and well-being – ES with direct use values. These include ES that are typically enjoyed by people visiting forest ecosystem for health promotion, prevention or rehabilitation and therapy. These ES providing direct benefits are as follows:

- **Recreation and mental and physical health:**
Walking and playing sports in green space is not only a good form of physical exercise but also lets people relax. The role that green space plays in maintaining mental and physical health is increasingly being recognised, despite difficulties of measurement (see chapter 2).
- **Tourism:**
Ecosystems and biodiversity play an important role for many kinds of tourism which in turn provides considerable economic benefits and is a vital source of income for many countries. Cultural and eco-tourism can also educate people about the importance of biological diversity (see also chapter 4.4.3).
- **Aesthetic appreciation and inspiration for culture, art and design:**
Language, knowledge and the natural environment have been intimately related throughout human history. Biodiversity, ecosystems and natural landscapes have been the source of inspiration for much of our art, culture and increasingly for science.
- **Spiritual experience and sense of place:**
In many parts of the world natural features such as specific forests, caves or mountains are considered sacred or have a religious meaning. Nature is a common element of all major religions and traditional knowledge, and associated customs are important for creating a sense of belonging.

There is also wide range of ES that provide benefits outside the ecosystem itself. That means that ES generates indirect value when it contributes through some biophysical process to an environmental production function, to the supply of some other ES. This group of ES providing indirect values includes broad range of services that help in creating healthy living environments. In addition to tangible products, forests play an important role in restoring degraded ecosystems, mitigating floods, droughts, and the effects of noise, purify water, binding toxic substances, maintaining water quality and soil fertility, helping erosion control, protecting drinking water resources, and assisting with the processing of wastewater. Ecosystems play a vital role in the global hydrological cycle, as they regulate the flow and purification of water. Vegetation and forests influence the quantity of water available locally. Forests can mitigate climate change and may help in regulating infectious diseases. Woodlands and trees have a positive impact on air quality through the deposition of pollutants to the vegetation canopy, reduction of summertime air temperatures, and a decrease in ultraviolet radiation. However, ecosystem services and goods that forests provide are

threatened by deforestation, pollution, biodiversity degradation, climate change and extreme weather events or natural hazards include floods, storms, tsunamis, avalanches and landslides. Ecosystems and living organisms create buffers against natural disasters, thereby preventing possible damage. Ecosystems and biodiversity provide many plants used as traditional medicines as well as providing raw materials for the pharmaceutical industry. All ecosystems are a potential source of medicinal resources.

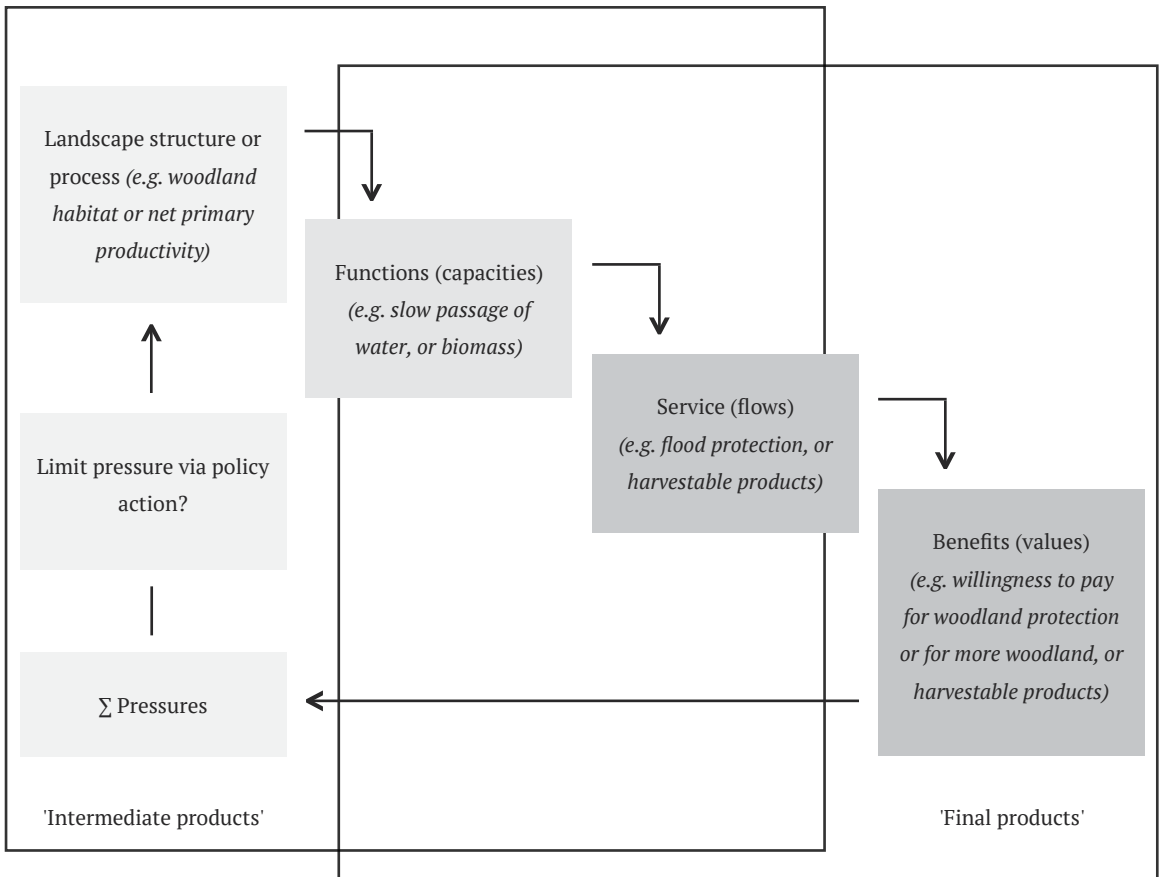
Service cascades concept

A way of representing the logic that underlies the ecosystem service paradigm to be considered by authors relevant for this study is “service cascades” concept shown in Figure 4. The diagram makes a distinction between ecological structures and processes created or generated by living organisms and the benefits that people eventually derive. However, the key point is that there is a cascade linking the two ends of a ‘production chain’. The idea is best illustrated by an example.

The presence of ecological structures like woodlands and wetlands in a catchment may have the capacity (function) of slowing the passage of surface water. This function can have the potential of modifying the intensity of flooding. It is something humans find useful – and not a fundamental property of the ecosystem itself – which is why it is helpful to separate out this capability and call it a function. However, whether this function is regarded as a service or not depends upon whether ‘flood control’ is considered a benefit. People or society will value this function differently in different places at different times. Therefore, in defining what the ‘significant’ functions of an ecosystem are and what constitutes an ‘ecosystem service’, an understanding of spatial context (geographical location), societal choices and values (both monetary and non-monetary) is as important as knowledge about the structure and dynamics of ecological systems themselves.

In following the cascade idea through, it is important to note the particular way that the word ‘function’ is being used, namely to indicate some capacity or capability of the ecosystem to do something that is potentially useful to people. The second important idea that the cascade concept highlights is that services do not exist in isolation from people’s needs. We have to be able to identify a specific benefit or beneficiary to be able to say clearly what is, or what is not, a services. The identification of what is an ecosystem service depends on context because they are “contingent” on particular human activities or wants. (Young, R.H., Potschin, M., 2010).

According to the above mentioned service cascade concept, the biophysical structure (forest) offers the relevant functions having its effects on mind and body. On the psychological side, for example, light and colour conditions are a contrasting experience to the city and on the physiological side the climate (lower radiation intensities, reduced humidity in contrast to the open field) leads to the service (mental recreation or restoration). This effects health and is a benefit. Thus, the health fostering effects are not assigned to the ecosystem services, but as a result of the providing, regulating, and cultural services they are a benefit. Sustainable forest management planning should search for possibilities into how the biophysical structure – forest with its functions - may lead to the services effecting health benefits.



— **Figure 4: The relationship between biodiversity, ecosystem function and human well-being (Young and Potschin, 2010)**

3.3.1.2 Conflicts of interest

A high number of people present at the same time in the forest, possibly doing several activities, may deter visitors (Arnberger and Haider, 2005a; Arnberger, 2006; Arnberger and Brandenburg, 2007; Arnberger and Haider, 2007; Arnberger and Eder, 2011b; Arnberger and Eder, 2012; Arnberger et al., 2010a, b). This ascertains that there are two major conflicts in recreational spaces (Pröbstl et al. 2010; Bafu and WSL, 2013; Cervinka et al., 2014; Rametsteiner and Kraxner, 2003), which might be relevant for people visiting the forest for health promotion, rehabilitation and therapy:

- Conflicts between forestry, hunting, nature conservation and recreation
- Mutual conflicts between people looking for rest and relaxation

Both types of conflicts negatively influence forest visitors' experiences. Pröbstl et al. (2010) found that conflicts between recreation and forestry occur mostly in countries with a low area of forest or those with highly productive and intensively used forests (UK, Scandinavia) (see also Irvine et al., 2016). Conflicts between recreational users and other user groups were most commonly reported in densely populated countries (Denmark, Belgium).

In 2009, the public opinion survey across the EU-27 of more than 11,100 randomly selected European citizens found that the public perception of the general condition of European forests is much worse than in reality. For that reason, forest utilisation aspects were generally ranked less important than forest conservation and forests' protective functions (differently in the Nordic/Baltic region) (Rametsteiner et al., 2009; Rametsteiner and Kraxner, 2003). Hence, there is high public sensitivity concerning the use of different forest management systems and technologies.

If we change the perspective from the land manager's to the visitor's view, forestry operations (including timber harvesting) take place in their perceived recreational space. Different harvesting technologies have a diverse impact on forest visitors. Even when there is high public awareness of the importance of the utilisation of wood, as can be found in Switzerland (Bafu and WSL, 2013), recreational forest visitors are seeking tranquillity in forests. Thus, they are usually unwilling to see huge forestry machinery such as harvesters in the forest. Depending on the country, for highly frequented forests near urban areas alternative solutions need to be considered to gain a higher public acceptance of timber harvesting operations. To increase the preference of forest visitors for forests, signs of forestry operations should be avoided (Edwards et al., 2012; Koole and Van den Berg, 2005; Korpela et al., 2010; Nielsen et al., 2012; Van den Berg and Koole, 2006). In particular, harvest residues (woody debris and soil erosion) and clear cuts are unpopular amongst visitors (Edwards et al., 2010; Edwards et al., 2012; Gundersen and Frivolt, 2011; Kearney and Bradley, 2011; Ribe, 2009; Silvennoinen et al. 2002; Ribe, 1989).

The urban population generally tends to lack understanding regarding harvesting timber or the importance of primary production in general. However, recent years have witnessed an increased awareness for nature conservation. Due to fairly long rotation periods typical for the majority of Europe's forests, misunderstandings of the role forests and forestry fulfil are common. Urban people rarely differentiate between commercial and non-commercial forests. Conflicts of interest between the recreational use of forests and production forestry, hunting and nature protection call for proper coordination and management of visitors.

Contrary to the tendency of low sensitivity and awareness towards forestry in general, there is still a relatively high level of public confidence and acknowledgment towards the local foresters, especially in rural areas where foresters are well known to a local community. Personal contact could ease a lot of ensuing conflicts. Unfortunately, the majority of forest visitors do not know their local forester (Suda, 2017) and, due to rationalisation in the forest sector, the size of the district managed by one forester has generally increased (depending on the country). Also, wood is increasingly considered an environment-friendly and healthy material with a high level of acceptance and demand by the public. The problem is that people clearly prefer wooden products in their homes and offices but do not accept forestry operations and harvesting in the field. These issues highlight the importance the public relations activities of forest enterprises and require effective communication and awareness raising campaigns.

— 3.4 Forest landscape planning inclusive of social aspects

3.4.1 Inventory and monitoring of recreation demands

As mentioned above, in most European countries there is free public access to forests for a recreational purpose. From the perspective of landscape planning, one of the challenges is the monitoring of forest visitors and their recreational demands in different regions. Demands for recreation in forests are also changing with the demographic structure and global development. The location and type of forest setting affect the priorities of visitors as well as their willingness to accept different types of forest management. However, for effective sustainable forest management, planning and monitoring of recreational demands are both necessary and need to be based on credible background data for sound future decision-making. That is why the monitoring of visitor numbers is crucial for strategic and operational forest management planning. The aim of the monitoring is: (i) research their preferences for different forest settings related to human intervention and existing biodiversity (e.g. tree species composition, forest stand density, age structure, management practices, etc.), (ii) to define the forest areas designated for visitors.

Numerous techniques and methods of monitoring visitor flows are known (Cessford and Muhar 2003). Selection of the proper method has to reflect its technical and personal requirements. Comprehensive knowledge of technical and methodological options, their costs and their respective advantages/disadvantages is a prerequisite for sound decision-making (Arnberger et al. 2005b). Monitoring design has to consider the area to be surveyed (e.g. a forest management unit) and its location within the landscape to decide on the most suitable monitoring method to identify spatial and temporal patterns of recreational use. Aerial photography (UAV or airplanes), video recording, time-lapse photo/video direct observation methods and various kinds of sensors are technically demanding, while roaming or fixed-location staff and on-site (face-to-face) interviews are more personally demanding. Self-registration, trip permits and bookings or entrance fee payments are useful sources of data on visitors as well. Recording and storing devices and modern energy supply can provide continuous quantitative data for longer periods. This kind of information can assist forest managers to schedule forestry operations in sensitive areas. Unfortunately, these more technically oriented methods provide limited or inferred information on visitors' preferences. On-site interviews are mainly time limited as they are done in preselected periods of the year. It requires more precise planning to make quantitative data gathered from time sampling applicable to a whole tourist season or a year. On the contrary, face-to-face observation provides valuable data on visitor's preferences regarding forest types, structure and composition, as well as non-forest landmarks within forests.

Following this, a combination of technical and personal observation is probably the most suitable option for forest managers to make informed decisions. This two-phase sampling can be divided into "technical" and "personal" phases. Technical devices used throughout the year (tourist season) can provide quantitative data on visitor numbers and the purpose of their visit (jogging, tourism, cross-country skiing, mushroom/berry picking etc.), age groups and gender of visitors. Recorded visitor interviews can specify a visit purpose, preferences, routes and spatial interests within the surveyed area. This second phase can be implemented during short periods within the year or tourist season. Obtained data will greatly contribute to an understanding of the impacts of forest management activities on the recreational value within participatory decision (see Chapter 3.4.5).



3.4.2 Forest preferences and shaping forests to enhance health benefits

From a forest management planning perspective, it is important to understand what type of forests people prefer for different health activities. Reviews of forest preference studies demonstrate that people tend to prefer forest scenes that exhibit a high number of large trees of different ages and species with an understory composed of low, sparse ground vegetation. Without appropriate background information about the value of habitat structure, dead trees and shrubs commonly elicit more negative preference ratings. In line with these results, field/forest scenes that exhibit higher visibility and physical accessibility tend to have higher preference ratings. Hence, human activity and management methods, as well as the level of biodiversity, influence the appearance of forests and seem to be relevant to preference (Eriksson et al., 2012).

As for human intervention, studies of forest management strategies have generally shown that more natural-appearing forests are preferred whereas those with obvious signs of forest management, such as clearcuts, are not (Ribe, 1989). Managed forests with smaller paths or trails may furthermore be preferred over completely natural forests (Van den Berg, Kooles, 2006).

3.4.2.1 Different forests and land cover types

There are relatively few studies comparing the restorative effects of different forest types: Martens et al. (2011) reported on a stronger change in “positive affect” and “negative affect” in a tended forest compared to a wild forest, the latter having a denser vegetation. Similarly, Tomao et al. (2018) found that stand density and shrubs negatively influenced the perception of the psychological benefits obtained by forest visits (see also Martens 2011). Chiang (2017) however concluded that a dense forest is better suited for attention restoration effects while a medium dense forest vegetation is more preferred. The variation in the effects on psychological wellbeing and restrictiveness between different forest types (e.g. pine forest vs. mixed forest; large urban park vs. extensively managed urban woodland) have been found in other studies as well (Sonntag-Östrom et al. 2011; Tyrväinen 2014).

Apart from the type and density of the forest, the size of the area seems to be relevant to the beneficial effect: larger greenspaces, either parks or urban woodlands, have stronger positive impacts on wellbeing and cognitive performance than small parks (e.g. Akpinar et al. 2016; Tyrväinen 2014).

Concerning the analysis of different land cover types, evidence is mixed: White et al. (2013a) found that woodlands/forests are associated with high levels of restoration. Some studies suggest that land cover classes (e.g. broadleaved woodland; coniferous woodland; semi-natural grassland; etc.) are not significantly associated with differences in mental health between individuals but that e.g. moving to “greener areas” has been associated with mental health improvements (Alcock et al. 2014). Akpinar et al. (2016) on the other hand found that aggregated “greenspace” was not associated with mental and general health, but that respondents in areas with more “forests” reported fewer days of mental health problems. These results suggest that mental health seems to profit from surrounding natural areas but that the question of scale that should be considered might be different between regions and population groups.

3.4.2.2 Forest and landscape preferences

Forest preference studies conclude that people appreciate mature forests with good visibility, some undergrowth and a green field layer with no signs of soil preparation. Forests that are thought to be in their natural state, or that look natural and bear no visible traces of human activity, are usually preferred. Often mature forest where it is easy to walk and where there are large-dimensional trees, is valued for recreational purposes (e.g. Frick et al. 2018). Correspondingly, the view after clear-felling is the least preferred environment (e.g. Kearney and Bradley 2011; Ribe 2009; Gundersen and Frivold 2008). In particular, the large size of the regeneration area and direct traces of cutting, such as signs of soil preparation and logging residues, have a negative impact (e.g. Karjalainen 2006; Silvennoinen et al. 2002).

On average, people do not prefer dead or fallen trees (e.g. Gundersen et al. 2017; Gundersen and Frivold 2011; Tyrväinen et al. 2003), if they are not informed about their value for biodiversity (Broderbauer, 2015; Tyrväinen et al., 2016). Preferences towards forest management, however, depend on personal characteristics and previous forest experiences (e.g. Kearney and Beadley 2011) along with the outdoor activities performed, thus, it is important to investigate forest landscape preferences of the actual users. The landscape’s characteristics and scenic beauty are affected by the seasonal appearance of vegetation and the amount of snow and therefore the environment may change considerably with the season (e.g. Tyrväinen et al. 2017; Ahas et al. 2005).

People have been found to prefer low biodiversity scenes of open areas with groups of bushes and trees rather than high biodiversity scenes of dense vegetation, leading several researchers to suggest that there is a conflict between biodiversity and visual aesthetics and that people would be less likely to visit high biodiversity settings (Nassauer, 1995, Parson, 1995, Gobster, 1990). For example, Gundersen and Frivold (2011) found that a respondent sample in Norway rated forest scenes with deadwood lower compared to scenes with little or no visible deadwood, indicating that people may prefer forests with lower levels of biodiversity. However, access to ecological information about the forest scene resulted in a higher rating of the scenes with deadwood.

3.4.2.3 Environmental quality and facilities

In their review van den Berg et al. (2015) concluded that, due to a lack of studies, it is not yet possible to draw conclusions about the (direct) influence of the quality of greenspace on health. However, from a residents' perspective, a relevant issue for using the forests is not only their accessibility, but also the environmental quality and diversity of opportunities for activities and nature experiences that are offered nearby everyday living environments (e.g. Tyrväinen et al. 2007). Perceived qualities of greenspaces, such as the attractiveness of the landscape, peace and quiet, species richness and cultural features have been positively associated with PA (Björk et al. 2008). In addition, factors such as the size and the connectivity of nature areas, the attractiveness and diversity of the landscape, as well as versatile outdoor recreation possibilities and services (i.e. parking lots, lighting, recreation trails, bike racks, resting places, playgrounds) (e.g. Kaczynski et al. 2014; Chastin et al. 2014; Schipperijn et al. 2013). Moreover, over-crowding in a green area may prevent people from visiting the area (Arnberger and Mann 2008).

Some authors, mostly from Japan, claim that most forest sceneries provide positive effects on human well-being. Park et al. (2009) showed equally positive effects in 28 different forest types. In contrast, Allex et al. (2017) found meadows embedded in the Viennese woods to be the best restorative environments in terms of recreation, stress reduction and perceived restoration of attention with forests ranked second. Also, mountainous areas play an important role in health promotion and disease prevention due to the natural scenery and remoteness (Yoo, 2007; Mao et al., 2012). Intense climatic stimuli and an environment that is often perceived as unusual and, therefore, very interesting (e.g. moors, springs, stone pits) can be found in such surroundings (Naumann, 2017). Therefore, it is important to keep viewing areas in forests free of obstacles to adapt the design to visitor preferences.



3.4.2.4 Preferences on forest management and human interventions

The attitude to forest management strongly depends on the real preferences of actual forest visitors (Tyrväinen, 2016). Therefore, user groups and performed activities should be analysed to give recommendations for suggested preferences (Kearney and Bradley, 2011; Gundersen et al., 2015). Even-aged, middle-aged and mature forest stands were found to be favoured by forest visitors in Finnish Lapland (Tyrväinen et al., 2016). Martens et al. (2011) found that, even for those participants that favoured unmanaged forests, the well-being increased more in a tended forest. Hence, silvicultural treatments can increase the recreational value of managed forests. Mattson and Li (1994) showed in the Swedish province Cästerbotten, dominated by spruce and pine, that the recreational value of forests can be enhanced by a shift from clearcutting with artificial regeneration to natural regeneration. However, this preference for natural regeneration might be associated with raising awareness about environmental aspects (similarly as with biodiversity and deadwood) rather than real experience in the field. Naturally regenerated forest stands are denser, which in many cases leads to low accessibility and visibility of forests and this factor is contradictory to the above-mentioned statements.

The same effect was achieved by reducing the share of spruce and favouring broadleaved species. Remaining shelter trees increased scenic values. Upton et al. (2012) showed similar results for Ireland and Rametsteiner and Kraxner (2003) for the United Kingdom, where mixed forest stands are preferred for recreation. Juan et al. (2001) concluded the same: diversity of tree species, including hardwoods, is important and intensifies awareness of seasonal changes.

Bostedt and Mattson (1995) added that reducing the size of clearcuts can potentially increase recreational values of forests. This confirms the theory that human evolution made people prefer half-open landscapes by providing safety and resources. Lower densities of stems and high crowns increase the view, the sense of direction and an increase in available light leads to a higher preference and physical relaxation (Staats et al., 1997; An et al., 2004; Hill and Daniel, 2007; Stoltz et al., 2016). Long crowns might also protect against weather which enhances feelings of safety (Lohr and Pearson-Mims, 2006).

Appropriate forest management activities lead to more light and visible forest scenery as well as to a reduced amount of deadwood. This is the forest scenery which visitors seem to prefer, according to Bauer and Martens (2010), because it is believed that people have a preference for less dense and dark forests (Martens et al., 2011). On the other hand, aiming at low volumes of deadwood would not comply with promoting forest biodiversity (Rathmann and Beck, 2017). After explaining its value concerning nature conservation to the visitors, lying deadwood is considered safer and can even improve the nature experience (Bröderbauer, 2015; Tyrväinen et al., 2016).

Edwards et al. (2010) and Ribe (1989) stated that also mature and over-mature forests are perceived as beautiful and contribute to the well-being of forest visitors as long as they show a certain degree of openness. This is consistent with the recently planned network of old growth forests in Spain, the recreational effects occurring in nature reserves and the idea of wilderness therapy (Esser, 2017; Fredman and Tyrväinen, 2010; Menton-Enderlin, 2017).

In many cases, forests used for recreation need to be managed for safety reasons, especially along the visitor pathways. Shelterwood cutting, strip cutting and group felling together with continuous cover forestry (including single tree selection) are the management options aesthetically preferred by visitors according to Ribe (1989; 2006; 2009), Gundersen&Frivold (2008) and Edwards et al. (2010). Therefore, it is challenging to manage forests in a manner to make them look cared for but still close-to-nature (Bell et al., 2009).

The demand for a wide view and long crowns is usually satisfied in older forest stands without dense undergrowth. This is typical in mature forest stands. After first compulsory utilisations of trees, the stocking is reduced and more light can penetrate the stand. However, natural regeneration will take over within a few years and, one or two decades later, the undergrowth, will reduce the view on the whole forest. Appropriately applied single tree selection systems usually create forests with a more differentiated structure and denser stocking than any other silvicultural system, which makes forests attractive from outside but with a reduced view inside the forest.

Even when there is a high public awareness about the importance of timber as a renewable material, as can be seen in Switzerland (Bafu and WSL, 2013), recreational forest visitors are still seeking forests for their tranquillity. Thus, they are often unwilling to accept huge forestry machinery like harvesters in forests. Depending on the country, for highly frequented forests near urban areas, alternative solutions for timber extraction might include traditional horse logging or using a cableway line transport of timber to avoid soil erosion and compaction.

3.4.3 Recreational infrastructure, facilities and services

Each element that makes forests accessible to visitors can be seen as infrastructure and should be recognised as a service provided by a land manager, ideally in shared responsibility and in collaboration with other partners. Many activities in forests are bound to these services (Bernasconi, 2008). Parking spaces and sanitary installations are often the first step in developing certain areas and are important for a certain level of comfort and in attracting people. Depending on the target group and its familiarity with natural settings, there might be the need for a higher standard of infrastructure. Immobile visitors, people in wheelchairs or those that rarely go to forests might prefer asphalted paths for practical reasons and feeling safe. On the other hand, such infrastructure might reduce the positive effects of forests for people preferring wild nature. The majority of outdoor enthusiasts looking for untouched nature will prefer unsealed paths. Periodic maintenance of recreational facilities in forested areas is crucial for attracting visitors. To make forest visitors feel safe the following principles may be implemented.

A wide view, cleared waysides, orientation signage and a levelled ground made suitable for walking instils a feeling of well-being and increases the recreational value (Herzog and Kutzli, 2002; Herzog and Leverich, 2003; Herzog and Kropscott, 2004; Herzog and Kirk, 2005; Ward and Thompson et al., 2005; Martens and Bauer, 2010). It is also possible to give the forest visitor a feeling of refuge to influence the sense of safety (Appleton, 1996). For example, this can be achieved by facilities like shelters protecting against natural elements. It is also important to combine these elements in a proper way. Sceneries low in prospect but high in refuge increase stress and attention fatigue (Andrews and Gatersleben, 2010; Gatersleben and Andrews, 2013). Visitors prefer a high feeling of prospect combined with some refuges. Especially for running trails, a lack of light should be avoided (Janeczko et al., 2017).

Schaffner and Suda (2008) made a survey of 600 German forest visitors and concluded that, in general, no special facilities were necessary for recreation in forests. The validity of this statement is limited because the interviewed persons were already forest visitors. A Swiss telephone survey in 2010 included over 3,000 randomly selected people and was repeated after 13 years (Bafu and WSL, 2013). People were found to be less satisfied (measured as an outcome of several other questions) when there was intensely used infrastructure for other visitor groups (e.g. horse riding trails). Facilities like forest huts or refuges enhanced the satisfaction, as well as water bodies. The majority of respondents (76%) wanted the number of recreational facilities to remain unchanged. The share of people demanding fewer facilities (15%) was higher than the share of those demanding more (9%). Those who demanded an increase in facilities wished for sitting benches, fire places and playing areas. Compared to the 1997 survey, there was no statistically significant change. This low demand, in general, complies with the conclusions of Schaffner and Suda (2008). Schaffner and Suda (2008) recommended to limit infrastructure because it could side-track the visitors from the forest itself. The infrastructure should be adjusted to the target group and should be divided into different zones (Steingrube et al., 2015). Too many different installations on little room might encroach on each other (Bernasconi, 2008). A study of Morris and O'Brien (2011) within the framework of the "Active England" programme showed that recreational facilities in the right amount attracted visitors in general. From the perspective of forest visitors searching a peaceful environment for health promotion, rehabilitation, therapy and recovery from stress and pressure, the appropriate quantity of infrastructure is important. However, in case of therapeutic use in specific medical indications, a more significant factor is the attendance of accompanying persons rather than the quantity of infrastructure. Treatments should be delivered by trained therapists in the forest to be able to positively affect the treatment of diseases as well as the extent of the disability caused by the illness.

Infrastructure and facilities can, on the other hand, increase the attractiveness of forests for new target groups, which would not visit forests without these facilities. The individual needs are often contradictory and target groups have to be defined (Bernasconi, 2008). Lee and Hong (2017) investigated visitor satisfaction in the National Healing Forests of South Korea and proposed to differentiate programmes by the age and health condition of the users and by "meeting the usage characteristics (e.g. the objective and the experience of a visit)".

Zhang et al. (2015) noticed that the composition of natural features and elements of infrastructure along visitor paths had a considerable impact on the respective experiences. Paths should be selected or planned in a way that the visitor reaches highlights like observation towers at the end. Quiet places that provide the possibility to touch natural objects should be located closer to the starting point, where the visitor is full of beans. Ideal trails can be built to connect places with a high restorative potential identified scientifically. Cervinka and Schwab (2017) called these types of paths "restorative trails" and found significant increases in connectedness to nature and mindfulness of the subjects after the visit.

Required recreational facilities should be tailored to the defined targeted group of visitors. Additionally, barriers outside the planning scope, whether physical or mental, have to be tackled beforehand. This might require cooperation with various municipal organisations (Cervinka et al., 2014). Based on Steingrube et al. (2015), possible recreational facilities might include the following:

Basic requirements:

- Traffic calmed areas
- Rescue points
- Water bodies and viewpoints (if possible)

Surroundings (if possible):

- Parking spaces and sanitary installations
- Waste management
- Health and wellness centres
- Restaurants and other eateries
- Information centres

Signposting:

- Direction signs with distances and listed attractions, maps
- Nature/education trails (health, history, etc.)

Path network:

- Different levels of difficulty
- Partly barrier-free
- Adapted soft walking surface (e.g. asphalt, gravel, mulch)

Other facilities:

- Sitting options, benches, tables, tree stems, stone blocks
- Reclining options (sunbeds, hammocks)
- Shelters
- Observation towers, climbing trees, etc.

Visitors prefer recreational infrastructure which is built from local resources (Nielsen et al., 2012). Benches, tables, sunbeds or bridges can be made locally out of tree trunks. It is very important to keep the areas free from waste (Ward Thompson et al., 2005; Cervinka, 2014; Suda 2017; Wölfle et al., 2016). Ideally, this could be made possible by visitor education and without placing waste bins in the woodland.

Access to forest for people with disability and special needs

For people with a disability it is often impossible to get out into nature to enjoy the restorative effects of forests. The ageing of the population increases the number of people with physical disabilities. Even in urban green spaces, the number of people with disabilities is under-represented and a possible health resource is unused. The possibility to participate in outdoor activities and social life are important for human health (Bai, 2017).

Forestland generally means insurmountable hindrances with bulbous roots that lie entangled over narrow, stony and uneven paths. People with walking difficulty often require, for reliable and safe access, level surfaces that are not slippery or slope too much either longitudinally or laterally. In addition, distances must be short, benches for resting must be available and also guide-rails to give support to those with poor balance. Walking aids may take the form of a walking stick, a walking frame or another person's arm on which one can lean.

Many European countries pledged to comply with the UN's Standard Regulations for people with disability. The fundamental philosophy behind this is to create participation and equality for people with disabilities throughout all of society. It is our common responsibility to build a society where people with disabilities have similar rights and possibilities as other citizens.

To tackle this issue, a manual "Access to the forests for disabled people" was produced by the National Board of Forestry in Sweden as part of the Swedish-French EU/LIFE project Urban Woods for People 2001 – 2005. This manual provides practical advice on how such technical obstacles can be removed or altered, how to plan paths and tracks, information boards and signs or parking in order to allow access to forests also for people bound to a wheelchair or with some other disability. It is aimed at professional foresters and managers of woodlands, municipal and other landowners, as well as non-profit organisations and others working in sport or recreational activities (Lundell, 2005).

Currently, the majority of the existing barrier-free sites are provided by educational institutions or large-scale protected areas (Menton-Enderlin, 2017). Morris and O'Brien (2011) showed that it is furthermore important to spread the information about barrier-free accessibility and to create guided programmes to increase the number of visits of groups with special needs.

3.4.4 Valuation of and payments for forest ecosystem services

One important aim of the Millennium Ecosystem Assessment is to analyse and, as much as possible quantify the importance of ecosystems to human well-being in order to make better decisions regarding the sustainable use and management of ES. Valuation is used as a tool that enhances the ability of decision makers to evaluate trade-offs between alternative ecosystem management regimes and courses of actions that alter the use of ecosystems and the services they provide (MA 2003).

The valuation of forest ecosystem services (FES) can provide information for decision makers at many different levels (Turner et al. 2010). This ranges from national and international policy decisions to regional and sub-regional decisions, and local planning decisions and projects. The challenge in each case is to identify all the ES that will be affected by the decision and to obtain sufficient information to conduct

the ecosystem service assessment, including linking the assessment of changes in service provision to measures of changes in human welfare (DEFRA 2007). Other reasons for undertaking valuation of FES are as follows: to assess (and improve) the overall contribution of forests ecosystems to social and economic well-being, to obtain information about the relative importance of FES and preferences for their provision across and from different stakeholder groups and understand how and why stakeholders use forests as they do, to assess the relative impact of alternative actions, as a decision support tool and identify potential winners and losers when adopting a certain management alternative (Merlo et al. 2005; FOREST EUROPE 2014; Mavsar, Varela 2014).

The role of valuation is to show the contribution of ES to the well-being of people, to increase awareness of existing benefits as well as creating a sense of ownership and commitment among stakeholders. However, evaluations themselves do not determine whether a service should go to market (let alone the questions of who should pay and how much they should pay); for that, negotiations between providers and beneficiaries are often necessary. Economic valuation of FES usually relies on the notion of consumers' willingness to pay for certain services and might become a background for establishing incentive schemes or markets of FES.

Valuation may help in designing mechanisms to capture the benefits of ES and in establishing finance/incentive systems, such as payments for ecosystem services (PES). PES covers a variety of financing arrangements through which the beneficiaries of ES pay the providers for the service.

When speaking about stakeholders, a term covers all those with an economic or socio-cultural interest (buyers or beneficiaries, sellers or service providers, knowledge providers, regulators, donors) (FOREST EUROPE, 2019). Buyers or beneficiaries are those who are willing to pay for an improved or safeguarded or restored ecosystem service. From the human health aspect's viewpoint, the "service provider" is forest owner/manager whose change of management practice can potentially secure or improve supply of the ecosystem service. On the other hand, "beneficiaries" are forest visitors coming to the forest for health promotion, therapy and rehabilitation using curative effects of forest or for forest pedagogy and other educational programmes or nature-based tourism. In this context, important role may play a "buyer", who could potentially be insurance companies, public health system facilities, hospitals, rehabilitation centres, municipalities, sport, tourism or forest therapy associations, tourist operators, etc. (see chapter 4.3.4). As an example, in some countries, such as the UK or Austria, medical services are usually offered in rehabilitation centres and hospitals. Different therapeutic offers in forests are used to improve the rehabilitation and recovery of patients from surgery, illness or injury. Some hospital grounds have forests/woods adjacent to the hospital buildings and within the hospital grounds and these can also be used by patients and staff for therapy or general relaxation (O'Brien, 2014). Social or green prescribing (see chapter 4.3.1. and 4.3.2) is another good example where stakeholders might be insurance companies, hospitals, rehabilitation centres, municipalities, etc.

The type of stakeholder influences the design and implementation of the payment for forest ecosystem services schemes. In this regard, there are three broad schemes: (i) public payment mechanisms (through which government pays recourse to enhance ecosystem condition and services on behalf of the wider public), (ii) private payment mechanism (self-organised private deals in which beneficiaries of FES contract directly with service providers) and (iii) public-private payment mechanism that draws on both

governmental and private funds (FOREST EUROPE, 2019). As an example, the management of a forest landscape which is appreciated as an enjoyable setting for tourism activities or human health promotion, rehabilitation or therapy in forests demands a public management component which can be integrated with both compensation mechanisms to those stakeholders who contribute to the maintenance of the forest landscape and, when viable, with mechanisms requiring payment from those tourist operators who gain indirect advantages from the resource.



3.4.5 Participatory decision

Typically, forest management planning has to consider more than one objective and very often includes several decision-makers. Forests near urban areas in particular are under much pressure from citizens who feel they should have a right to influence management of their favourite places in surrounding forests. They use their local forests for various purposes such as sports, berry and mushroom picking, relaxing in nature, etc. Simultaneously, the forest owners' goals are often completely different. Many forests also harbour valuable habitats and can be under protection. Forest management planning and the use of forest areas is undoubtedly a participatory planning problem (Kangas et al. 2015). Implicit to the endorsement of public participation in forest planning is the recognition that forestry as a specific management intervention either has been changing or indeed needs to change (Buchy, Hoverman, 2000).

Because of a strong interconnection/ interdependency and cross-effects between forest management and local communities, it is clear that participatory planning is an essential part of sustainable forest management. This planning is also a relevant approach to show the contribution of ecosystem services to the well-being of people. It supports better awareness of the existing benefits and creates a sense of ownership and commitment among stakeholders.

Public involvement shall start from the very beginning. The first step should be the identification of locals who are interested in using the forests and all others who can somehow influence, or who are affected by, forest management (Bell et al. 2009). Constantly informing the public about all steps in the planning process is an essential part of participatory sustainable forest management.

Public consultation meetings are the best examples of how to involve stakeholders in participative planning of the management in urban forests. They give stakeholders a chance to express their opinions and wishes, but this approach might not be always the most efficient. Therefore, visitor and citizen interviews should be used to determine public opinions (Kangas et al. 2015). On the other hand, exorbitant public demands for forest recreation and related services (e.g. forest aesthetics, management regimes not disturbing visitors) may be totally incompatible with even limited timber production. Therefore, there is also a need for teaching the public that sustainable forest management has always been a part of forming rural landscapes and that the use of timber products is good for the environment. It will be impossible to balance all three pillars of SFM in forest management planning without increasing public awareness of the complexity of the issue.

In the frequently visited forest areas, people may have preferred places which they like for walking with their dogs or children or for jogging and spending time for health promotion and rehabilitation. That means that the value of a particular forest and its management are more important than how the whole forest area is managed in general (Tyrväinen et al. 2007).

Participatory planning is beneficial for final decisions on forest management because local people might have specific knowledge about particular forest stands which is not included in forest inventories. Participatory planning can also increase the acceptance of forest management activities by the public and thus avoid potential conflicts of interest. It has been noted that a fair process of participation can also make people react less negatively to adverse results for them (Brockner and Siegel, 1996).

Engaging the public in forest planning is just a first step of participative sustainable forest management. All management activities have to be monitored and revised regularly, and consistency with the management plan must be duly inspected (Bell et al. 2009). The communication of all changes compared to the initial plan with the public is an essential part of the successful participative forest management. Of equal importance are regular surveys related to the satisfaction of visitors. All stakeholders must reach the common understanding of management requirements and limits. Ideally, planning process and management activities should be a cyclical process, with the evaluation of the results and the updating of management goals according to the conditions and constraints.

3.4.5.1 Approaches for decision supporting

Forests can provide a large number of ecosystem services including human health promotion to the public while contributing to the income of landowners. Through the variety of site conditions and different economic constraints, forest management should address complex planning tasks in a very detailed way. The complexity of forest management will be even more appreciated, providing human health and well-being aspects are appropriately considered.

With populations and economies growing worldwide, the demands on forest resources are increasing, and sustaining the supply of ecosystem services becomes crucial. As described in Chapter 3.3.1.2.2., through growing public participation in the decision-making process and in the context of increasing conflicts of interest between recreational use of forests or other aspects of human well-being and sustainable forest management, new demands have emerged for tools that support our understanding of forest management issues, and for the development and evaluation of alternative management options.

Decision Support Systems (DSS) are able to solve such complexly structured decision problems by integrating database management systems with analytical and operational research models, thus providing various reporting capabilities. However, while integrating the human health aspects into the management of forests, new perspectives are still appearing. This, however, will require further development of more advanced decision-making approaches and models which will consider human health aspects.

Delivery of recreational and other ecosystem services related to the promotion of human health and well-being are dependent also on the spatial arrangement of forests. For many small private and public owners, DSS might facilitate searching for possible best compromise solutions between different, often contradictory, interests associated with spatial planning and management activities. Moreover, spatial arrangement of forests changes over time. The same applies to new demands on forests, which further complicates the whole decision-making process and provides a reason for a continuous and iterative process. Currently, there is no clear understanding of how to incorporate human health and well-being aspects and recreational services into the spatial optimisation models. Even well implemented spatially explicit DSS, as for example Heureka for Northern European countries, (Horstkotte et al., 2011; Korosuo et al. 2011) and Optimal for Central European countries (Marušák et al. 2015) do not include any recreational or human health and well-being indicators.

Furthermore, not only theoretical background, but also technological advancements are necessary to increase the sustainability of forest management (Bell, 2009). Progress in this field can be achieved through the rapid development of computers and geographic information system (GIS) that can efficiently support the interpretation of common statistical data and visitor counts (Sievänen et al., 2008). Models that describe recreation from a spatial point of view and spatial modes of motion could be helpful tools to avoid conflicts and adapt forest management in the future.

The Forest Research Institute (FVA) of Baden-Wuerttemberg, Germany, has developed such models to optimise the potential of forests as recreational areas and to update the state of the forest function mapping. They included the use of space for recreational purposes, spatial modes of motion and existing recreational facilities, combined with attractiveness and other parameters in this mapping method (Wurster et al., 2017).

The Finnish Environment Institute (SYKE) developed an extensive, nationwide GIS database focusing on outdoor activities within the VIRGIS project to harmonise different databases, including the National Sport Databank of Finland (owned by the University of Jyväskylä), Natural Heritage Services of Metsähallitus GIS data on state-owned resources and the data of 13 regional Environment Centres.

Similar data of a participatory GIS was used by the Finnish Natural Resources Institute to improve the nature based services in the Levi tourist resort in Finnish Lapland during snow-free seasons. The ecosystem

services concerning health/well-being and the favourite places of visitors were identified. The result included aesthetic places as well as places offering edible non-wood forest products to harvest. Hotspots of ecological and perceptual values were finally identified visually by overlapping maps. The outcome was a selection of 20 hotspots that can be used by local tourism enterprises. Guided nature tours, including collecting wild food, are planned at the moment (Uusitalo et al., 2017). This can contribute to raising the attractiveness of forests, offering guidance to visitors and also to reducing the impact on forest ecosystems.

— 3.5 Conclusions and policy implications

European society is becoming influenced by global trends and demographic changes, such as urbanisation, which have not only physical, but also economic and socio-cultural implications. As a result, the relationships between society and forests are changing and forest management, defined as structural intervention in forest ecosystems, has to adapt to changing societal pressures and demands. Modern forest management planning has to consider more than one management objective and its process very often includes several stakeholders and decision-makers who often have very diverse, sometimes even contradictory interests requiring the provision of a broad range of ecosystem services. The concept of sustainable forest management has, on a pan-European level, made remarkable progress in this regard. It is based on the three pillars of sustainability covering economic, ecological and social aspects thus matching public demand for all ecosystem services. The importance of multifunctionality of forests and full integration of social functions of forests such as recreation, tourism and human health and well-being has been acknowledged by the recent policy commitments at the pan-European level.

The provision of social functions of forests is, therefore, becoming an increasingly important part of forest management in many European countries. The multitude of demands and expectations inevitably generate conflicts. These conflicting demands put a new pressure on forests and forest managers and it is envisaged that the trade-offs between maintaining timber production and creating areas suitable for recreation, sports and rehabilitation from stress-related diseases will become very important in the future. Therefore, these aspects should be taken into consideration and integrated into forest management planning which represents, in the majority of cases, a participatory process involving citizens, businesses, organisations and other parties having interests within the respective forest tract or its vicinity.

There are not only societal demands that influence forest management planning. First and foremost, there are forest owners and forest managers who do so through their legal property rights (very diverse across Europe) and their willingness to make forests accessible for recreation and leisure activities. Today, 90% of European forests and other wooded land are available for recreation. (Forest Europe, 2015). Overall, forest ownership in Europe (excluding the Russian Federation) is balanced; 44% of Europe's forests are publicly owned, whereas 56% are under private ownership (UNECE, 2019) and, in the majority of countries, the attitudes towards forest visitors differ between these two categories. Management of a forest landscape, which is appreciated as an enjoyable setting for tourism activities or human health promotion, rehabilitation or therapy, demands a public management component. This can be integrated with both compensation mechanisms to those stakeholders who contribute to the maintenance of the forest landscape (forest owners/managers as providers of a service) and, when viable, with mechanisms requiring payments from those who gain indirect advantages from the forest resource (buyers and beneficiaries).

By “beneficiaries”, the authors refer to forest visitors coming to the forest for health promotion, therapy and rehabilitation, using curative effects of forest or for forest pedagogy and other educational programmes or nature-based tourism (Figure 5). “Buyers” could potentially be insurance companies, public health system facilities, hospitals, rehabilitation centres, sport, tourism or forest therapy associations, tourist operators, municipalities, etc.

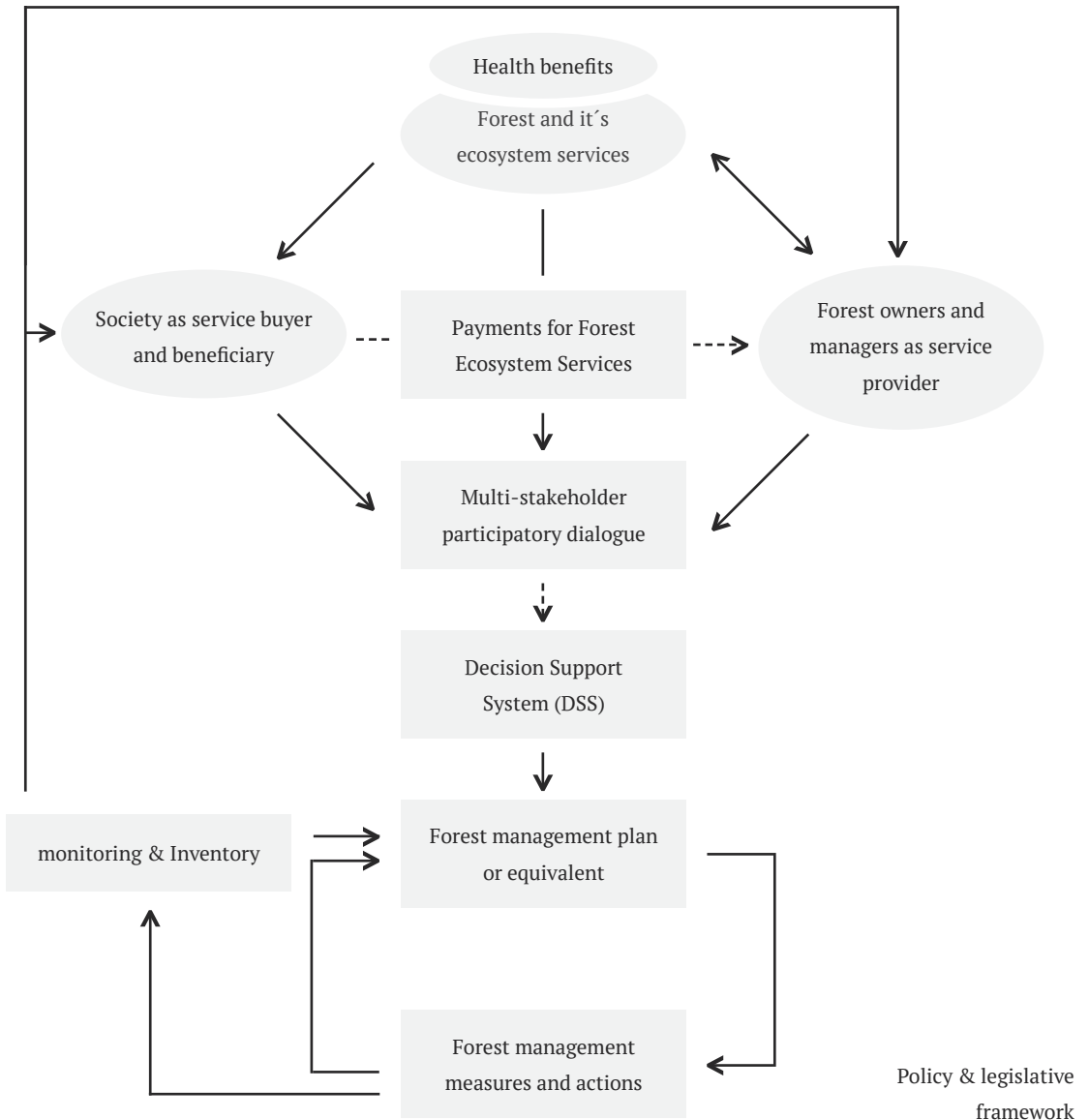
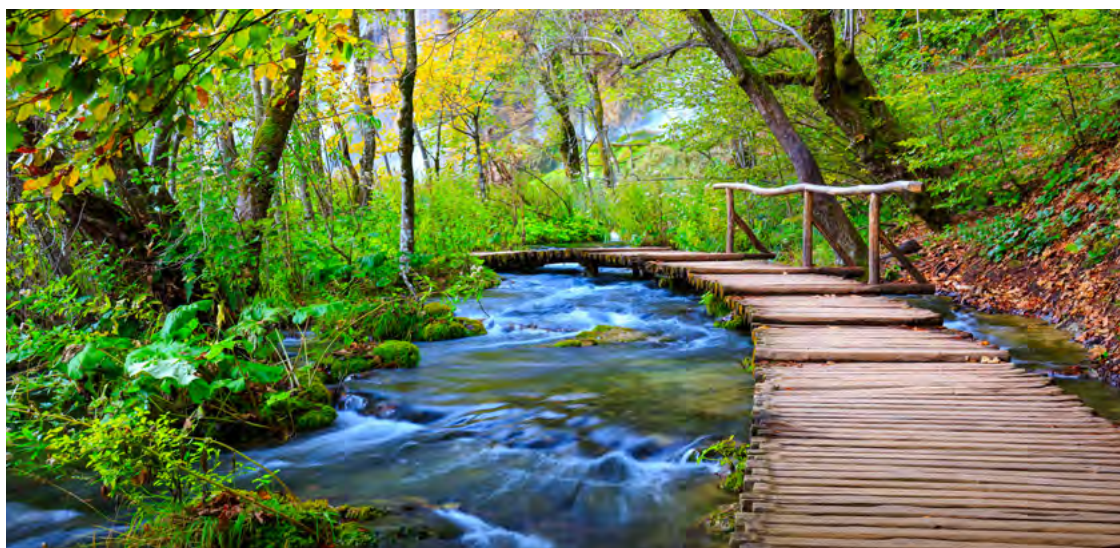


Figure 5: Multi-stakeholder participatory forest management planning as a key element for the integration of human health benefits and other social aspects

Forest owners/managers applying the process of participatory planning, can change management practices and thus potentially secure or improve the supply of ecosystem services required by society or stakeholders. Forest preference studies have shown that people appreciate forests with good visibility, some undergrowth and a green field layer with no sign of soil preparation and no traces of human activity (natural look). Based on data obtained from the forest inventories and monitoring, forest managers better understand the demands as well as impacts of forestry measures on the recreational values of forests. Appropriate infrastructure, amenities and facilities are to be recognised as services often provided by forest/land owners for society, but ideally they should be provided (built and managed) in collaboration with other partners and shared responsibilities.

In this context, willingness to create partnerships and long-term collaborations might be a key to success. When speaking about human health and well-being, forest owners and managers may engage in cooperation with professionals from the public health care system, education system, sport, recreation, tourism sector and NGOs. The integration of human health aspects and other social aspects into forest landscape planning will, on the one hand, require additional costs for maintenance and special management. On the other hand, these costs can be compensated defrayed through the generation of new green jobs and the diversification of production and, most importantly, these new approaches might contribute to public acceptance of forestry.

This in turn does not just mean that the wider community expects to dictate to the forestry professionals what they should or should not do, but rather that the community recognises that various parts of society could play complementary roles in forest management (Buchy, M., Hoverman, S., 2000). Of equal importance, authors see the necessity of a public awareness campaign, realised by the forest sector, in a bid to promote sustainable forest management as it has always been a part of forming rural landscape, as well as to understand that the use of timber products is a smart solution for the environment. It will be impossible to balance all three pillars of SFM in forest management planning without increasing public awareness of the complexity of the issue. Most important of all the challenges will be to foster the development of genuine collaborative practice and the education of the new generation of foresters with new types of skills, such as communication, conflict management, etc.



Key conclusions

- Integration of, whenever possible, social functions of forests such recreation, tourism, human health and well-being aspects into forest management planning;
- Innovative participatory process of forest management planning engaging a broader range of stakeholders;
- Further strengthening of multifunctional sustainable forest management;
- Incorporating payments for forest ecosystem services related to human health into national monetary systems;
- Creation of an effective legislative and institutional framework to allow and promote payments for ecosystem services, including their monitoring and flexible adaptation to the changing economy and environment;
- Search for new financial sources of payments for ecosystem services or compensations of increased costs resulting from their free provision.
- Further research in the field of payments for particular ecosystem services and other financial tools for their support.
- The improvement of the willingness of private forest owners to provide their forest areas in one of the major challenges of the next years and has to be stimulated by funding incentives, assistance and encouragement;
- Monitoring and inventory of forest visitors' demands and preferences;
- Analysing the stakeholders and identification of main beneficiaries from and main providers of human health and wellbeing related services.
- Management of forest visitors to ensure their safety and avoid adverse environmental impacts;
- Collaborative practice in the building and maintenance of infrastructure, amenities and facilities in forests;
- Full public recognition of all services delivered by forest owners achieved by joint public awareness-raising measures;
- Public awareness about the health benefits of forests;
- Public awareness campaign realised by the forest sector in a bid to promote sustainable forest management;
- Training and education of forest professionals to gain news cross-cutting skills.

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4

Health benefits of forests: opportunities for the forest sector

Authors: Markus Sallmannshofer, Dirk Schmechel, Liz O'Brien, Franziska Krainer, Ľudmila Marušáková

— 4.1 Introduction

Chapter 2 of this study summarised research evidence associated with effects and exposure to forests for physical health and mental well-being as well as social benefits for people. The review acknowledged that these effects are positive, especially in terms of health promotion, prevention and therapeutic effects. However, in order to prove healing/curative effects of forests it is evident that more research is needed in the future.

The development and implementation of different strategies, focused on promotion of positive effects of forest landscapes on human health, covers a broad range of concepts and approaches: newly identified forms of relaxation, such as mindfulness, combinations of different types of forest recreation for health purposes as well as various types of therapies associated with forests. It also includes various types of activities and programmes carried out in wooded land which often require well designed facilities and amenities in carefully identified areas.

The multi-functionality of forests, as required by ministers in Oslo (see Chapter 3 for more information), provides multiple opportunities for the forest sector to offer new types of services in order to obtain additional income and develop new green jobs, but also to illustrate how the multi-functionality of forests works on the ground. The opportunities associated with the positive effects derived from forest ecosystem services need to be better promoted through the sustainable forest management.

The sections of this chapter illustrate a vast range of concepts for utilising the beneficial effects of forests for human health and well-being. Sections 4.2 and 4.3 describe approaches that mainly focus on forests for health promotion or therapeutic interventions. Sections 4.4 and 4.5 are mapping programmes and interventions that primarily follow objectives other than health promotion, but are broadly recognised providing indirect health benefits as synergy effects or are integrated in other fields, such as education, recreation and tourism in forests.

The sections are structured according to the potential number of users and the intensity of using forests for health and well-being. Interventions focused on health promotion and disease prevention reach higher numbers of participants, whereas therapeutic interventions involve those who are already ill (Figure 6).

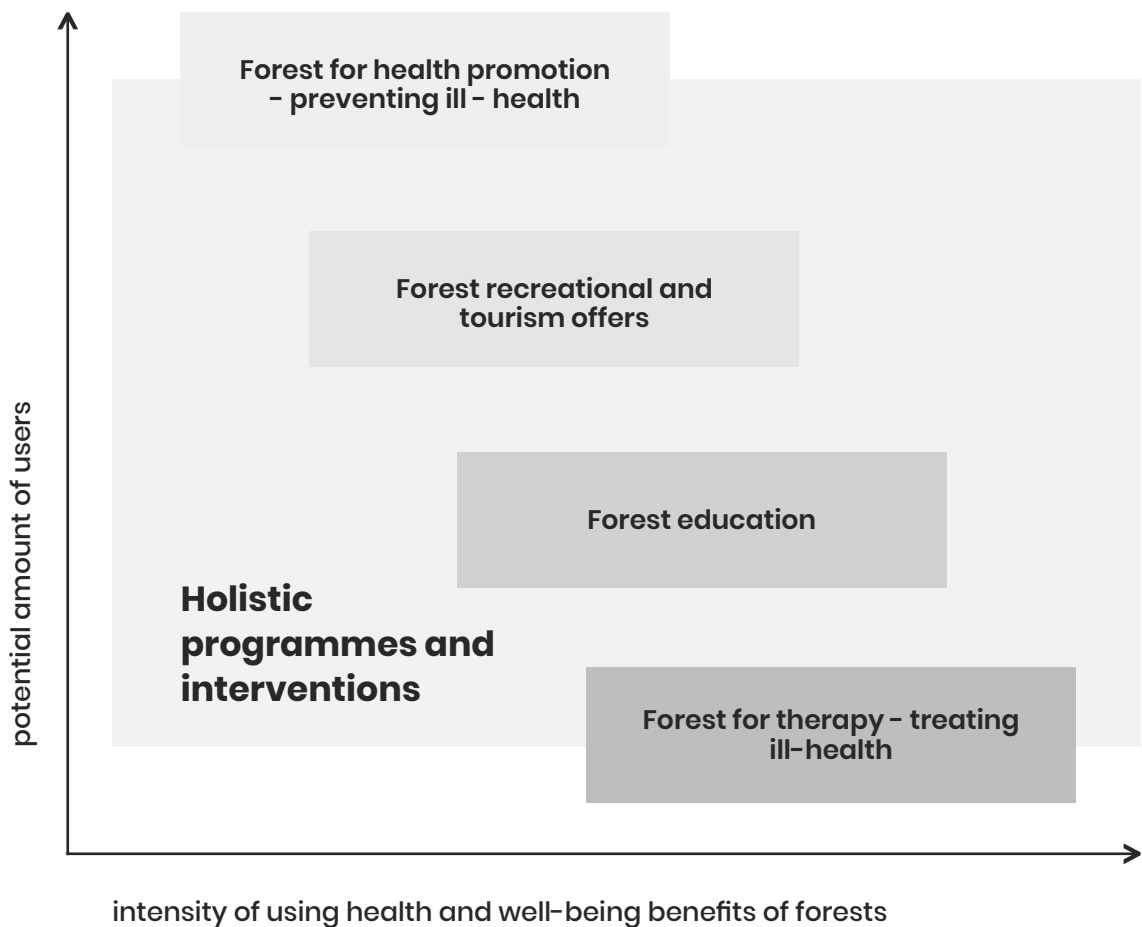


Figure 6: The potential amount of users and the intensity of using health and well-being benefits of forests (modified from SITRA (2013)).

The terminology and concepts used to describe the various opportunities in this chapter differ significantly in various countries. As an example, “forest bathing” and “forests for mindfulness” share similarities in encouraging participants to focus and concentrate on the present moment, not to be distracted by other thoughts and to experience forest via all senses. Another example is the term “Green Care” (Sempik et al., 2010), which is, in several European countries, considered as a holistic concept that encompasses different interventions ranging from horticultural and animal assisted therapeutic interventions to programs supporting several other approaches aimed at improving human health (Section 4.6.4). Social forestry is also sometimes used as a holistic term that can describe “structured measures that aim to strengthen emotional and social skills and to promote health in specific target groups” (Cervinka et al., 2014). In some social forestry approaches, target groups include people with specific needs: with disabilities, disadvantaged people or specific target groups where a more balanced or integrated approach is needed (women and girls, migrants, people over 45 or under 16 years of age, as well as people on low incomes).

If required, specific activities tailored to the needs of the target group are conducted in woodlands and usually guided by experts who have special training. Social integration can be enhanced by promoting “the participants’ health, self-esteem, self-assurance and concentration levels” (Cervinka et al., 2014). Disabled people, women and children, immigrants and older people aged 45+ are often targeted to benefit from social forestry programmes (Cervinka et al., 2014).

Within this chapter, good practice examples to illustrate how some of these opportunities came into reality in different countries are presented. The examples are taken from literature or internet reviews, or by using the personnel contacts of the FOREST EUROPE Expert Group on Human Health and Well-being members.

As presented in the introduction, examples cover the 46 FOREST EUROPE signatory countries. Therefore, the FOREST EUROPE Expert Group on Human Health and Well-being, consisting of 25 experts representing 15 countries and international organisations contributed. To establish a coherent set of examples, key criteria were identified (Table 1). As an example, health improving therapies in forests should be conducted in collaboration with scientific and medical institutions. The effectiveness of these therapies has been confirmed by medical and other evidence, but this criterion is not of prime importance for recreation and other outdoor pursuits in forests supporting healthy lifestyle. The criteria in Table 1 were identified as important in the provision of good practice examples and the examples should have a clear reference to a specific target group.



Section

4.2 Forest for health promotion – preventing ill-health

4.3 Forest for therapy - treating ill-health

4.4 Forest education providing indirect health benefits

4.5 Forest recreational and tourism offers providing indirect health benefits

4.6 Cross-sectoral cooperation, green jobs, and added value for forest owners

Criteria

Transferability to other regions	X	X	X	X	X
Evidence based or scientifically supported	(X)	X	X	/	(X)
Other quality management for ongoing improvement (e.g. feedbacks)	(X)	(X)	X	(X)	X
Financial profit by the forest owner	(X)	(X)	X	(X)	(X)
Local added value in the region	(X)	(X)	(X)	X	X
Target group definition and orientation	X	X	X	X	X
Suitable qualification of employees (at least nature- or health sector)	(X)	X	X	/	X
Publication or some sort of evaluation (e.g. written up as grey literature)	X	X	X	X	X

“X” – mandatorily required

“(X)” – preferable

“/” – not required

— 4.2 Forests for human health promotion and disease prevention

This section describes concepts and opportunities directly focussed on providing health benefits for a large and inclusive population to prevent diseases and ill-health.

Health benefits can be provided without direct intervention - just by making forests accessible for recreational use. More information about public access to forests is contained in Chapter 3 - Human Health and Sustainable Forest Management. Well planned, designed and managed infrastructure can, however, increase the suitability of the environment for some target groups (e.g. viewpoints, wooden infrastructure, cycling and walking trails).

4.2.1 Curative and healing forests and healing forest trails

The idea of spending time in a natural environment due to its restorative and therapeutic effects has been broadly acknowledged since the 16th century. In Europe, people suffering from breathing difficulties, tuberculosis or some psychological illnesses had the opportunity to spend some time in a spa surrounded by forest.

Nowadays, when green spaces have been extensively replaced by urban infrastructure, crowded places and polluted environments, there is immense potential for forests to remedy this. A significant positive association between the quantity of green space in and around residences and perceived mental health was found by Van den Berg et al. (2015). Today, urban and peri-urban forests in particular are highly frequented by visitors and can play an important role in promoting health (Andersson, 2017). The restorative benefits of forests can help promote human health. Additionally, there are some specific forests that are promoted or designated as healing sites.

There is no official definition of cure and healing forests, but according to <https://www.kur-und-heilwald.de/1-kur-heilwald/?lang=en>, “cure forests” are wooded areas which, due to their various properties, are suitable for promoting health and well-being across a broad spectrum. Spending time in curative forests can help prevent the aggravation, recurrence and progression of diseases (secondary prevention). According to the same resource, healing forests are wooded areas, which are suitable for therapeutic use in specific medical indications. Treatments accompanied by trained therapists in the forest are able to positively affect the treatment of diseases as well as the extent of the disability caused by this illness (tertiary prevention). Chronic diseases can be treated so as to mitigate the symptoms.

These initiatives have been inspired by the Asian healing forest networks dedicated to recreational and therapeutic use (e.g. Forest Therapy Society, s.a.; Zhang et al. 2015). Other countries are identifying forests that can be used for similar purposes. For example, seven therapeutic forests have already been established in Girona, Spain (Esser, 2017). A network of old forests for health and eco-tourism purposes called “Associació Sèlvans” is to be established all over Spain. The recent change of forest law in the German state of Mecklenburg-Western Pomerania is a prominent example of legally declaring forests as healing forests – in agreement with the forest managers (good practice example given at the end of Section 4.2). These forest networks can also help to strengthen the tourism sector.

The composition of natural elements and forest infrastructure can influence health and well-being experiences (Zhang et al. 2015). Paths can be created, selected or planned to promote beneficial effects for visitors (Chapter 3 - Human Health and Sustainable Forest Management). Trails can be installed to connect places with high restorative potential based on current scientific evidence. Significant increases in connectedness to nature and mindfulness of those in a study using such paths were found by Cervinka and Schwab (2017). For example, “restorative forest trails” have been developed in Finland since 2010 to make people more aware of the benefits of forests for their physical well-being and mental health.

4.2.2 Forest for mindfulness and forest bathing

Mindfulness involves a range of practice-based approaches aimed at focusing people’s minds on the present moment, on breathing and on using all the senses to engage with woodland (Ambrose-Oji, 2013). Mindfulness has been used with cognitive behavioural therapy during or after woodland walks (Kim et al. 2009, Sung et al. 2012). Mindfulness has also been used in projects focused on well-being for vulnerable communities. For example, O’Brien (2018) in an evaluation of a well-being intervention in a woodland in England found that sound mapping was one of the mindfulness activities that was particularly appreciated by those suffering from addiction issues. Other approaches such as “forest bathing” and ecotherapy also include elements of mindfulness.

“Shinrin-yoku”, a synonym for “bathing” in the atmosphere of forests (Akakabe, 2010; 2012), was formed as a concept in 1982 by the Japanese Forest Service to promote the effects of forests on physical and mental health and to facilitate their targeted use (Tsunetsugu et al., 2007). Since then, Shinrin-yoku has become an important term for relaxation (Morita et al., 2007) and the reduction of mental stress (Morita et al., 2008). Park et al. (2009) understands the term in a broader way as connecting with forests. It is a relaxation method that can be combined with recreation in forests and includes stimulation of all the senses (Tsunetsugu et al., 2010). Li et al. (2008b) compare forest bathing to aroma therapy which excludes audiovisual and haptic stimulation. Their studies have focused on the effects of odours and the impacts of phytoncides on forest visitors. “Shinrin-yoku” is often limited to woodland walks and focuses on sensual perception of the forest environment. The aroma of wood oils, resins and their components can lead to relaxation (Akakabe, 2010; 2012; Nakagawa et al., 2015). Therefore, forest bathing effects might be gained even outside of forests by relocating or imitating forest elements (Nakagawa et al., 2015). This can be achieved by the use of materials or odourants, visually or by an audio-imitation (Sawada et al., 2016). Kawai and Miyachi (2016) show that pinenes can reduce the activity of the autonomic nervous system. Some plant extracts maintain their effects even in products such as sprays, gels or emulsions and are used in products such as air fresheners, scents, soaps and cushions (Nakagawa et al., 2015).

“Forest bathing” in the broader sense is practised world-wide in many accessible forests. First used in Asia, this term has become well known in Europe in the context of forest recreation in recent times. According to Tsunetsugu et al. (2010) and Morita et al. (2008), there have been comparable forms of activity in Germany since the 19th century, Tsunetsugu et al. (2010) suggests Kneipp therapy as an example, which partly uses similar elements to “forest bathing.”

1 Hydrotherapy including hot and cold water applications, often performed in natural environments

4.2.3 Forests for outdoor recreation

The World Health Organisation (2016) outlines that regular moderate intensity physical activity such as cycling, walking or partaking in sports can have significant benefits on health. Physical activity can reduce certain causes of mortality, diabetes, heart disease and dementia (All Party Commission on Physical Activity, 2014). Forests can offer a broad range of recreation and physical activity opportunities for all ages from organised activities such as walking, cycling, running, Nordic walking, yoga and pilates, through to encouragement of self-led physical activities that people can undertake with friends or on their own. In England, a partnership between Forestry Commission England and Sport England resulted in the Active Forest Programme which encourages people to be active in forests by improving infrastructure (paths and facilities), holding organised activities and events, and through communicating the benefits of physical activity (O'Brien and Forster, 2017). Fourteen forest sites are currently participating and new sites will come on stream in 2019. Benefits of participation include physical and mental well-being, feelings of escape and freedom, and fun and enjoyment.



Good practice examples

“Active Forest–Programme”, England

Written by: Liz O'Brien

Organisations involved

Forestry Commission England, Sport England.

Aim

To encourage physical activity and create a sporting habit for life to visitors to the Public Forest Estate in England.

Target group

All groups, but particularly families with children and older adults.

What happens

The Active Forest pilot programme began in 2014 and was developed via a partnership between Sport England and Forestry Commission England. The 3 year pilot focused on 5 public forest sites in England managed by Forestry Commission England. The sites were large in size and already used by a mix of local residents and visitors from further away. An Active Forest programme manager was appointed to oversee the work and an Active Forest Coordinator (AFC) was recruited for each of the 5 forest sites. The AFC's developed a range of physical activity events, organised activities, and play on the day activities including fun runs, Nordic walking, cycling, orienteering, table tennis, volleyball, wild running, parkrun and archery. Each AFC sought to understand the existing types of visitors and the population surrounding their sites, and focused on targeting those who were often less likely to meet the current recommendations for physical activity. AFC's delivered and ran some of the events and activities, while others were delivered by third party providers, for example local sports clubs, independent professionals, and national groups such as British Orienteering or parkrun. The 3 year pilot ended in 2017 and, due to the success of the programme, identified in the monitoring and evaluation, the Active Forest programme has been scaled up. In 2018 it included 14 forest sites in England, and another 4 urban forest sites are due to be included in the programme from 2019.

Results of the programme

Monitoring and evaluation was a key element of the programme and included the collection of organisational, survey, and qualitative data. Over 700,000 sporting visits were made over the 3 years of the pilot. There was a significant increase in sporting activity for those who were less active. The most popular activities were cycling, running, orienteering, bat and racket sports, and fitness. The main motivations to get involved were to be physically active in nature, for enjoyment, to get fit and to improve health. While

the main four benefits identified by over 80% of respondents were physical well-being, fun and enjoyment, mental well-being and a feeling of escape and freedom. Mental well-being came out strongly as a theme in the qualitative research.

Reference

O'Brien, L and Forster, J., 2017. Fun and fitness in the forest: Monitoring and evaluation of the three year Active Forest pilot programme. Report to Sport England and Forestry Commission England. Farnham, Forest Research, 133 p.

Websites

www.forestresearch.gov.uk/research/active-forest-programme-evaluation



Spa and healing forests, Germany

Written by: Markus Sallmannshofer

Organisations involved

Eigenbetrieb Kaiserbäder Insel Usedom, Spas Association of Mecklenburg-Western Pomerania, Office of Bäderverband M-V e.V.

Aim

To raise the competitiveness of the health and tourism sector.

Target group

Visitors seeking recreation for health promotion in forests (also for people with visual disabilities), and for ill people through therapeutic programmes.

What happens

The revised version of forest law in the German federal state of Mecklenburg-Western Pomerania provided the opportunity to classify forests as spa and healing forests (“Kur- und Heilwald”) by law to enhance the competitiveness of the health and tourism sector. The first forest of this classification was established in 2017 on the Island of Usedom in Heringsdorf. A certification for sustainable forest management is a precondition and the prevailing right to enter the forests can be limited for this area to create tranquillity (§22 LWaldG Mecklenburg-Western Pomerania).

Two types of classifications are existing (Düsterhoft, 2017; Steingrube et al. 2015)

- Spa forests:
health-promoting with widespread impact (e.g. forest bathing)
- Healing forests:
specially structured / shaped for therapeutic and supervised use (forest therapy)

Within the area the use of mobile phones was prohibited at first (Welzer, 2017), however, an app corresponding to objects that are posted in the spa and healing forests is now available. The spa and healing forest of Usedom covers 187 hectares of beech and pine forests next to the shore. It offers several healing trails. One of the healing trails is specially adapted for people with visual disabilities using guiding-assistance-systems through kerbstones. All the healing trails have resting points with information desks and instructions for exercises comparable to the Finnish “Restorative Forest Trails”. The investment for development and installation was about 360,000€ and was 90% funded by the state and the European Union (EFRE) (Steingrube et al., 2015). The spa and healing forests in Germany are free of charge (Ministerium für Wirtschaft, Bau und Tourismus Mecklenburg-Vorpommern, 2016).

Results of the programme/project/intervention

As the project is seen as a success, the planning for three more spa and healing forests in Mecklenburg-Western Pomerania has already started.

Reference

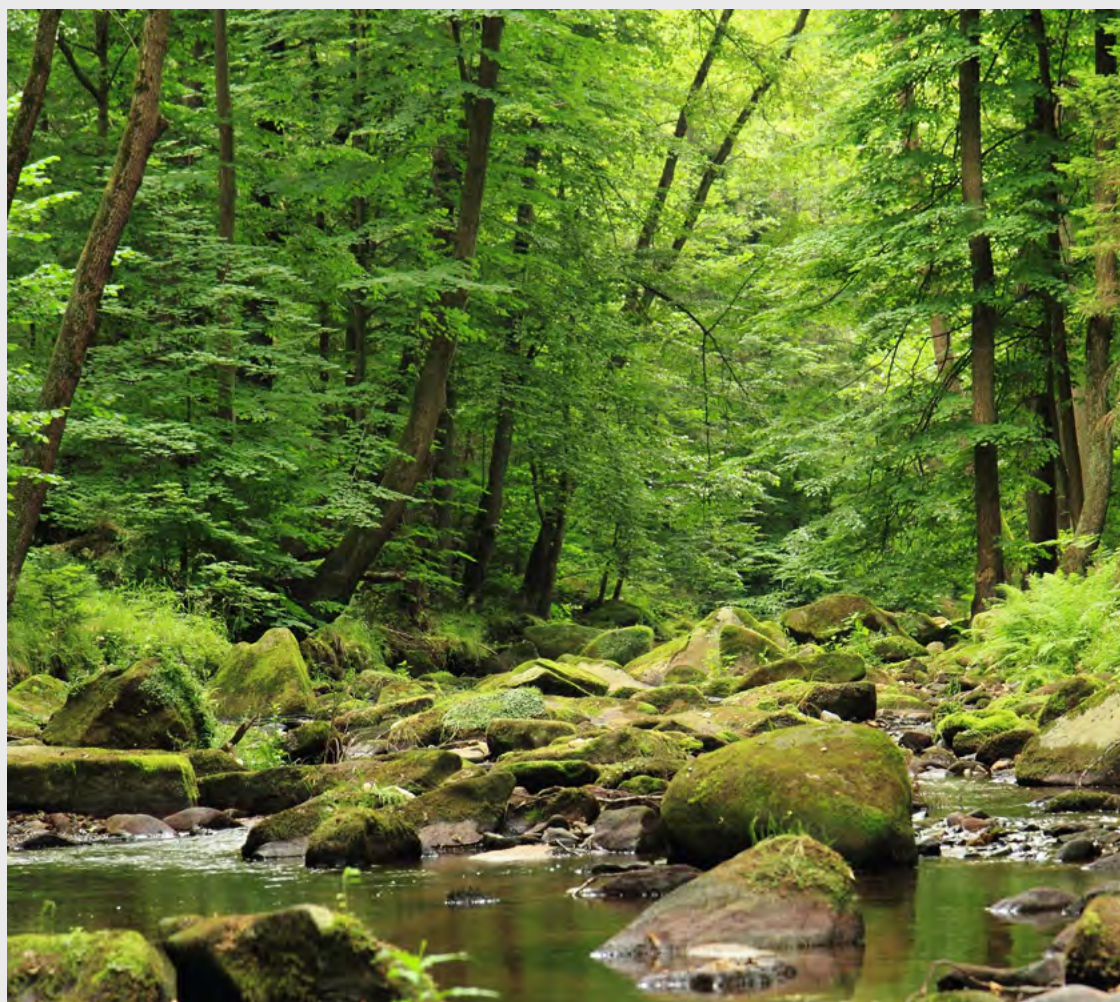
listed at the end of the chapter

Website

www.kur-und-heilwald.de/?lang=en

www.mv-baederverband.de/en

www.youtube.com/watch?v=QyoIP-nEMM4 [German]



Regeneration trail in the Biosphere Reserve Wienerwald (Vienna Woods), Austria

Written by: Benjamin Stadler, Markus Sallmannshofer

Organisations involved

Austrian Federal Forests – forest enterprise ‘Wienerwald,’ Biosphere Reserve Wienerwald Management GmbH.

Aim

To develop and run a nature trail for the prevention of stress related diseases.

Target group

Mainly adults.

What happens

The Austrian Federal Forests AG has developed a special trail in the Wienerwald Biosphere Reserve, enabling participants to use the positive effects of the forests under expert guidance in order to regain mental balance.

The guided tour will be conducted in a small group on an easily accessible, approximately two km long route. In the interplay with stimulating elements from forest pedagogy, participants are active in nature. Mindfulness in dealing with themselves and their problems is focussed. At the beginning, participants receive trail guidelines.

The nature trail was opened in March 2017. A guided tour takes around three and a half to four hours with a minimum of three and a maximum of six participants. Together with the guidelines the tour costs 45 €. Participants have to be at least 18 years old to be accepted for the guided tour. Tours can also be booked individually with a group of a minimum of three people. Special guided tours for children can also be booked.

Results of the programme/project/intervention

Reachability by public transport, small group sizes and a programme fitting to the participants’ age.

Website

www.bundesforste.at/natur-erlebnis/biosphaerenpark-wienerwald/ergaenzende-seiten/regenerationspfad.html [German]

www.bundesforste.at/fileadmin/wienerwald/PDF-DATEIEN/Angebote/Spezialangebote/BPWW_Regenerationsfolder_27_10_2016_screen.pdf [German]



Forest bathing establishment and dynamisation in the Biosphere Reserve of Urdaibai, Spain

Written by: Gorca Altuna

Organisations involved

Union of Foresters of Southern Europe (USSE), Association of Relatives and Persons with Mental Illness from Bizkaia (AVIFES), Forest Owners Association from Bizkaia, Urremendi Rural Development Association, Basque Country Government (Eusko Jauriaritza-Gobierno Vasco), European Agricultural Fund for Rural Development (EAFRD), and Shinrin-Yoku Barcelona.

Aim

To implement forest therapy as a healing activity and to offer forest bathing for human health and well-being promotion.

Target group

The project in its first stage is focused on people with mental illnesses. At the end, the forest bathing path will be opened to the public.

What happens

From the first week of July until the end of October 2018, three controlled groups of participants with mental illnesses, limited to 10 people in each group, were taken to a natural path (part of the pilgrims way Camino de Santiago) in the Biosphere Reserve of Urdaibai (Northern Spain) once a week for two hours with a trained forest bathing guide. These interventions are free of charge for all users. AVIFES is carrying out forest therapy users' evaluation: physical measurements before and after each session (oxygen saturation, blood pressure and heart rate) are taken and, for the psychological purpose, they are using a quality of life model for people with intellectual disabilities, adapted by AVIFES for people with mental illnesses. This model analyses different factors that serve as indicators to evaluate quality of life. These factors are analysed for each user after each intervention. Once the project is over, information boards will be installed and the site will become a public forest bathing location. Forest owners of the land where the path runs have received 500 € each for a three-month use of their land. All costs in the project were met by the Basque Country Government and EAFRD funds.

Results of the programme/project/intervention

Physical measurements are showing that there is a general trend towards an increase in oxygen saturation, a decrease in blood pressure and a decrease in heart rate after forest bathing. The first results of the psychological evaluation also described positive trends (overcoming barriers such as panic to physical contact, refusal to socialise, refusal to participate in group activities, refusal to leave home).

In addition, the project will offer a signposted nature path for health promotion for all people interested, especially for people from Bilbao and its surrounding areas.

Reference

“El Correo” newspaper, cover page on 2018 July 29th. Digital version including a video report: www.elcorreo.com/bizkaia/bosque-cura-mente-20180729230504-nt.html

Website

www.basoan.net

www.usse-eu.org/en/proyectos

www.youtube.com/channel/UCrP-b--1iem7dQaKNBl67hg



“Nature mindfulness walks in the forest”, Switzerland

Written by: Marlén Gubsch

Organisations involved

Forest enterprise ‘City forest office Baden’ (Forstbetrieb Stadtforstamt Baden).

Aim

To train participants in mindfulness towards nature and mindful stress reduction by experiencing nature and themselves.

Target group

General population, urban population.

What happens

Duration: 1-2 h

Annual participation: 20-150 people (depending on participation)

Use intensity: several days during the year

Costs for participation: around 0-30 CHF per participant (depending on the fundraising possibilities that the forest enterprise was able to negotiate)

Accessibility: forest area, only for people able to walk in the forest

During this nature mindfulness walks (“Achtsamkeitsbasierte Waldführungen”) the forest visitors are guided and follow a special trail into the forest with the aim of experiencing the forest with all their senses. They are trained in mindfulness towards nature. By perceiving nature and themselves participants calm down, take a break from everyday life and thus reduce stress. Special forest places will be prepared in the future for finding peace and rest. The programme is based on a forest-oriented approach, where health promoting activities are offered by specially trained employees of the forest service. Strong cooperation and partnerships are targeted and will be established among the forest owners and the healthcare sector (e.g. spa and thermal clinics) to facilitate and fund “forest bathing offers.”

Results of the programme/project/intervention

The participants experience nature with their senses, they immerse into and deeply connect with nature, calm down and reduce everyday life stress.

Website

www.baden.ch/de/kultur-freizeit/freizeitangebot.html/131

“Trail for the soul in Heiligkreuz”, Switzerland

Written by: Andreas Bernasconi

Organisations involved

Unesco Biosphere Reserve Entlebuch, Lucerne, Switzerland, and the regional/local forestry service.

Aim

To take the visitors out of their hectic everyday lives and enable to experience nature in a very sensual way.

Target group

e.g. individuals, families, schools, tourists or specific groups (e.g. firms, clubs or associations).

What happens

Duration: between 20 and 120 minutes

Annual participation: It is estimated that there are about 5,000 visitors per year, including about 20 guided tours.

Use intensity: different usage throughout the year

Costs for participation: the visit of the trail is free, guided tours can be booked subject to a moderate fee

Accessibility: the walk is short and easy and thus suitable for everyone; parking is nearby.

For the trail for the soul in Heiligkreuz (“Seelensteg Heiligkreuz – ein Ort der Kraft”) around 500m of boardwalk have been installed in a beautiful forest of many blueberry bushes and ferns. The trail is slightly elevated to approach the forest from an unusual angle. Stops motivate visitors to use all their senses to consciously experience this immersion in nature. The visitor should experience the forest in a sensual way and is gently introduced to the themes of the circular trail: to become, to be and to pass away.

Results of the programme/project/intervention

The visitors are focused on themselves and nature, immerse into nature and recover very quickly.

Website

www.biosphaere.ch/de/detail/poitype/outdooractivetour/poi/seelensteg-heiligkreuz-ein-ort-der-kraft

— 4.3 Forests for therapy and rehabilitation – treating illnesses

Forest therapy, as opposed to forest bathing, focuses on treating ill-health through treatment and rehabilitation in a forest environment. Forest therapy involves smaller numbers of people often with specific health conditions such as mental ill-health and addiction issues. Forest therapy treatments often include collaboration between the environment and health sectors. Many types of forests can be used for forest therapy from rural to peri-urban or urban forests. This approach has economic potential via the creation of new jobs, however, it strongly depends on the cost/benefit transfer mechanism between forest managers and health enterprises.

Depending on the target groups, specific activities should be chosen. Good examples include breathing exercises, art and crafts activities, meditation, dream journeys and tree climbing (Kim YounHee, 2016B). Forest owners can encourage visitors to perform their own physical and meditative activities and provide supervised use of forests for health aspects in the same way other excursions (e.g botanical or ornithological) are offered, integrating these services into the economy of forest enterprises. New target groups are reached, and the portfolio of forest enterprises can be expanded.

A big advantage is that forest therapies are usually applied multiple times by the same user and a customer base is established, while excursions involve mainly one-off visits. Target group oriented packages that last for several days are common and popular (Steingrube et al., 2015). They can appeal to a wide range of clients of various ages. In Japan certain “forest therapy bases” have contracts with forest enterprises, which regularly provide their employees with the opportunity to take part in forest therapy programmes (Hiking Research, 2012; Forest Therapy Society, s.a.).

The Korean Forest Service was one of the first to investigate the development of practical forest therapies for clinical purposes and estimated a high economic value that can be made the most of by forest owners and the medical sector (Shin et al., 2010). Forest therapy can be very cost-effective, because the highest cost for medical institutions applying forest therapy is usually transportation to a forest site (Van den Berg, 2017; Bach, 2017). Nevertheless, costs for health and forestry staff as well as preparation for and follow-up have to be taken into account. Yoo (2007) expected additional growth of this type of approach in certification and insurance. This will contribute to the spread of concepts of forest therapy.

4.3.1 Forests for hospitals and health care

This concept combines the beneficial effects of forests with medical services usually offered in rehabilitation centres and hospitals. Different therapeutic programmes in forests are used to improve the rehabilitation and recovery of patients following surgery, illness or injury. In many cases, forest therapy is used as a supporting therapy alongside main clinical treatments. In such cases a major aspect can be distraction from the patient’s medical conditions (“being away”). However, forest therapy can also be the main treatment, especially when physical exercise is recommended. Forests can also be a suitable environment for psychological interventions. Depending on patient’s needs, interventions are offered voluntarily and repeated a number of times. Forest therapy walks are widely used, but there are also possibilities to apply clinical forest therapy for people with limited mobility. Some hospitals have forests/woods adjacent to the

hospital buildings and within the hospital grounds and these can also be used by patients and staff for therapy, exercise or general relaxation (O'Brien, 2014).

4.3.2 Forests for social prescribing

Social prescribing is a means of enabling doctors, nurses and other primary care professionals to refer people to a range of local, non-clinical services. Primary health care professionals have and do prescribe activities such as walking, volunteering, arts activities, cooking etc. and some of these are taking place in a forest environment. The Chopwell Wood Health Project in Northern England is an example of physical activity on prescription (O'Brien, Greenland and Snowdon, 2006). The Forest of Dean in south west England was used by a Walking for Health group that successfully applied for a social prescribing kite mark which allows them, along with other accredited organisations, to receive referrals from doctors for those who would benefit from involvement in regular walking (Walking for Health, 2014). A recent review of social prescribing in England found many different models, and limited research into the effectiveness of such an approach. However, from the cases identified in the study, good partnerships, joint ownership and high levels of cooperation were found to be important between primary care providers and the organisations delivering the activities in nature (Natural England, 2017).

4.3.3 Wilderness therapy and forest camps

Wilderness therapy programmes take place in unmanaged and naturally developing areas for therapeutic purposes. Experiences in natural landscapes are combined with various psychotherapeutic approaches. The different purposes of this therapy range from general improvements in mental health to reductions in weight (Annerstedt & Währborg, 2011). Russel (2001) remarked that the same body of theories provide a foundation for most wilderness therapy programmes. "A crucial aspect is the use of 'natural consequence' as a therapeutic device" (Cervinka, 2014, p. 24). This term suggests that there can be multiple positive effects that can potentially lead to changes in behaviour or ways of thinking with nature acting as the setting and catalyst for such changes (Cervinka, 2014). Such programmes are often applied for psychological reasons and demand a level of physical fitness.

In contrast to forest therapy, wilderness therapy is not specifically bound to forests. Natural and unmanaged environments such as mountains and moorlands can be specially selected for this purpose and often include forest areas. Therefore, the character of wilderness programmes can be more adventurous than classical forest therapy. Fascination and positive arousal might be especially experienced in wilderness landscapes (Ensinger and Lindern, 2018).

Besides one-day interventions, wilderness therapy can be offered in various forest camps. Depending on the facilities of the camp and the activities performed, the wilderness character of the intervention changes. Annerstedt and Währborg (2011) noted that adverse effects like injuries occurring in such programmes are rarely investigated. An evaluation of six environmental camps in Iowa (USA) showed childrens' preferences for adventurous activities and how the camps fostered positive attitudes towards wildlife in the long term (Dettmann-Easler and Pease, 1999). Thus, wilderness therapy might be especially suitable for children and young people. A Spanish association is aiming to establish a network of old forests for conservation and recreational purposes that include an aspect of wilderness (Associanó Sèlvans, 2018).

Good practice examples

“Branching Out” programme, Scotland

Written by: Liz O'Brien

Organisations involved

Forestry Commission Scotland, NHS Scotland, local authorities in Scotland.

Aim

To encourage the use and enjoyment of woodlands for mental health patients.

Target group

Adults accessing mental health services in Scotland.

What happens

Branching Out began in 2007 in the city of Glasgow as a pilot led by Forestry Commission Scotland, as part of its Woods for Health strategy to encourage the use of woodlands for physical and mental health. Since then, with the support of a number of health sector partners, the Forestry Commission has run nine groups per year in Greater Glasgow and the Clyde Valley, as well as expanding into new areas in Scotland. The programme caters to adults of both sexes, all ages, varying levels of physical fitness and capability. Branching Out addresses the issue of isolation and other problems suffered by those with mental health conditions by bringing clients together in the outdoors. A 12-week programme in woodlands is designed to increase mental well-being, physical activity, team building, and social skills. Programme groups of up to 12 clients meet once a week for 12 weeks, with each session running for about three hours. Participants are referred by healthcare professionals, and most groups are formed of clients from a single mental health service. Any woodland activity can be included in a Branching Out programme, with clients free to choose which activities they pursue. Activities on offer include: health walks; tai chi sessions; conservation activities; environmental art and photography; green woodworking/willow weaving; bushcraft; learning activities and social activities to give participants the chance to just relax in the woodlands and get to know other people. Branching Out has won a number of awards and there is a high demand for new projects to be established. The management team has developed a Branching Out training course to help support other environmental organisations interested in running a programme in their area, and they have also produced a resource guide to help other organisations learn from the project.

Results of the programme

An evaluation study found that participation in Branching Out tended to significantly increase the physical activity of those involved; and clients have reported improvements in areas such as self-esteem, motivation, sense of achievement and social skills. There were greater benefits for those with poorer mental health.

Reference

CJC Consulting, 2016. Branching Out economic study extension. Report to Forestry Commission Scotland. Oxford, CJC Consulting, 32p.

Website

www.scotland.forestry.gov.uk/supporting/strategy-policy-guidance/health-strategy/branching-out



Forest therapy walks for patients with chronic pain, Austria

Written by: Franziska Krainer

Organisations involved

- Thermenhof/Special Institute for Rehabilitation (SKA) in Warmbad-Villach, Carinthia.
- Austrian Research Centre for Forests – Project Green Care FOREST /Forest Training Centre Ossiach, Carinthia.
- Self-employed forest educators.

Aim

To offer patients forest therapy walks on a voluntary and weekly basis, which serve as a supplement to the patients' specific and individual therapy programmes. The forest therapy walks help patients in developing individual coping strategies for difficult life situations and are based on the idea that forests offer various health benefits to people. They are conducted in order to distract patients from their pain, help them to relax, improve their sleep quality and promote physical activity.

Target group

Patients from the SKA suffer from chronic pain in their musculoskeletal system. The chronic pain is caused by illness, disability or is a consequence of recent medical operations. The participants stay at the SKA for around 3 weeks.

What happens

The idea for the forest therapy walks was born after a young doctor of the SKA attended medical training in Germany. Afterwards she contacted the FAST Ossiach (Federal Research and Training Centre for Forests, Natural Hazards and Landscape Austria) to help her implement forest therapy walks at SKA. A pilot forest therapy walk for the medical team was conducted by the FAST Ossiach, which led to the decision to implement the forest therapy walks in a standard SKA therapy programme. Jointly a forest educator was identified who is able to offer this programme on a weekly basis. The forest therapy walks have been offered since 2015, with around 100 participants per year. They are conducted once a week, last for two hours and are limited to around 15 people. The setting is the nearby forest, which can be reached by foot in about 5 minutes from the SKA. It is up to the medical team to decide which patients are suitable for the forest therapy walks. This depends on the patients' musculoskeletal and cardiovascular constitution. Patients need to be able to walk an approximate distance of 1.5 km. The patients of the SKA are inpatients, so they can join the forest therapy walks theoretically 3 times during their stay. The forest therapy walks are included in the patients' treatment programme at the SKA (costs unknown). The walks are conducted by an experienced forest educator. The walk aims to distract people from their medical conditions; therefore the pain therapy itself is not discussed. The forest educator does not give any movement or exercise instructions; the forest itself, its animals and plants are the focus of the walks. The activity in the group in the natural surroundings of the forest has a soothing effect.

Results of the programme/project/intervention

Ongoing project with ongoing evaluation

Website

www.med-warmbad.at/Thermenhof/EN/Home.html



“Woodlands for Health” project, Ireland

Written by: Markus Sallmannshofer

Organisations involved

Coillte (The Irish Forestry Board), Mental Health Ireland, Health Service Executive HSE, Wicklow Mental Health Association, Wicklow Sports Partnership, University College Dublin.

Aim

To encourage cooperation between forest managers, medical services, researchers and outdoor activity organisers to increase the therapeutic use of forests to relax, improve their sleep quality and promote physical activity.

Target group

It is usually prescribed by medical professionals for adult mental health patients (Mental Health Ireland, 2017).

What happens

The Woodlands for Health project has been running since 2012 in Wicklow in Ireland. It comprises a range of treatment programmes for people using Wicklow mental health services. Special guides offer nature walking programmes over 12-week periods that are accompanied by community mental health nurses. The walks are mostly of three hours duration and include a meal along with a shared experiences session. The main activity is walking. Occasional mindfulness sessions, nature and environment talks, woodland art and elements of yoga and tai chi shall be included in future (Burke, 2017).

Access to these forests and these walks are provided by Coillte, a commercial forestry and land solutions company that was formerly included in the civil service and is the custodian of 7% of land in Ireland (Thompson, 2016; Coillte, 2016). Guides include Coillte staff members, members of the partner organisations and project volunteers. They undertake SAFE talk suicide prevention training which is recognised internationally (4-hour listening skills course), Garda (Police) Vetting, First Aid training and walking courses (Burke, 2017).

The partnership between six organisations highlights the importance of cooperation between forest managers, medical services, science and outdoor activity organisers. The programme is provided as a public service for the benefit of local people. There is no fee applied and no intention of charging participants. Finance is provided through the partner organisations to deliver the programme (Burke, 2017).

Results of the programme/project/intervention

The project was evaluated by the Health Service Executive (HSE) and University College Dublin: The mood of the participants was improved by 75% and the quality of their sleep by 66%. Thoughts of suicide were reduced by 82%. A club that was developed by the participants as a direct result of the programme, to undertake outdoor activities together, illustrates the strong social component of green therapy (Coillte, 2018; Mental Health Ireland, 2017).

Reference

Burke, C., 2017: Personnel information via e-mail on Friday, 20.10.2017.

Coillte, 2016: "Coillte Annual Report 2016." www.coillte.ie/media/2017/05/Coillte-Annual-Report-Accounts-2016.pdf (last accessed: 10.12.2018).

Coillte 2018: "Our story." www.coillte.ie/about-us/our-story/ (last accessed: 10.12.2018).

Mental Health Ireland, 2017: "Woodlands for Health." <http://www.mentalhealthireland.ie/partnership/woodlands-for-health/> (last accessed: 10.12.2018).

Thompson, S., 2016: "Why a woodland walk is good for your head." www.irishtimes.com/news/environment/why-a-woodland-walk-is-good-for-your-head-1.2475324 (last accessed: 10.12.2018).

Website

www.wicklowmentalhealth.org/projects/woodlands-for-health

www.mentalhealthireland.ie/partnership/woodlands-for-health/



“Healing Forest Garden Nacadia”, Denmark

Written by: Markus Sallmannshofer

Organisations involved

Department of Geosciences and Natural Resource Management University Copenhagen, SWECO Architects, Malmos Landskaber, with support from Realdania, the Obelian Family Fund and G.B. Hartmann Family Fund.

Aim

To improve quality of life and the ability to return to work or studies at the end of the treatment.

Target group

Individuals who are suffering from stress-related illnesses.

What happens

The Healing Forest Garden Nacadia is based on the therapeutic use of sensory experiences and horticultural activities for people with stress-related psychological problems.

The Forest Garden is located in Denmark and has a size of one hectare, integrated in the “Horsholm-Arboretums” with a size of 40 hectares (Bröderbauer, 2015). The Swedish “Alnarp Rehabilitation Garden” was the role model for the area design. With the subdivision of the area appropriate to the stage of the therapy, the operators try to have ideal scientifically proved preconditions for forest therapy. The programmes’ duration is about 10 weeks, but workshops and courses are additionally offered. Even though the Healing Forest Garden Nacadia is not a genuine natural forest, it uses natural forest elements to catalyse therapeutic processes (Corazon et al., 2010).

Results of the programme/project/intervention

The effects of the design on patients’ health outcomes were measured with a diagnostic post-occupancy evaluation. It has shown that the Nacadia therapy garden fulfils its stated aims and objectives (SIDENIUS, 2017).

Reference

Corazon, S. S., Stigsdotter, A. U. K., Jensen, A. G. C., & Nilsson, K. S. B., 2010. Development of the nature-based therapy concept for patients with stress-related illness at the Danish healing forest garden Nacadia. *Journal of the American Society for Horticultural Science*, 20:34-51.

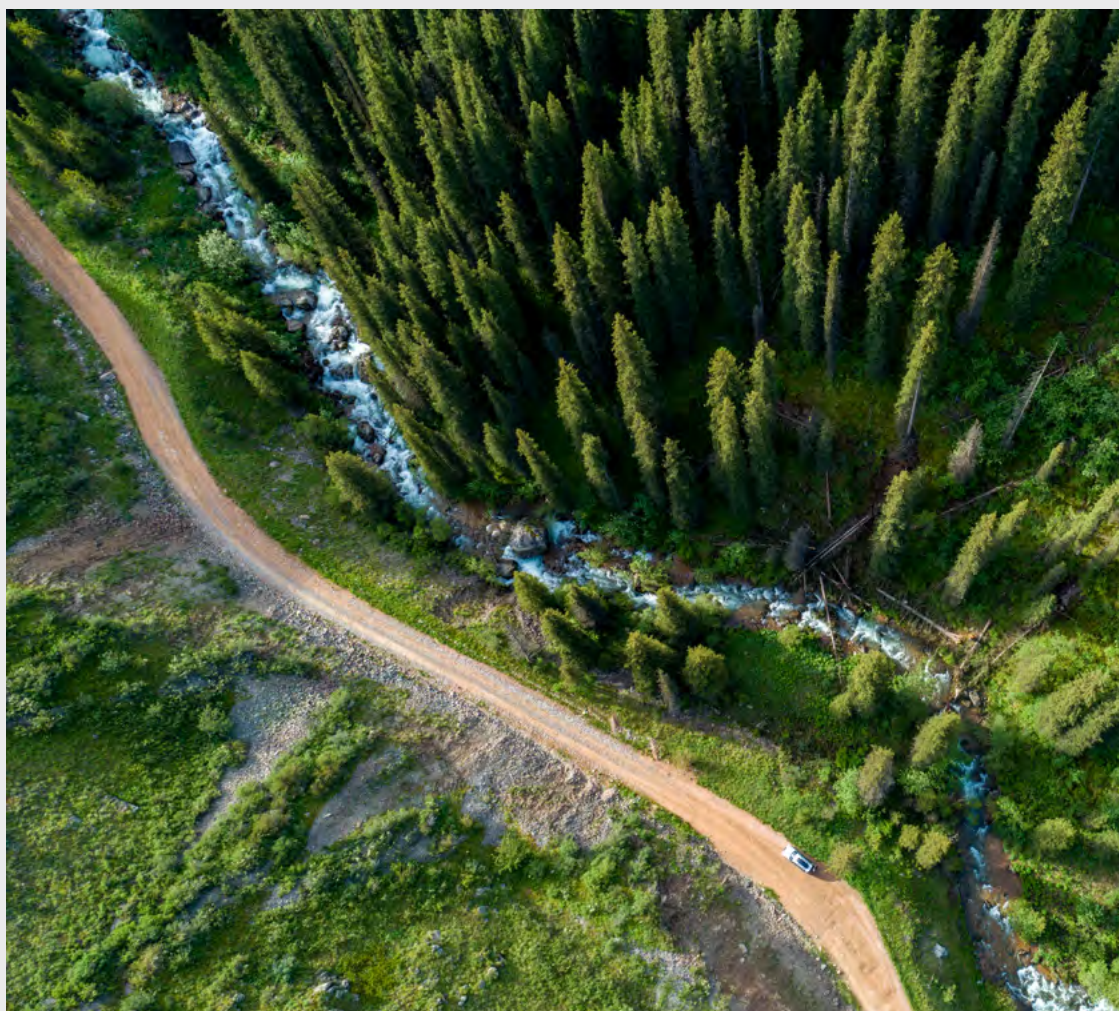
Sidenius, U.; Karlsson Nyed, P.; Linn Lygum, V.; K. Stigsdotter, U., 2017. A Diagnostic Post-Occupancy Evaluation of the Nacadia® Therapy Garden. *International Journal of Environmental Research and Public Health*, 14(8): 882.

Sidenius, U; Stigsdotter, UK; Poulsen, DV; Bondas, T., 2017. I look at my own forest and fields in a different way: the experience of nature-based therapy in a therapy garden when suffering from stress-related illness. *International journal of qualitative studies on health and well-being*, 12(1): 1324700.

Website

www.natureandforesttherapy.org/uploads/8/1/4/4/8144400/_nature_based_therapy_for_stress_illness-danish_garden.pdf

www.natureandhealth.ku.dk/information-index/news1/nacadia/



“White Raven – Forest Project Enterprise”, Germany

Integration for the support of people with special needs

Written by: Dirk Schmechel

Organisations involved

White Raven – Forest Project Enterprise (“Weißer Rabe – Waldprojekt”); Department for Work and Economy and Department of Social Affairs of the city of Munich; Agency for Employment Bavaria; Counselling Centre for Drugs and Addiction; Counselling Centre for Integration; employer associations; chambers (or guilds) of crafting; Chamber of Trade and Industries.

Aim

Permanent employment in a realistic forest-working situation, supported by social-pedagogical backing and helping participants to live a self-ordered, independent life and return to the regular labour market.

Training in social competencies, education and support for finding employment.

Therapy support for psychological or addiction-caused diseases, support of persons with physical or mental disorders.

Relevance of the forest: Working in the forest and in nature stimulates the capacity of physical as well as mental and psychological power. The activities of the forest project enable the participants to feel they are undertaking a regular job. This provides participants with a sense of normality and identification – it is like “being a forest worker”. The measures create a day structure, teamwork and social empathy in a protected and calm surroundings.

Target group

Long term-unemployed people with support needs. This can be people suffering from psychological problems, disabled people, people with addiction problems or language difficulties, people without a school graduation or finished apprenticeship, and refugees.

What happens

In the White Raven Forest Project the participants are offered activities such as: afforestation and tree planting, forest tending, tending of gardens and green spaces, preparation and selling of firewood. In 2018, 34 employees were working on the project, whereof 6 are professional instructors.

Other branches of the “White Raven Enterprise” are: a second-hand trade, carpentry, a housekeeper service, a toy repair workshop, a sewing workshop and a transport business. In all “White Raven” branches, about 60 instructors (professional pedagogues, social workers, craftsmen) are employed. In all branches, more than 300 individuals are participating in the integration offers.

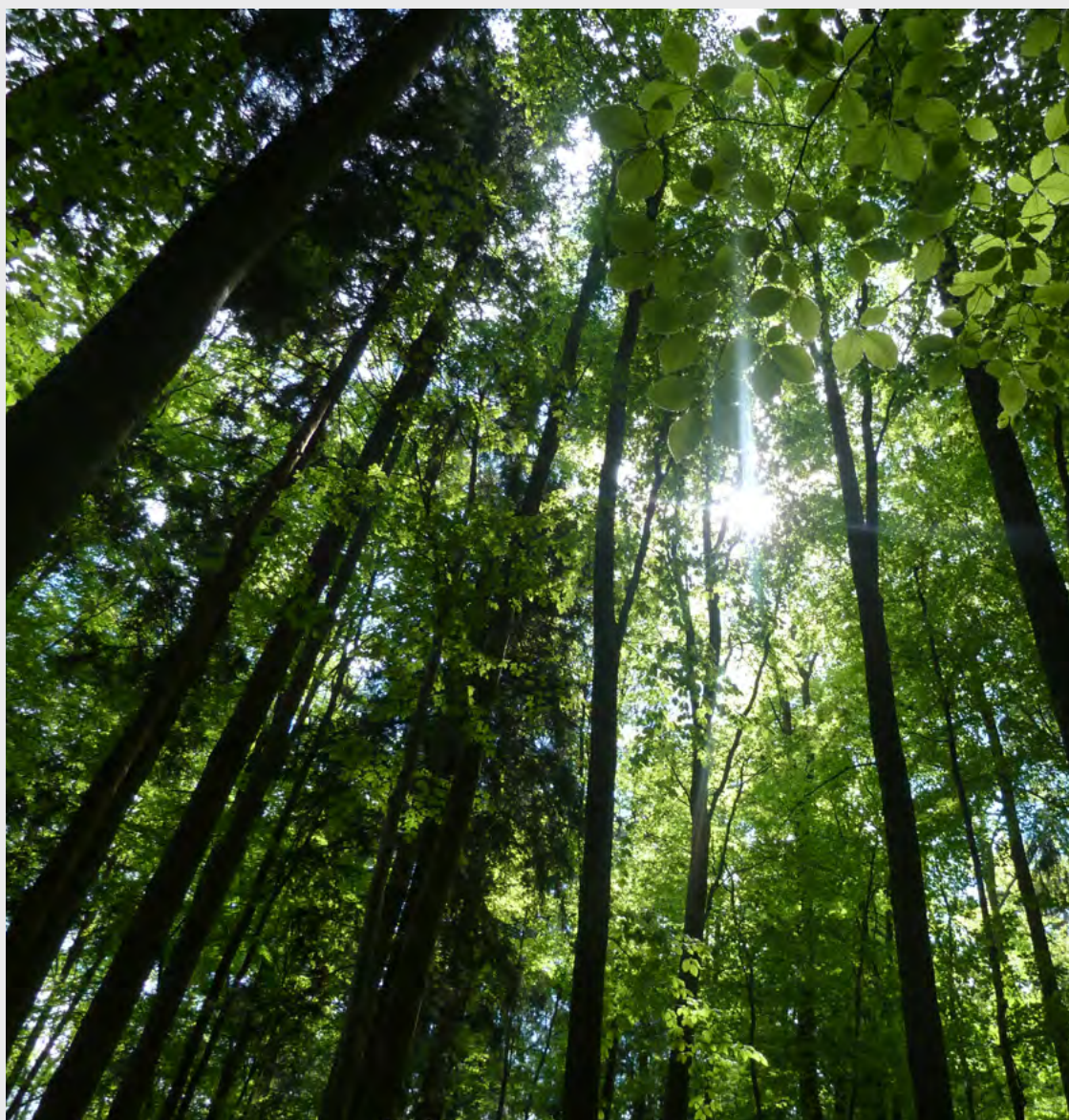
Results of the programme

In 2017 the “Forest Project” enabled 21% of the participants that finished the project to secure regular employment.

Website

www.weisser-rabe.de/unsere-betriebe/waldprojekt/

www.weisser-rabe.de/fileadmin/user_upload/Weisser_Rabe-Garten_und_Landschaftsbau_072017.pdf



— 4.4 Forest education providing indirect health benefits

4.4.1 The restorative effects of education in forests and forest pedagogy on human health

There are some research results showing that outdoor learning, especially when an immediate relationship from the early years exists, decreases “Nature Deficit Disorder,” a concept described by Louv (2006). Learning to be active and to interact with natural elements as well as learning to feel good from this interaction, in outdoor learning surroundings, has positive impacts on those in education (Van den Bosch, 2017). Evidence highlights that variation in school yards with greenery promotes the physical activity of pupils, and more trees in school yards leads to increased use and physical activity. Also, natural environments at schools have been shown to improve mental health and reduce behavioural disturbances (Van den Bosch, 2017).

In forest schools children behave more harmoniously (Blizard & Schuster, 2004), and they have lower levels of stress hormones (Van Den Bosch, 2017; Dettweiler et al. 2017). Other research shows that pupils participating in forest schools face less sun-exposure, have better motor functions, show increased self confidence and self-esteem and better general well-being. General education subjects can be taught outdoors at forest schools as well as indoors and research indicates that this can lead to improved literacy and numeracy skills, better cognitive and linguistic skills, more motivation and concentration (O’Brien and Murray, 2007), better reading; and improved school attendance (O’Brien and Murray, 2007; Van den Bosch, 2017).

4.4.2 Outdoor educational institutions: kindergartens and schools

Forest kindergartens

A forest kindergarten has no indoor spaces apart from an officially prescribed base (depending on national laws). It is usually surrounded by forest. Educators and children spend their time outside nearly every day, as long as there is no risk of hazards. The bases are refuges, site trailers and sometimes houses and are used to store second sets of clothes and other materials. Supervision times are defined and daily routines are important (Bancalari, 2015). Several studies showed that children educated in forest kindergartens are well prepared for school (Gärtner 2011, Häffner 2002). Free, unstructured, and natural playing in the forest is of high importance because it involves a continuous process of learning. Children can develop their own creative games according to their own needs. Kiener (2003) and Lettieri (2004) outlined that children attending forest kindergartens seem to act more creatively compared to those at indoor educational institutions. The general diversity of the environment and seasonal changes in the forests, as well as the use of forest elements, are able to continuously stimulate creativity (Fjørtoft and Sageie, 2000; Fjørtoft, 2004). Faber Taylor et al. (1998) reported an intensification of the bonding between children and adults in green spaces that can be beneficial for education and evoke a sense of safety among children.

The initiative to establish a forest kindergarten is often driven by parent groups. Therefore, they are often funded by private investments, contributions of the parents, sponsors, and additional incomes of the kindergarten (e.g. afternoon care, vacation programmes and workshops). They can also be part publically funded. In Austria, approximately half of the existing eighteen forest kindergartens receive additional public

funding. To eliminate potential hazards, the forest kindergarten area should be assessed and controlled every day by kindergarten staff and periodically by forestry staff (Bancalari, 2015).

Significant improvements in creativity, fantasy and gross motor abilities have been found for children that spend all week in forest kindergartens, but the benefits were less for those who spent one day per week in the forest (Kiener, 2003; Kiener and Stucki 2001; Grahn et al., 1997; Fjørtoft and Sageie, 2000; Fjørtoft 2004). Additionally, the relationship with nature has been found to improve, as well as self-confidence and independence (Griffiths et al., 2010; Kiener and Stucki, 2003; Gebauer et al., 2005). The immune system is strengthened by the contact with mud, soil, water and exposure to all weather conditions (Grahn et al., 1997; Kiener and Stucki, 2001). This prevents or helps reduce classic and chronic diseases, and allergies (Kruse, 2013). Social skills have been found to improve (Kiener and Stucki, 2003). Häfner (2002) identified deficits in fine motor skills. Children educated in forest kindergartens achieved higher competences in developing fantasy and creativity as well as in social behaviour, cooperating with teachers and motivation to interact, more than pupils from regular kindergartens. Other studies, such as Kiener (2003), could find no significant differences between intervention and control groups. More scientific references for the health benefits of the forest kindergartens is summarized on the homepage of the German association of forest kindergartens: <http://bvnw.de//category/wissenschaftliche-studien/> [German].

Nearly all children that attend forest kindergartens do so due to the explicit desire of their parents, and this might impact on the findings of the research mentioned when compared with general public nurseries.

Alongside classical forest kindergartens, there are some modifications and variations:

- Hybrid forms merged with classical kindergartens are called integrative forest kindergartens. Time is regularly spent in buildings as well as time in the forest. Some institutions offer children the chance to choose whether to join the group going into the forest or to stay indoors, if there are parallel groups (Bancalari et al., 2015).
- Forest playing groups are sometimes additionally offered by forest kindergartens. Regular meetings can extend the offer and can be integrated with children of classical kindergartens. Afternoon care in forests can be attractive for schoolchildren too. Such offers sometimes come from foresters or forest pedagogues and mainly they offer lots of activity, games or sports in the forests nearby the schools.
- Forest day nurseries target children younger than three years. Different equipment and new pedagogical concepts are necessary for the positive development of very young children (Bancalari et al., 2015). Day nurseries can prepare children for visiting the forest kindergarten when they are old enough. Day nursery children are mainly between the age of 18 month/2 years (depending on their motor skills) and 6 years.

Forest schools

Forest schools are comparable to the concept of integrative forest kindergartens and began to develop from a Scandinavian idea of nursery schools. They were brought to England from Denmark in 1993 (Maynard, 2007). In 2007 there were already over 150 forest schools in England, Wales and Scotland (O'Brien, 2009). This approach mainly involves taking pupils once a week to forests and is focussing not only on nursery but also on primary and secondary education students. Confidence, social and communicative skills, motivation and concentration, understanding of and connectedness to nature as well as physical skills have been shown to be improved. Individual learning processes are enhanced, and the regularity of the forest visits strengthens familiarity and conscientiousness (O'Brien and Murray, 2005; 2006; 2007; Massey, 2002; Roe & Aspinall, 2011; Lovell & Roe., 2009). The abilities gained can be transferred to the classroom and children especially can learn to handle risks (Massey, 2002). The British programme developed with the "Learning Outside the Classroom Manifesto" published by the UK Government in 2006 (Department for Education and Skills; 2006). Maynard (2007) additionally highlighted the outstanding possibilities for environmental education. In the meantime, the concept of regular visits to forests by schools is also found in other countries. Forest schools are mainly implemented by employing nature pedagogues at schools to provide regular or voluntary courses, project weeks or afternoon care. Regular teachers can also use nature for teaching purposes, for example via day visits to nature spaces (Lirsch, 2015). A Forest Schools Association has been set up in the UK to provide a voice, advice and information for those involved in forest schools (<https://www.forestschoollassociation.org/the-forest-school-association/>). In the UK forest school practitioners need to undertake specific training in order to be able to take children out for a forest school session.

4.4.3 Forest pedagogy /Forest Related Education for Sustainable Development (ESD)

Forest pedagogy (FP) is associated with interactive, action and experience orientated learning. For a long time there were no standardised definitions of FP (Bancalari et al., 2015), but in 2007 (passed in 2013 by the German Forest Chief Conference) the German "Framework Guidelines and Minimum Standards for the Certification of FP" defined FP as forest related environmental education undertaken by qualified people. FP promotes understanding and acceptance of sustainable and multifunctional forest management. Forests are used as a location and a practical model for all dimensions of sustainability (Zertifikat Waldpädagogik, 2017). Three different groups of goals and objectives can be identified (FCN-Subgroup-Forest Pedagogics 2017, <http://forestpedagogics.eu>):

Educational goals of ESD on forests:

- communicate values like respect for nature, consideration for fellow beings and living beings, responsibility, tolerance, solidarity between generations as well as global and long-term thinking and acting
- improve creativity and imagination, cooperative and action competencies, interdisciplinary thinking, curiosity, concentration and social behaviour
- offer free space for self-discovery and learning about nature, natural habitats and biodiversity
- stimulate contemplation and reflection about the results of actions, their own role in the context of nature or society and the possibilities to change actions and attitudes in everyday life

ESD objectives for sustainable forestry:

- raise awareness of the benefits of sustainable forestry, of the value of non-wood forest products and services (benefits for society – mental, practical, emotional), and of the places of employment in the forest sector and the forest-based industry
- provide added values to rural development (employment, tourism, income, etc.)
- foster interactions and exchanges between rural and urban areas/people
- improve relationships with the environment at a local level
- promote the continuing use of wood as a renewable material (to gain social acceptance for timber harvesting and forest management)

Environmental objectives, forest-related objectives:

- develop awareness, sense of responsibility and interaction for the role of forests and forestry
- develop awareness of climate change (risks and potentials)
- foster interests and cooperation to make forests, their products and their management prepared for other challenges and risks ahead (water resources, energy, biodiversity, protection of soil)
- improve understanding of forest management and forests' multifunctional benefits

Health effects of forests in the context of forest pedagogy

Activities such as sports and recreation as well as the topic of a healthy way of living are directly addressing many peoples' personal needs, wishes and expectations. The topic "Forests and Human Health" is suitable for communicating correlations between these personal demands and the multiple functions and services that SFM offers society. To communicate about this complex subject, FP can provide a number of effective messages and simplify or illustrate facts and knowledge concerning the positive impact of forests on human health.

The positive effects of forests on human health are of high relevance for generating a new dialogue between the forest sector and society. The forest sector should focus more intensively on the benefits people can gain from forests to meet the demand of public interests and expectations of forests and how they should be managed. As well as the recreational and protection services of forests, their impact on human health is getting worldwide attention and considered increasingly important. Studies show that people have a strong emotional relationship with forests (O'Brien and Morris, 2013; Suda and Dobler, 2014). Forests, timber and SFM can be perceived positively, but for many people forestry still has a negative image. Sometimes forestry is seen as a threat to forests (Kleinhüchelkotten, 2010; Rametsteiner et al., 2009). Therefore, those with other forest-related interests, for example, the protection of nature in non-managed forests, are raising more public awareness with their messages. Depending on forest management objectives foresters are sometimes labelled as "bad guys" by the public and not as "friends or conservers of forests" (Dobler and Suda, 2015).

In his opening speech at the IUFRO 125th Anniversary Congress in Freiburg 2017, Göran Persson, the former Prime Minister of Sweden, underlined that "we need to find compelling narratives about how to use our forests". The impact of forests on human health and the management measures some foresters are providing to guarantee these benefits are such a compelling narrative. "Doctor Forest", in the meaning of utilizing the forest for health aspects, is able to show the forester as an authentic and competent helper of forests. Therefore, FP activities are an important way of conveying these messages.

With regard to demographic change, and the fact that our cities are growing rapidly "Doctor Forest" is even more urgently needed: the World Health Organization (WHO) demands, in the "Parma Commitment for Urban Green Spaces," "...We aim to provide each child by 2020 with access to healthy and safe environments ... and to green spaces in which to play and undertake physical activity." (WHO, 2010, 2016)

Examples for communicating health benefits via practical FP activities and projects

A lot of existing FP activities (games, demonstrations, field and research activities, other FP practices) are suitable for illustrating the importance of forests and forest ecosystem services for human health. Nevertheless, it is necessary that forest pedagogues are able to explain these benefits. Thus the activities should be adjusted and adapted to maximise their beneficial impact on health (examples are given below).

- ***Human health and physical activity***

Physical activity can have an enormous impact on health. Many diseases are caused by a lack of physical exercise. More and more medical therapies offered by hospitals and physio clinics are carried out in forests. FP activities that motivate and encourage people to exercise can contribute to physical health.

- ***Human health and forest functions***

Some of the “forest protection functions” or “public welfare functions” directly connect with human health. Forests provide drinking water, improve air quality in urban areas and reduce traffic noise. These functions directly relate to citizens’ needs and demands for recreation and tranquillity that they hope to experience in forests.

- ***Human health and food & medicine***

Forests offer plenty of healthy food, such as honey, venison, mushrooms, herbs and a lot more. These products are not only healthy, it is fun to search for and gather them. They provide for unusual recipes and can be cooked over an open fire. Many FP activities encourage participants to try to prepare “stick bread,” forest mushroom soup, salted forest herb butter or self-baked bread. There are also a lot of medicinal products with healing properties that originate in forests. FP activities, such as making your own arnica salve or ethereal pine needle oil are just a few examples of the beneficial impact of forests on human health.

- ***Human health and sensory experiences***

FP is much more than learning about forests. A lot of FP activities take advantage of learning through the senses and focus on hearing, smell, taste and touch. Often this has to do with changing perspectives or perceptions since concentrating on a certain sense can help people to change their perspective or perception of certain things. People can reduce their levels of stress and recover faster by learning to use all their senses and taking notice of their surroundings.

- ***Human health and meditative experiences***

Some FP activities are silent, meditative and relaxing. They can be combined with reading or listening to poems and stories about forests, listening to fairy-tale tellers or meditative texts. This may help people to relax and temporarily forget about their problems.

- ***Human health and creative activities***

Body, soul and psyche belong together – so being creative, for example by creating “land art,” drawing and designing with materials from nature and forests can intensify the mental and psychological well-being of those involved, and thus have positive effects on human health.

Good practice examples

“Forest School”, United Kingdom

Written by: Liz O'Brien

Organisations involved

Numerous including schools, independent Forest School providers, associations and groups.

Aim

To provide an inspirational process that offers all participants regular opportunities to achieve and develop confidence and self-esteem through hands-on learning experiences in a woodland or natural environment with trees.

Target group

Children and young people.

What happens

Forest School is a specialised learning approach that sits within and compliments the wider context of outdoor and woodland education. Forest School includes a number of key features including: 1) The use of a woodland or treed (and therefore “wild”) setting that is framed by strict safety routines and established boundaries that allows the flexibility and freedom for child-initiated (not only issue-led) learning, and other innovative approaches to learning to take place in a low-risk environment; 2) Learning can be linked to the national curriculum and foundation stage objectives whilst setting those objectives in a different context, and it is not focused just on the natural environment; 3) The freedom to explore using multiple senses is fundamental for encouraging creative, diverse and imaginative play; 4) Regular contact for the children over a significant period of time (e.g. all year round, in all weathers). Regular can mean anything from fortnightly during a school term to one morning, afternoon or day every week for three to twelve months; 5) A high adult to pupil ratio (e.g. groups are small with approximately twelve children per session) allows for children to undertake tasks and play activities that challenge them but do not put them at undue risk of harm. It also allows practitioners to quickly get to know the individual learning styles, abilities and characteristics of the children in their charge. Currently in the UK, Forest School is being used with a range of groups from early years children to those with special needs (e.g. speech and language difficulties) or young people with emotional and behavioural difficulties.

Results of the programme

A number of research projects have been undertaken to explore the impacts of Forest School on children and young people, and on their physical activity levels and mental wellbeing. Results show that Forest School enables children and young people to be physically active, it is effective for those with emotional and behavioural problems and for kinaesthetic learners i.e. those who learn by doing.

Reference

Roe, J. and Aspinall, P. 2011. The restorative outcomes of forest school and conventional school in young people with good and bad behaviour. *Urban Forestry and Urban Greening*, 10: 205-212.

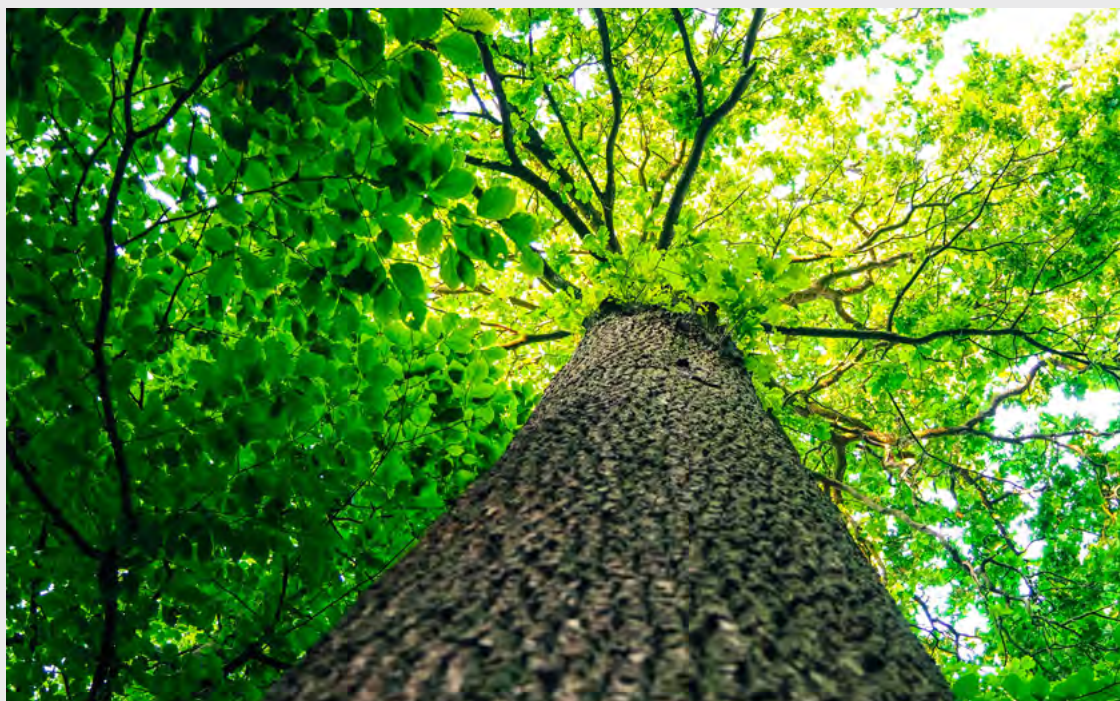
Lovell, R. 2009. An evaluation of physical activity at Forest School. Doctoral Thesis, University of Edinburgh, 402 p.

O'Brien, E and Murray, R. 2007. Forest School and its impacts on young children: case studies in Britain. *Urban Forestry and Urban Greening* 6: 249-265.

Website

www.forestschoollassociation.org

www.forestresearch.gov.uk/research/forest-schools-impact-on-young-children-in-england-and-wales



“Social Forest”, Spain and Germany

Written by: Markus Sallmannshofer

Organisations involved

SocialForest – Servicio Forestales y Formación.

Aim

To educate and socially integrate unemployed young people; “Forest Coaching” to enable young people to acquire professional competences; and the offer of effective capacity-building training.

Target group

Unemployed young people at risk of social exclusion and marginalised people, local authorities and private companies, other unemployed, and migrants.

What happens

“SocialForest” is a social enterprise based in Barcelona, Spain, that offers forest management, forestry training and social integration of unemployed young people at risk of social exclusion, and marginalised people.

The services are offered to private and public institutions in Catalonia, Spain, and Germany. Sustainable forestry is used as a tool for social inclusion. Therefore, teamwork, mutual confidence and a relaxed and friendly working atmosphere are encouraged. It is a collaboration of the forest-agriculture sector and social sector. The company is certificated by PEFC. Integrated, multidisciplinary and effective capacity-building training is held for the target groups.

“SocialForest” describes itself by three major aspects:

- As a forestry enterprise, SocialForest is performing consultancy and forestry services. These operational services include projects of fire prevention, conservation and traditional forestry operations, such as maintenance of roads and clearings. A major aspect is to reduce risks in the workplace.
- Therapeutic effects of forests are used in a concept called “Forest Coaching.” Its main aim is to enable young people to acquire professional competences and skills in an easy and natural way. Through this they can learn about empowerment, respect and inclusion.
- Social integration of unemployed young people is taking place during vocational training. The aim is for them to become professional forestry workers, subsequently hired within the enterprise or in other forestry companies.

Results of the programme/project/intervention

The investment in people is seen as leading to sustainable development and it is described as cost-effective with immediate direct returns (Englert, 2017).

The programme was awarded “La Obra Social de la Caixa”, “Quardons annels de la fusta”, “Premis excel·lencia energetic”, and “BBVA Momentum”.

Reference

listed at the end of the chapter

Website

www.socialforest.org/en



Forest school Bodensee, Austria

Written by: Benjamin Stadler, Markus Sallmannshofer

Organisations involved

Stadt:Wald – Verein zur Förderung von Waldwirtschaft und Wissen, aks Gesundheit GmbH, Hospiz Vorarlberg.

Aim

Forest education, improvement of mental and physical health by staying, working, and relaxing in the forest.

Target group

Pupils, families, adults and companies.

What happens

In addition to guided tours by forest pedagogues, the forest school Bodensee offers services for health promotion. They developed the project “Workout in the Forest” for the state administration Vorarlberg as further education for employees. For a period of one year, the employees take a regular time-out in the forest in order to increase their subjective well-being and job satisfaction. The soothing experience of the forest should stimulate self-reflection. In addition to topics of physical activity in the forest and relaxation through the forest, participants are engaged in social processes by joint actions. These principles are also applied for the workshop “Resilience for managers with the mountain forest as a teacher!” that aims promote better health of employees.

Likewise, mourning sessions for children has been set up in cooperation with the Vorarlberg hospice. Through reflection on the natural processes in the forest, including illnesses and death, children can develop a better understanding of death which can be useful for the mourning process. There are also several other benefits to mention: in cooperation with the “aks Gesundheits GmbHs x-team”, a group programme for overweight children in the forest was implemented, in which the children can have fun and be active, but also experience and learn about the forest. Additionally, the state administration of Vorarlberg implemented “forest bathing workshops”. Further social benefits are grandparents / grandchildren days and childrens’ birthday parties in the forest.

Results of the programme/project/intervention

Since it was founded in 2007, the forest school Bodensee has successfully offered courses, workshops and more. The project has been awarded a recognition prize at the “Future Prize of the City of Bregenz” and a recognition award at the “Vorarlberger Schutzwaldpreis 2017” in the society category.

Website

www.waldschule-bodensee.at

“Doctor Forest” – forest pedagogy activities within the annual Forest Week 2018, Germany

Written by: Dirk Schmechel

Organisations involved

Bavarian Institute of Forestry, Bavarian Forest Administration, forest pedagogy centres in Bavaria.

Aim

development of tested forest pedagogy-best-practice-activities (publication).

carrying out the “Bavarian Forest Week 2018” (9th – 17th of June 2018) under the motto “Doctor Forest”.

motivation of the 47 local Bavarian forest offices and the 10 forest pedagogy centres to support the Forest Week by implementing events in the state-wide public relations campaign.

Adoption of the topic “Forests and Health” in the forest pedagogy activities.

Target group

Short term: Offering forest pedagogy events related to the annual topic “Forests and Health,” especially to schoolchildren, kindergartens, seniors, and families.

Long term: Forest pedagogues, foresters, forest owners, teachers, educators.

What happens

Beginning in September 2017, a working group at the Bavarian Forest Institute started to collate existing forest pedagogy activities concerning the “Forests and Health” topic. The results were quite sobering. Two workshops (one for forest pedagogy experts, one for foresters at FP centres) were organised to design, discuss and test new activity ideas. In the same shape and style as the existing Bavarian “Guidebook – Forest Pedagogy”, 15 new activities were described and published. The publication (50 pages) also contains background information, literature references and link tips.

Results of the programme

During the 2018 Forest Week (9th- 17th of June) the topic “Forests and Health” was communicated in about 40 public events (accessible to everyone for free) and about 200 topic-related forest field trips for schoolchildren in Bavaria.

Website

Publication: www.stmelf.bayern.de/mam/cms01/wald/waldpaedagogik/dateien/handreichung_wald_erleben_2018red.pdf[German]

Topic: www.lwf.bayern.de/wissenstransfer/waldpaedagogik/191808/index.php [German]



Forest Experiment, Switzerland

Written by: Andreas Bernasconi

Organisations involved

Association Forest Experiment (“Verein Waldexperiment”).

Aim

To introduce young children from an urban environment to the forest wilderness and let them detect and explore this unknown environment and develop new ideas (open structure).

Target group

Children between 7 and 11.

What happens

Duration: 1 year (12 modules)

Annual participation: 20-24 children per experiment; 3 experiments per year

Use intensity: 1 module every month

Costs for participation: around CHF 250 per year

Accessibility: forest area, only for people able to walk in the forest

The programme Forest Experiment (“Waldexperiment”) is based on a forest oriented approach and on findings and methods from social pedagogics; the association is combining forest and social pedagogic skills and professions. The children develop their own ideas and experience the so far unknown forest. Based on individual decisions, personal risk limits are reached in a secure setting. These activities are part of an integral health experience in the sense of reflection.

Results of the programme/project/intervention

The experiment results in self-confidence which is an important contribution to life-long learning.

Reference

Publications can be found on the website.

Website

www.waldexperiment.ch

Forest Olympics Gantrisch, Switzerland

Written by: Andreas Bernasconi

Organisations involved

Regional Nature Park Gantrisch (“Regionaler Naturpark Gantrisch”).

Aim

To bring schoolchildren into the forest and to let them experience all human senses within a forest environment in a motivational context.

Target group

Schoolchildren (year 3 and 4; children between 9 and 12); the event is organised in collaboration with the schools; usually 10 to 15 classes participate in one event (different schools from different areas).

What happens

Duration: 1 day (every second year); it is an event organised for all classes of the same age from the participating schools

Annual participation: around 250 to 280 children every second year

Use intensity: 1 day in summer

Costs for participation: participation is free; the event is organised by the regional nature park in close cooperation with the schools and other institutions from businesses and local communities

Accessibility: forest area, only for people able to walk in the forest

Forest Olympics Gantrisch (“Waldolympiade Gantrisch”) is an event based on the idea that all the children go through different duty stations in the forest fulfilling various tasks. The tasks are directly linked to all seven human senses (official six senses: sight, hearing, smell, taste, touch and balance; and the “unofficial seventh sense” of intuition or inspiration). The duty stations are designed in an “Olympic setting”. The event is organised on a cross-sectoral approach linking stakeholders from different sectors throughout the region.

Results of the programme/project/intervention

Children can easily be motivated and should be recognised as a special target group. Cross- sectoral cooperation is highly important for single and series of events.

Reference

Publications can be found on the website.

Website

www.gantrisch.ch



— 4.5 Forest recreation and tourism provide indirect health benefits

At present, many people all over Europe participate in outdoor recreation, and among natural areas, forests are considered one of the most attractive types of natural environment. However, there exist clear differences between European countries regarding participation in various recreation and forest-based tourism activities. These differences are related to recreation possibilities offered by forests in terms of accessibility, and quality of the areas. There are also cultural differences in traditional forest uses that vary across Europe. As a result, the relative importance of forest recreation and tourism differs from country to country (Tyrväinen et al., 2008).

For some recreational activities, leisure and sports, forests and trees can be a precondition and nature based tourism has a high potential to enhance rural development in many European countries (Bori-Sanz, 2002). In Scandinavian countries and Austria, there seems to be a positive relationship between the percentage of land covered by forest and the importance of forests for tourism in these areas (Tyrväinen et al., 2016; Grieshofer et al., 2011). Yet forests alone are rarely the only attractive feature of natural areas popular with visitors. Visitors are often attracted by the scenic beauty of these areas and their infrastructure (Tyrväinen et al., 2016; Barroso et al., 2012; Grieshofer et al., 2011). Environmental and social development can be enhanced by efficiently managed organised tourism in forested areas (Bori-Sanz, 2002).

With the decline in the importance of timber production in some European regions and major structural changes in the agricultural economy, nature tourism is often seen as an alternative to rural development. Research summary from the European COST Action E33 – Forests for Recreation and Nature Tourism concludes that recreation and nature tourism can make important contributions to the rural economy. The level of these contributions depends on social factors, such as attitude and level of cooperation among stakeholders, and natural features, such as geo- and biodiversity.

Recreation or tourism should be sustainably developed and appropriate compensation for forest owners should be considered if they do not receive direct income from these activities (Bernasconi, 2008). Forest workers can often boost their income by working as tourist operators or guides. Ten percent of interviewed forest workers of the Polish State Forests were found to be running their own agro-tourism businesses which are seen as a means of securing additional income (Nowacka et al., 2017).

4.5.1 Attractiveness of forests for recreation and tourism

Recent trends show that an increased number of regions consider themselves health benefiting regions. Each region (area) possesses a unique combination of environments and resources available to visitors. These health regions are typical examples of clustered tourist offers covering a wide range of services (e.g. good practice example “Alpine Health Region of Salzburger Land, Austria”). Limited, location specific resources are of a high importance for bespoke health offers (Pichler et al., 2017).

A major problem is that the economic value added is yet to become attractive for forestry enterprises facing potential financial costs (Sekot, 2007, 2016). It is therefore of high importance to make these opportunities economically attractive for forest land owners. Ahtikoski et al. (2011) showed for commercially used forests

situated between two top-rated Finnish tourist resorts that financial losses from adapted forest management practices were offset by the increased number of visitors. These opportunities can be exploited by involving forest owners and forestry enterprises directly or indirectly (compensation) in generating economic profits.

Creative tourism

Forests can provide unique accommodation during holidays. Exclusively designed tree houses, cabins or tents often form a special feature of the area. Creativity is a major factor for developing unique selling points. Additionally, new target groups can be attracted - for example by events combining forest stays with music or art.



4.5.2 Sustainable recreation and tourism

Tourism also exerts significant pressures on forests ecosystems and therefore adequate trade-offs and synergies must be accounted for in order to cater for various demands (Ennoursaid, 2017). Negative impacts have to be minimised to contribute to sustainable development and to minimise conflicts (Bell et al., 2009). Eco-labelling schemes can stimulate eco-friendly developments in tourism. Eco-tourism is defined as “responsible travel to natural areas that conserves the environment and improves the well-being of local people” (TIES, 2017). Therefore, a major aspect is eco-efficiency that describes the carbon dioxide equivalent emissions assessed against generated revenues. Transport modes and distances, accommodation facilities and occupancy rates significantly influence this ratio (Gössling et al., 2005). Eco-certificates are, however, more complex and also include other ecological impacts. These certificates provide marketing advantages and should therefore be attractive to the tourism sector (Margaryan, 2017). Although the size and income of the company is linked to being eco-certified, the popularity of eco-certification in Norway and Sweden remains limited. Reasons for this include complicated application procedures and high fees for certification (Margaryan, 2017). To target sustainable development, certification schemes should not only address environmental impacts but also social, cultural and economic impacts on a regional and wider scale (Tepelus and Córdoba, 2005).

Good practice examples

“Woods in and around Towns” programme, Scotland

Written by: Liz O'Brien

Organisations involved

Forestry Commission Scotland and numerous partners.

Aim

To provide good quality and accessible woodlands close to where people live and work.

Target group

Urban deprived communities.

What happens

The Woods in and around Towns (WIAT) programme started in 2004 and tackles the barriers people face to regularly visiting and benefitting from woodlands. The programme focuses on the location, accessibility and management of urban woodlands, to encourage more use by local people. It aims to improve local woodlands and a forestry challenge grant was made available to improve woodlands that are within 1 kilometre of a population settlement of 2,000+ people. Sustainable forest management is central to WIAT's success, with long-term maintenance and management being important to derive the most from WIAT woodlands for everyone. After improvements to woodlands are made, community engagement is organised to reach out to local communities and raise awareness about the woodlands, and encourage use and enjoyment of the woods for people's well-being.

Results of the programme

An evaluation of the WIAT challenge found that, overall, the number of visits to WIAT woodlands increased, including people from some of Scotland's most deprived communities. After £2.5 million of funding for improvements to WIAT woodlands, the recreation and health and well-being benefits were calculated at approximately £13 million per year. Funding was critical to increasing woodland access and changing patterns of visiting behaviour, since most of the woodland improvements would not have happened otherwise. A five year study funded by the National Institute for Health Research studied whether there were improvements to psychological well-being of the WIAT programme. Three communities were chosen to receive the WIAT intervention and three control communities were identified, thus a natural experiment was carried out as part of the research. The work is due for publication in early 2019.

Reference

Ambrose-Oji, B. Saraev, V. Peace, A. Connolly, T. Chetcuti, J. Edwards, D., 2014. An evaluation of the WIAT challenge fund: changing use patterns, the value of recreation and health benefits, and lessons learned. Farnham, Forest Research, 65 p. www.scotland.forestry.gov.uk/images/corporate/pdf/wiat-evaluation-2014.pdf

Ward Thompson, C., Silveirinha de Oliveria, E., Tilley, S., Willings Botha, E., Briggs, A., Cummins, S., Leyland, A., Roe, J., Aspinall, P., Brookfield, K and Mitchell, R. 2019. Health impacts of environmental and social interventions designed to increase deprived communities' access to urban woodlands: a mixed-methods study. *Public Health Research*, Vol 7, 2. DOI.10.33.10/phr-7020.

Website

www.scotland.forestry.gov.uk/supporting/strategy-policy-guidance/communities/woods-in-and-around-towns-wiat



“Alpine Health Region SalzburgerLand”, Austria

Written by: Markus Sallmannshofer

Organisations involved

SalzburgerLand Tourism, Paracelsus Medical Privat University (PMU) Salzburg, University Hospital for Anaesthesiologie, Gasteiner Spa, Rehabilitation and Healing Caves GmbH, Spa and Health Partners Gastein, Rock Spa Bad Gastein, The Gasteiner Valley Alpine House, Hohe Tauern Health, Zell am See - Kaprun Tourismus, Saalfelden Leogang Touristik GmbH, Palace Spa Hotel, Guest Service Tennengau, MCO Private Hospital GmbH, Medical Centre Bad Vigaun, Gastein Alpine Spa.

Aim

To create a major health tourism destination outstanding on a European scale by clustering tourist attractions.

Target group

Health tourism overnight guests with a focus on active outdoor tourists, stressed people and those suffering from respiratory diseases, rheumatism, and skin conditions.

What happens

The Alpine Health Region SalzburgerLand (“Alpine Gesundheitsregion Salzburger Land”) is based on a project that investigated around 200 healing resources, combining 14 health regions and businesses ranging from spa hotels to health care centres. These healing resources were checked with regard to their medical, scientific and touristic potential. Selecting location-bound and regional resources ensures competitive advantage. Nevertheless, the area is rich in forests and using this forested, natural landscape (alongside other resources) is a tourist magnet. The combination of medical treatments and inter-sectoral cooperation is fostered to create innovative health tourism value chains (Pichler et al., 2017).

Results of the programme

A systematic analysis of (site specific) competitive advantages is beneficial for the establishment of (unique) health tourism attractions.

Reference

Pichler, c., Salletmaier, C., Bauernberger, L., Haas, Wl., Lehofer, B., Kuhn, W., Bott, A., Steckenbauer, C., Hartl, A., 2017: The Alpine Health Region Salzburg – A Government-driven Approach for Evidence-based Health Tourism. In: Austrian Research and Training Centre for Forests, Natural Hazards (BFW) and Landscape & Institute of Landscape Development, Recreation and Conservation Planning, University of Natural Resources and Life Sciences, Vienna (eds) 2017. Proceedings of the 3rd International Conference on Landscape and Human Health: Forests, Parks and Green Care. Vienna, BFW, 143 p.

Website

www.salzburgerland.com/en/alpine-health-region

www.brochures.austria.info/pdfs/0000/8634/agr_magazin_en_final.pdf



Forest rope courses and treetop walks

Written by: Markus Sallmannshofer

Organisations involved

Location specific.

Aim

“Edutainment” - visitors are supposed to have fun visiting the sites and seeing the changing views while environmental education programmes take place (Thassler, 2017).

Target group

Children and adults, treetop walks also for disabled people.

What happens

Developed for military purposes, rope courses are today available for pedagogic and tourist purposes and call for the physical skills of users. They are mainly built in forests using tree-friendly steel cable constructions combined with protective covers for the trunks. Usually, there are several tasks of varying difficulties provided. For pedagogic use, special approaches are necessary to focus on personal development in communicative and problem-solving skills as well as in confronting fears and strengthening self-confidence. The concept targets children as well as adults in so-called management training and was first used in schools in 1941 (Hochseilgarten-Verzeichnis, 2018). The tourist arrangement requires the handling of high visitor numbers and provision of fun. In 2010, there were more than 1,300 forest rope courses in France, Germany, Italy, Spain, Sweden, England and Switzerland combined, visited by more than 17,000,000 people annually (Bernasconi, 2011). Since 2010, the number of rope courses in Germany has increased from 300 (Bernasconi, 2011) to 481 (Anonymous, 2017), but not all are located in forests.

Treetop walks, in general, are mostly wooden constructions that provide access to the upper canopy of forests. They are often wheelchair-accessible and a German survey showed 2% of the visitors being mobility disabled. Due to their high costs, they are mainly located in national parks and biosphere reserves.

Results of the programme

Treetop walks are highly effective measures for visitor guidance through the concentration of visitors. There are 17 treetop walks in Germany and an additional one is being currently installed. Five are found in Austria and, since 2012, there is the Stezka korunami stromů Lipno in the Czech Republic.

Reference

Anonymous, 2017: "Hochseilgärten in Deutschland." www.hochseilgarten-kletterwald.de/hochseilgaerten-deutschland-karte.html (last accessed: 30.11.2017)

Bernasconi, A., 2011: Seilparks in der Schweiz. Die Branche boomt. Wald Holz 92, 4: 36-40.

Hochseilgarten-Verzeichnis, 2018: "Geschichte der Hochseilgärten." www.hochseilgarten-verzeichnis.de/hochseilgarten-geschichte.php (last accessed: 10.12.2018)

Thassler, O., 2017: Treetop Walks – Access to Green Spaces and a Modern Approach to Social Inclusion. In: Austrian Research and Training Centre for Forests, Natural Hazards (BFW) and Landscape & Institute of Landscape Development, Recreation and Conservation Planning, University of Natural Resources and Life Sciences, Vienna (eds) 2017. Proceedings of the 3rd International Conference on Landscape and Human Health: Forests, Parks and Green Care. Vienna, BFW, 143 p.

Website

www.hochseilgarten-kletterwald.de/ [German]

www.hochseilgarten-verzeichnis.de/ [German]



“WALDNESS” programme, Austria

Written by: Benjamin Stadler, Markus Sallmannshofer

Organisations involved

Tourism marketing Pangerl & Pangerl, tourism association Almtal, forest school Almtal, and NATURSCHAUSPIEL.at, in cooperation with local hotels, youth hostels and guest houses.

Aim

To develop holiday offers including “forest bathing,” forest and herbal pedagogics, relaxation and physical exercises in forests.

Target group

Individuals, couples and groups who want to improve their physical and psychical health.

What happens

Since autumn 2017, forest holidays have been offered in an Upper Austrian valley called Almtal under the WALDNESS® brand. The aim is to offer high quality holiday with comprehensive activities in the forest. Included in the programme are massages in the forest, forest Wyda (yoga of the Celts), a “forest bath” next to a mountain pine (Latschenbad), a forest buffet, hiking with forest cooking in the forest school, forest sauna, forest cosmetics and Kneipp applications in the forest. Due to the tourism promotion, the term “forest bathing” is an important part of WALDNESS®. All offers are under the motto “retreat, recreation, recharge your batteries and feel a bond with the forest”.

The Almtal in the Salzkammergut is the first destination where the WALDNESS® programme is offered,. It has been developed by local hoteliers, tourism experts, and groups of other people. Other destinations are to follow. A forest holiday includes four nights in one of the WALDNESS® establishments. Costs range from €450 to €600 depending on the accommodation. It can be booked as a package and also with other services from partners such as NATURSCHAUSPIEL.at. Offers are bookable at any time of the year and are based on the restrictions of nature. In the autumn, there are also dew hikes and sunrise breakfasts whilst in winter one can enjoy snowshoe and lantern hikes.

Results of the programme/project/intervention

The programme was started in autumn/winter of 2017 and is still running successfully.

Website

www.waldness.info/
(www.waldness.almtal.at)



— 4.6 Green jobs generating additional income and investments in the forest sector

4.6.1 Green jobs based on forest ecosystem services

Environmental, social and health services may generate new jobs and can be developed as marketable goods hence they provide competitive advantages by creating additional quality characteristics and publicity for the regions (Düsterhoeft, 2017). Valuations of non-marketed services show that they are a neglected asset and that their potential is underutilised. Payments for environmental and social services may generate new ways of revenue and investment. It is a challenge for the future to find a balance between traditional forest goods and services and new services and if possible to combine them in new attractive packages.

Due to often poor health in urbanised societies associated with a modern lifestyle, sedentary work and mental stress, there is an increasing potential for creating new green jobs related to the positive effects of forests on human health and well-being. This on the one hand applies pressure on forests as places of recreation and on the other hand increases demand for forest-related social services (Forest Europe Liaison Bratislava, 2017; Marusakova and Veszlay, 2017). Expanding non-wood forest services will help create employment opportunities within SFM (Bernasconi, 2008).

New career opportunities have recently emerged for forest guides, forest pedagogues and health care professionals in several countries, such as the United Kingdom, Germany, Spain, Austria, Slovakia, the Czech Republic, Poland, etc. In particular, women with their experience, skills and knowledge show a high interest in these areas, which might challenge the traditionally male-dominated sector and make it more gender balanced (Forest Europe Liaison Bratislava, 2017). At present men account for the majority of the sectoral workforce in the pan-European region (Forest Europe 2015).

However, there is a great difference in attitude towards forest visitors among forest owners and forest managers, especially between owners of public and private forests. Owners of private forests are generally much more wary of visitors. To succeed in improving the use of forests for health benefits, it is important to encourage private forest owners to open their forests to citizens of surrounding towns.

Local providers of forest activities can generate revenue and benefit from offering various activities, such as guided forest excursions, educational or therapeutic programmes, workshops, seminars, etc. Forests with exceptional infrastructure can generate revenue from entrance fees. Offering various forest-based packages is vital to increase the competitiveness of the forest sector. As an example, a provider of forest activities can generate additional income from providing overnight accommodation or from collaboration with other potential beneficiaries. Cross-sectoral cooperation and collaboration among different stakeholders (tourism associations, insurance companies, NGOs, sporting associations) is needed to enhance regional development (Pichler et al., 2017). Providing these new services has the potential to increase public understanding and acceptance of forest management practices.

An overview of different health activities, partners, and deliverers of human health benefits from forests is shown in Table 1.

Table 1

Category	Examples of activities	Potential partners for the forest sector	Delivered by
Forests for human health promotion and disease prevention	Cure and healing forests and spas, healing forest trails, regeneration and wellness paths, forests for mindfulness walks and programmes, forest bathing, trails for the soul, anti-stress programmes	Health care sector, research institutes and academia, biosphere reserves and environmental organisations, municipalities, sporting associations, meditation groups, etc.	Forest guides, forest owners, managers, forest enterprises staff in collaboration with medical professionals, instructors and therapists
Forests for therapy and rehabilitation	Forest therapy, wilderness therapy programmes, forest therapy walks, forests in rehabilitation centres and hospitals (with forest sofas, barefoot, moss and wellness paths), forests for social prescribing tackling social isolation, therapeutic handcrafts, horticultural activities	Health care sector, insurance companies, health care associations, social consultation centres, hospices, Association of Nature & Forest Therapy Guides, research institutes and academia, architects, sporting associations, hydrotherapy facilities, etc.	Medical professionals, instructors and therapists, social workers, forest therapy guides in collaboration with forest owners, forest managers
Forests for forest pedagogy	Educational outdoor programmes, field trips, thematic excursions, observational trips, workshops, kindergartens, forest playing groups, forest day nurseries, forest school, clubs and camps, etc.	Educational sector, foresters, forest owners, schools, kindergartens, NGOs, municipalities, environmental organisations, etc.	Forest pedagogues, teachers, educators
Forests for nature-based tourism, recreation and sports	Guided walks, educational trails, thematic excursions, horse trails, mountain-bike and Nordic walking trails, ski tracks, orienteering programmes, adventure parks, forest rope courses, treetop walks, house or hotel on trees, viewpoints and hides, tree climbing, playing grounds, forest holidays, forest cabins, picnic sites with fire places, nature trails, forest open-air museums, etc.	Recreation enterprises, landscape managers, tourism and sport associations, hotels and guesthouses, visitor centres, environmental organisations, national parks, NGOs, forest owners, forest guides, forest rangers, etc.	Forest guides, forest and land owners, forest managers, sports instructors, entrepreneurs in tourism and sports

Collaboration with partners and professionals outside the forest sector will not only ensure higher quality of services, but also sharing of incurred costs, especially if substantial investments are needed (in particular to build appropriate infrastructure). On the other hand, cost and benefit transfer mechanisms between forest/land managers/owners and tourism/health enterprises must be fair to both sides. In some cases, forest visitors are willing to pay for the use of recreation facilities and services. However, in some countries, especially in Central and Eastern Europe, people automatically expect these types of services will be free of charge and paid for through general taxation. In this regard, cooperation with external partners might provide extra support when applying for joint projects. The funding might be provided as a single contribution of one body or by combining several sources. There are several funding options to cover the costs of health promotion activities including:

- Paid guided health programmes, interventions, forest pedagogy programmes
- Fee-paying attractions with extensive infrastructure, possibly with an exclusive use
- EU Funds (e.g. European Regional Development Fund), Norwegian grants, etc.
- Financial support from municipalities and governments (national grants)
- Co-financing from educational sector, tourism and sporting enterprises
- Co-financing from health care system and insurance companies
- Own resources of forest enterprises (effective marketing tools)

4.6.2 Qualifications and job training

At an international level, legislative conditions vary considerably between countries and responsibilities thus need to be defined at a national level (Houston et al., 2010; Russell, 2001). Efforts to standardise therapy programmes were made several years ago (Russell, 2001). Inconsistencies between educational courses and certifications could have implications for the delivery of forest related health services. Therefore, it is important to have international standards that can be adapted to national levels in different countries.

For example, the Chair for Public Health and Health Services Research (IBE) at the Ludwig-Maximilians-University in Munich is currently developing a training curriculum for forest therapy guides in Germany and an international minimum standard (core-curriculum) in cooperation with the “Association of Nature & Forest Therapy Guides.”

Forest therapy guide could be an additional qualification offered also in the health sector (Brunner, 2017). The core-curriculum represents highly professional and standardised contents for forest therapy education which should, if necessary, be complemented by national or regional specifics. This could also serve as an advanced training course for medical professionals (Immich and Kotte, 2017). In the United Kingdom,

there are nationally recognised qualifications that forest school practitioners need to obtain. There are different levels of courses available depending on whether trainees aspire to lead forest school sessions or work as session assistants.

4.6.3 Networks, cross-sectoral communication and coordination

As described in details in Subchapter 4.6.1, networks and cross-sectoral communication are the two major aspects to consider when trying to exploit the opportunities and benefits forests provide for human health. At present, the forest sector might not be fully aware of various opportunities and benefits provided by forests in the context of human health and well-being or might not be fully able, even if willing, to implement them successfully without partners. Networks will support the implementation and promote the awareness not only among providers, but also among potential users.

Cooperation between the forest, health, social, education and tourism sectors has to be promoted and fully developed. Establishment of networks with players from these sectors is essential and should actively be supported by all stakeholders. Health opportunities and benefits offered by forests go hand in hand with SFM - the forest sector plays the key role in providing and maintaining these opportunities (at least providing the forest areas). To ensure the forest sector benefits financially from generated profits it has to participate in the development of new marketable income streams.

Effective cross-sectoral communication and coordination is needed to efficiently interconnect stakeholders and to foster exchange on the benefits and services forests provide for human health. Regional development, the connection between urban and rural areas, as well as public health aspects can be targeted and improved by networking activities and projects. This applies to both large and small businesses and requires openness, innovation and committed interest to jointly develop balanced, sustainable and integral strategies.



Good practice examples

“Green Care FOREST”, Austria

Written by: Franziska Krainer, Markus Sallmannshofer

Organisations involved

Austrian Research and Training Centre for Forests, Natural Hazards and Landscape Austria, Federal Ministry for Sustainability and Tourism Austria, Working group Green Care Austria (strategic level, 24 partners involved), Project Green Care Austria – Where People Flourish (agricultural sector project), Association Green Care Austria (operative level).

Aim

To assist Austrian forest owners in providing and opening their land for Green Care projects to strengthen social sustainability. Green Care FOREST as an interface works on multiple levels: it addresses different groups, such as forest owners and institutions from various sectors; it marks possibilities for overlapping work fields and enables projects which support and promote health and well-being, education and employment of various people. Green Care FOREST as an enabler of cross-sectoral cooperation, communication and collaboration contributes to social sustainability in a wide-reaching way.

Target group

Green Care FOREST collaborates with the existing Green Care project of the agricultural sector in Austria and especially addresses forest owners and forest managers. Nearly half of Austrian territory is covered by forests. Therefore, the Green Care FOREST target group is large: 82% of Austrian forest are owned by private forest owners. The remaining 18% are owned by the state and municipalities.

What happens

The project Green Care FOREST is based at the Austrian Research Centre for Forests (BFW) and was established in 2014. The project can be seen as an enabling interface between two major groups that normally, or at first glance, do not have any overlapping work areas: (1) forest owners and forest managers and (2) institutions from the health, education, employment, and social sectors.

For forest owners and managers, Green Care FOREST provides new ideas for forest based products and services. These products and services derive from the fact that forests are a great place for health and well-being. Hence, Green Care FOREST encourages forest owners and managers to also focus on the social aspects of their forests and “open” them for social initiatives, projects and engagement.

For institutions from the health, education, and social sectors, Green Care FOREST mediates the beneficial and positive effects forests provide for people’s health and well-being, and how interaction with nature can contribute to a healthier lifestyle and disease prevention. These beneficial and positive effects of forests

offer new possibilities to work with various target groups, such as small children and school pupils, stressed adults, elderly people as well as migrants, and people with physical and psychological health issues. The BFW fulfils a guiding and supervisory function for Austrian agriculture and forestry. An adjustable modular system should be provided to support agricultural family businesses in particular (Ziehaus, 2017). The aim is to strengthen farms, improve rural economy and revitalise rural areas and to increase the quality of life by providing new sources of income and job opportunities. Various programmes can be supported by Green Care FOREST including forest kindergartens, forest-youth project weeks, and educational programmes for senior citizens (Wurm, 2014). Forests are again seen holistically as a location for education, employment, and health.

Results of the programme/project/intervention

In order to deliver scientific support, the research project “Green Public Health - Benefits of Woodlands on Human Health and Well-being” was created in cooperation with ILEN (BOKU) and the Medical University of Vienna. The outcome was a comprehensive literature review:

Cervinka, R., Hölzge, J., Pirgie, L., Schwab, M., Sudkamp, J., Haluza, D., Arnberger, A., Eder, R., & Ebenberger, M. (2014): “Green Public Health – Benefits of Woodlands on Human Health and Well-being.” Vienna, Austria: Austrian Federal Research Centre for Forests (BFW), Vienna.

Furthermore, Green Care FOREST regularly publishes practical handbooks, which give hands-on insights in the implementation of different Green Care FOREST projects. These focus on using forests for Green Care activities targeted at different groups of people (children, the elderly, etc.). Cross-sectoral cooperation and communication are important tools in this process. To receive the WIAT intervention and three control communities were identified, thus a natural experiment was carried out as part of the research. The work is due for publication in early 2019.

Reference

Ziehaus, L., 2017: Health, Social Aspects and the Future Potential of Austrian Forests. In: Austrian Research and Training Centre for Forests, Natural Hazards (BFW) and Landscape & Institute of Landscape Development, Recreation and Conservation Planning, University of Natural Resources and Life Sciences, Vienna (eds) 2017. Proceedings of the 3rd International Conference on Landscape and Human Health: Forests, Parks and Green Care. Vienna, BFW, 143 p.

Wurm, R. 2014: “Green Care FOREST - diversification as an opportunity for forestry.” https://www.waldwissen.net/wald/erholung/bfw_greencareforest/index_EN (last accessed 10.12.2018)

Website

www.bfw.ac.at/rz/bfwcms.web?dok=9844

Urban forest in Celje (Mestni gozd Celje), Slovenia

Written by: Manca Baznik

Organisations involved

Slovenian Forest Service (Unit Celje), Municipality of Celje, Government Office for Development and European Cohesion Policy, private forest owners.

EU Project: GREEN4GRAY (pilot project for sustainable urban forest management)

Aim

To promote understanding and importance of forests. The city council declared these urban forests to be classified as special purpose forests protected by law. The original forest area has been expanded by buying forests from private owners. The council supports recreational and educational programmes in forests and public awareness campaigns to raise the importance of urban forests for human health and well-being. Permanent financial support for managing and developing urban forests in the area has been established.

Target group

Local inhabitants, education system (primary schools, high schools, kindergartens), tourism.

What happens

The urban forest in the southern part of the municipality of Celje, with its 114 hectares area of public ownership and its 15 km of equipped and multifunctional trails, represents the biggest public green area around the city. In 1991, a survey on the current state and condition of urban forests and the development of social forest functions was carried out and a long-term management plan was formulated. Additionally, the city council passed a local law for the protection of urban forests. Since 1997, the Municipality of Celje has established a permanent provision in its budget to cover primary costs associated with long-term urban forest management. These costs include costs for private forest redemption, compensation to private forest owners for a limited use of their forests, costs for the restricted forest management and the costs for construction and maintenance of recreational infrastructure. As the Municipality of Celje owns a complex of production forests located outside the protected urban forest area, most of the income from these forests is invested in the urban forest area. The Municipality of Celje purchased most of the private forests in the urban forest area of Anski vrh at a price 15-25% higher than for regular forest land. In general, the municipality doubled its ownership of the protected urban forests. The Forest Service was the intermediary between the municipality and private forest owners and the initiative partner of this project. Two forest service employees are solely responsible for forest pedagogics. Forest pedagogic knowledge was gained by attending several seminars at the Austrian Research and Training Centre for Forests (BFW) in Gmunden and at the Faculty of Pedagogics of the University in Maribor. The forest service coordinates all activities, but offers like tree houses are also provided from local tourist organisations.

Following the principles of the multifunctional purpose of forests, in the year 2003 cultural projects were run in the forest. The municipality hosted two European Forums on Urban Forests with more than 150 delegates from 22 European countries, USA and China. In 2008 The Slovenia Forest Service and the Municipality of Celje upgraded past successful cooperation by signing a contract which authorised the Forest Service to undertake urban forest management and planning. The Forest Service, in co-operation with the local municipality, launched a non-commercial brand “Mestni gozd Celje” (Urban Forest Celje) to promote the values of urban forests and to raise awareness. Thanks to the EU project GREEN4GREY that ended in 2015, the urban forest now features new educational, adventure and recreational paths. The biggest contribution of cooperation in the project is a tree house of 60m² in the tree canopy used as an urban forest informational centre.

Results of the programme/project/intervention

In the last 25 years, visitor numbers have increased fivefold (from 15,000 visitors in 1993 to 80,000 in 2018). In the last 10 years, foresters from the Slovenian Public Service organised around 40 guided excursions for school and pre-school children per year. Over the last years, the Public Forest Service gained experience in educational corporation with schools and designed three programmes for different target groups. The project with its unique management, regulation, coordination, local and private interest and development of recreational and educational equipment, is an example of good practice.

Over 150 articles on the urban forest of Celje were published in newspapers and broadcast on electronic media, mostly in local newspapers, television and radio. The recognition of urban forest values requires an adapted forest management which should also include new, non-traditional knowledge, such as participatory planning, conflict management, public relations, marketing, lobbying, etc., all of which deal with the public. The re-creation of urban forests of Celje as a new quality public green space came gradually and according to the strategy plan. First small steps were followed by further development and tangible results. An atmosphere of confidence between the local authorities, forestry professionals and urban forest users was slowly created. It generated further development which is still in progress. Its common thread is high quality performance, cost effective approach and organic gradual growth, all typical characteristics of the forest ecosystem. The development of new concepts in forestry may be significant also in the wider context. One of Slovenia’s strategic economic activities is tourism based on landscape diversity and well-preserved natural environment, where forests are its vital essence. In this context, urban forestry may represent the core for the future development of the landscape forestry in Slovenia dealing with the research, management and marketing of the environmental and social functions of forests as an inseparable part of the Slovenian cultural landscape.

The project was recognised by the European Commission conference in 2011 as being among the top five examples of good practice. In 2016, the project was also recognised as an example of good practice in the FAO publication “Guidelines on Urban and Peri-urban Forestry.”

Reference

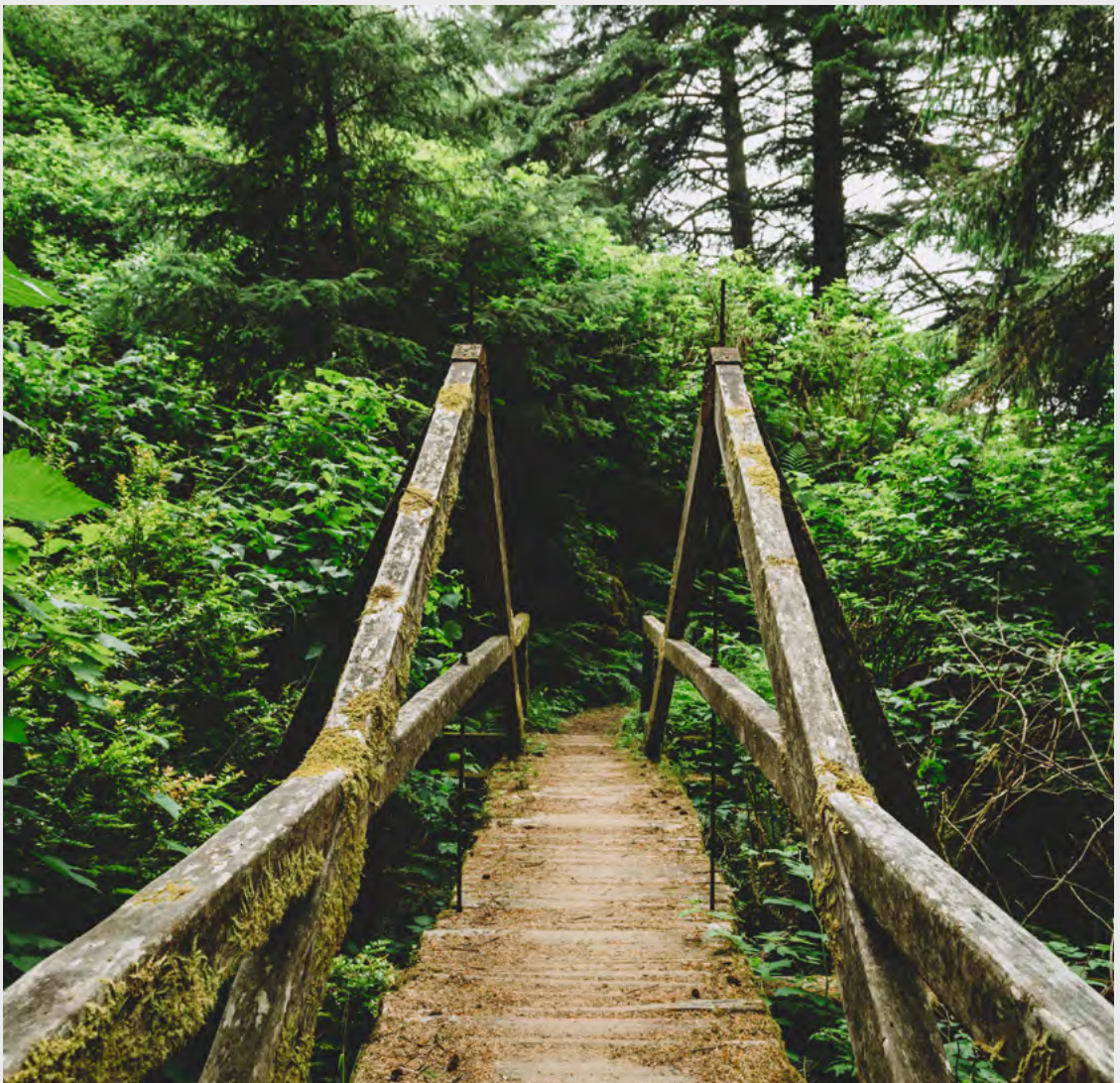
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Website

www.celje.si/sl/kartica/mestni-gozd

www.zgs.si/obmocne_enote/celje/gozdne_ucne_poti/index.html#c2224

www.rodnagrada.si/odkrivajmo_slovenijo/2015092820353922



Key conclusions

- **There is a wide range of opportunities for promoting the health benefits of forests to populations across Europe.**
- **The approaches vary across different countries, however, they can be delivered through specific programmes focused on health promotion and therapy or through educational programmes and broader recreation and tourism offers.**
- **This provides opportunities for forest managers to diversify their businesses and/or supplement their incomes.**
- **Collaboration and partnerships between the forestry, environment, education, tourism and health sectors can provide new opportunities for the delivery of health benefits for diverse populations in urban and rural areas.**
- **The development of successful programmes and interventions is often based on cross-sectoral cooperation.**
- **The opportunities for forests to contribute to health and well-being enable the forestry sector to be considered in key national government objectives and strategies, World Health Organisation action plans and the Sustainable Development Goals.**
- **Research, monitoring and evaluation of forest health and well-being programmes and interventions is important for understanding their efficiency and suitability for various target groups.**

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