D.3.3.2 General Forest Health Strategy for Healthy Forest Regions

Strategy document
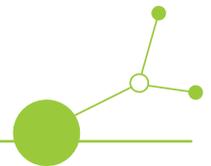
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The *HealthyForestRegions Project - Supporting Healthy Forest ecosystems for human well-being in forest regions* (CE0100310) operates under Interreg CENTRAL EUROPE's 2021-2027 funding. It is aligned with Priority 2 '*Cooperating for a greener Central Europe*', and addressing Objective 2.4, '*Safeguarding the environment in Central Europe*'. The project spans form April 2023 to March 2026, with a budget of €2.78 million, of which 80% are funded by ERDF. Involving nine partners across six Central European countries with six project regions, the project fosters commitment among policy- and decision-makers to maintain and create conditions that support the health of the regional forest ecosystems. Thereby, the *HealthyForestRegions Project* supports the long-term well-being of the people living, working and spending time in the targeted regions.

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D.3.3.2 GENERAL FOREST HEALTH STRATEGY FOR HEALTHY FOREST REGIONS

1. Introduction

Healthy Forest Regions (HFRs) are forest-rich landscapes where forests play a vital role in human well-being and regional resilience. Supported by an international network, they are defined by the recognition that diverse forest ecosystem services – such as water regulation, carbon storage, biodiversity, recreation, and cultural values - are indispensable under unavoidable social-ecological changes and developments. Within HFRs, stakeholders specifically commit to the conservation and promotion of forest health as a foundation for long-term sustainability.

Especially in forest-rich regions – but also beyond – humans derive numerous benefits from forest ecosystems. The range of forest ecosystem services includes the more obvious provisioning services like food, water and materials (e.g. timber, fuelwood) and several cultural services needed for recreation, enjoyment or spiritual balance, for example. Arguably even more important as a fundament of human well-being are regulating services which refer to all ecosystem services resulting from the ability of ecosystems to regulate biological processes and to influence climate, hydrological and biochemical cycles, and thereby maintain environmental conditions, together with abiotic equivalents. Especially in the current climate crisis, forest ecosystems play a central role for human well-being, above all in terms of health and security but also for supporting provisioning and cultural services. Such regulating services include, for example:

- Climate regulation: Forests regulate climate at local, regional and continental scales by producing atmospheric moisture and rainfall and controlling temperature.

- Carbon sequestration: Forests absorb carbon dioxide during growth and store it in biomass, reducing atmospheric CO_2-levels.

- Erosion regulation: Leaf canopies intercept rain, reducing erosion by providing surfaces for evaporation, while roots absorb water and enhance soil infiltration.

- Natural hazard regulation: Forests mitigate the impact of natural hazards by retaining excess rainwater, preventing extreme runoff, reducing flood damage, and serving as windbreaks for urban areas.

- Water purification: Forest soils filter out pollutants such as mercury, pesticides, and other harmful substances, ensuring cleaner water—a process especially dependent on healthy forest ecosystems.

- Air pollution control: Trees improve air quality by absorbing odours and gases (e.g. nitrogen oxides, ammonia, sulphur dioxide and ozone) and trapping particles from the air on their leaves and bark.

The concept of Healthy Forest Regions includes a set of guiding principles of action. The first principle focuses on forest management:

Implement an ecosystem-based, close-to-nature forest management and ecosystem-specific biodiversity conservation.

In order to support the implementation of this principle, a *General Forest Health Strategy* has been developed in the frame of the Interreg Central Europe project *HealthyForestRegions - Supporting healthy forest ecosystems for human well-being in forest regions* with the participation of nine project partners from six countries working on six exemplary HFRs as pilot areas.

The **main goal of this General Forest Health Strategy** is to maintain and enhance forest health for human well-being in HFRs. The **strategic vision of forest management in HFR** is characterised by ecosystem-based approaches that operate both at the forest stand and the wider landscape level. These approaches emphasise safeguarding essential forest structures, functions, and services while ensuring ecological resilience and the continued provision of benefits to society.

Basic assumptions guiding forest management were set as a part of this strategy. It is important to note that forests are understood as complex, dynamic ecosystems that require management at temporal and spatial scales. Forest health is best supported by ecosystem-based, close-to-nature practices, combined with education, communication, and a common vision. Healthy forests improve human well-being and increase the provision of ecosystem services, while inappropriate or intensive interventions can undermine them. Wood remains a key renewable resource, yet its production must be ecologically responsible and based on ecosystem-based approach, with opportunities for additional income through ecosystem service markets. Aligning human interventions with natural processes strengthens forest health, while effective management focuses on preserving what is good, reducing what is harmful, and addressing what is lacking. Finally, old-growth forests should remain unmanaged to conserve these biodiversity hotspots. **These shared assumptions form the foundation of the HFR strategy and provide a common ground for long-term cooperation and resilient forest management.**

In HFRs, **forest management practices are a key part of the strategy** and play a central role in safeguarding ecosystem integrity and ensuring the continued provision of services for human well-being. Several existing concepts provide strong foundations for this. PRO SILVA Close-to-Nature (CTN) forestry emphasises management that mimics natural processes, enhances structural diversity, and supports long-term resilience. Similarly, the broader concept of Closer-to-Nature (CrTN) forestry applies silvicultural interventions mimicking natural stand dynamics, reducing intensive practices in favour of adaptive, site-specific approaches that retain deadwood and habitat trees in order to promote biodiversity. At a wider scale, ecosystem-based forest management within a socio-ecological framework integrates ecological sustainability with human needs, balancing biodiversity conservation, timber production, and other ecosystem services. Together, these approaches can provide a toolbox for maintaining and enhancing forest health in HFRs, ensuring that forests continue to serve as resilient, multifunctional systems under changing social and environmental conditions.

Despite their high ecological value, HFRs face a range of **interconnected problems** that threaten forest health. Factors such as climate change, invasive species, and unsustainable use lead to visible symptoms of decline, including reduced biodiversity, weakened regeneration, soil degradation, and increased vulnerability to pests. Direct causes often stem from overharvesting, inappropriate silvicultural practices, and fragmentation, while deeper drivers include economic pressures, limited institutional capacity, and competing land-use priorities. Administrative and institutional frameworks are frequently fragmented, making coordinated forest and landscape management difficult. Economic incentives often prioritise short-term gains over long-term resilience, while socio-cultural contexts can either strengthen stewardship traditions or, conversely, contribute to neglect. Moreover, the lack of a comprehensive landscape-level management approach hinders the integration of ecological, social, and economic objectives across wider regions. These challenges undermine the ability of forests to deliver vital ecosystem services—such as clean water, carbon storage, recreation, and cultural value—that are indispensable for regional human well-being. **The strategy also focuses on reducing these problems** by means of aligning governance and local participation with the broader vision of ecosystem-based forest management.

2. Process and methods of preparing and developing the strategy document

This strategy document was elaborated in the framework of the Interreg CENTRAL EUROPE *HealthyForestRegions Project - Supporting Healthy Forest ecosystems for human well-being in forest regions* (CE0100310) by nine project partners in six countries (Croatia, Slovenia, Austria, Slovakia, Czech Republic, Germany). In each of the six countries one project region was selected as pilot Healthy Forest Region. The strategy document has been developed as a part of the *Healthy Forest Regions Concept*.

2.1. Preliminary regional studies

2.1.1. Analysis of forest health in HFR target regions

Forest health for all six HFR project regions was analysed with indicator-based remote sensing methodology in a web-based tool (*Healthy Forest App*[1]) developed within the framework of the project itself using Google Earth Engine. Analysed indicators include forest cover, temperature regulation on hot days based on LST (Land Surface Temperature), forest connectivity, forest vitality and forest vitality change based on NDVI (Normalized Difference Vegetation Index). The LST and NDVI datasets used were provided by the scientific working group Ermida et al. (2020)[2], while the global forest extent and change data originated from the working group Hansen et al. (2013)[3].

2.1.2. Analysis of the significance of regional forest ecosystems for regional human well-being

The significance of regional forests and the ecosystem services they provide for regional human well-being and health was analysed with the help of two standardised online surveys.

One survey addressed the general public, focussing on personal well-being within the regional forest context. It ran from 25th March to 7th July 2024 and included questions on the frequency of forest visits, activities in the forest and the personal importance of forests to respondents.

The second survey was an expert consultation, conducted from 14th May to 7th July 2024, which examined the general significance of the forest for human well-being and health, looked more closely at the economic dependence on forest products and services for the entire region. It asked for the participants' professional perspectives.

2.1.3. Analysis of the administrative and institutional framework

For the six HFR project regions the current administrative and institutional setting for forest management was analysed applying a jointly developed structured analysis framework. It was examined which actors, regulations, structures or processes currently support, oppose or impede forest health, what are the risks, the potential, and where are the gaps. In an online partner workshop, recommendations were subsequently

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[1] https://econics.projects.earthengine.app/view/healthyforest

[2] Ermida, S. L., Soares, P., Mantas, V., Göttsche, F.-M., & Trigo, I. F. (2020). Google Earth Engine Open-Source Code for Land Surface Temperature Estimation from the Landsat Series. Remote Sensing, 12(9), 1471. https://doi.org/10.3390/rs12091471

[3] Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A., Tyukavina, A., Thau, D., Stehman, S. V., Goetz, S. J., Loveland, T. R., Kommareddy, A., Egorov, A., Chini, L., Justice, C. O., & Townshend, J. R. G. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. Science, 342(6160), 850–853. https://doi.org/10.1126/science.1244693

developed for the administrative and institutional framework in (potential) HFR to maintain and promote forest health.

2.2. Defining a common baseline

2.2.1. Development of definition of "healthy forest"

During several online partner sessions three kinds of definitions of a "healthy forest" were developed by the HFR project partners and finalised in a face-to-face meeting with all project partners. This includes a scientific definition, a short version in simpler language as well as a figurative description. The scientific definition is as follows:

A healthy forest can be described as a forest ecosystem with inherent structures, functions and dynamics that provide it with both the necessary efficiency and resilience to develop without abrupt and large-scale changes in emergent system properties or geographic distribution, and the ability to respond flexibly to external changes.

These emergent properties include, among others, a stable discernible microclimate, high energy intake, high storage of eco-exergy, high level of self-organisation, self-regulation and (regulatory) influence on the environment, and great contributions to self-preservation.

2.2.2. Agreement on basic assumptions of forest management

During a personal project meeting in June 2025, most HFR project partners agreed on 11 basic assumptions with regard to forest and forest management:

- *Assumption 1) Forests are complex, dynamic ecosystems within a broader ecological, climatic, and socio-cultural context.*

- *Assumption 2) Forest management that supports forest health operates at both the forest and landscape level and at different levels of complexity and time.*

- *Assumption 3) The health of a forest increases with ecosystem-based, close-to-nature management, education, communication and a common vision. As essential forest structures, functions and relations become degraded, forest health declines accordingly.*

- *Assumption 4) Strengthening forest health enhances overall human well-being, including physical and mental health.*

- *Assumption 5) The healthier the forest is, the higher the potential provision of ecosystem services.*

- *Assumption 6) Wood remains an important renewable resource for human well-being. Wood and human well-being.*

- *Assumption 7) Intensive timber harvesting that is not adapted to the site conditions causes a deterioration of forest health.*

- *Assumption 8) To safeguard forest health and maintain essential ecosystem services, wood production and other human interventions must be ecologically responsible and adapted to site-specific vulnerability.*

- *Assumption 9) Beyond timber production, forests offer a wide range of alternative income opportunities on ecosystem service markets.*

- *Assumption 10) An effective HFR forest management approach aims to: a) preserve what is good; b) reduce what is harmful, c) target what is lacking.*

- *Assumption 11) Virgin forests should remain untouched.*

2.3. Online project partner workshops

2.3.1. Framing the strategy

In several regular online project meetings, the framework for the general strategy was developed jointly by most HFR project partners. This included defining the main goal of the strategy, the topics and components to be covered, the main messages to be conveyed, the target groups as well as the intended development process.

2.3.2. Systemic situation analysis and strategy development

Two targeted online partner workshops in summer 2025 more specifically focused on the situation analysis of forest health identifying relevant problems in the HFR target regions (i.e. factors affecting forest health) as well as identifying corresponding strategies to address those problems. These workshops applied elements of the Conservation Standards[4] and MARISCO[5], both tools for adaptive and proactive conservation management, as a basic methodological approach.

2.4. Development process of regional strategies

Parallel to the joint development process of the General Forest Health Strategy, regional strategies were developed in a participatory process together with relevant actors and stakeholders in the two project target regions HFR Kočevsko in Slovenia and HFR Schorfheide-Chorin-Odertal in Germany. Results from regional workshops and the regional strategy development process were integrated into the General Forest Health Strategy.

2.5. Further project activities as a basis for the strategy

2.5.1. Development of an HFR Interpretation Plan

An interpretation plan for HFR conveying key messages about the significance of forest health for human well-being was developed at the beginning of the HFR project. It provides a rich source for educational approaches and measures to be applied for awareness raising.

2.5.2. Regional analysis of ecosystem services in HFR target regions

For some HFR target regions selected ecosystem services (e.g., hazard control, recreation, carbon sequestration) were more profoundly analysed in terms of their provision and supporting forest management.

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[4] https://www.conservationstandards.org/

[5] https://www.marisco.training/

3. Identified problems

3.1. Forest health

3.1.1. Factors affecting forest health

The analysis within the Healthy Forest App shows that forest health is generally higher in forest areas with high continuity (i.e. low degree of fragmentation), in larger forest areas and in those with higher distance to areas of human development and the open landscape. Forest health is comparably lower along the forest edges, in smaller as well as in more fragmented forest areas.

3.1.2. Symptoms of reduced forest health

The spatial analysis within the Healthy Forest App evaluated the following indicators as characteristics of a healthy forest: forest connectivity, high temperature regulation capacity, high vitality and a positive vitality change. Conversely, if connectivity, vitality and temperature regulation of forests are low, this can indicate reduced forest health.

The systemic situation analysis revealed the following ecological stresses, that means symptoms of reduced forest health, that were identified in all project regions and rated as particularly relevant:

- Increasing temperature in the forest
- Decreasing moisture in the forest (soil & air)
- Increasing vulnerability to calamities (incl. windfall, insect damage, fire, drought)
- Decreasing species diversity
- Decreasing connectivity of forests (incl. patch size, isolation, fragmentation)

3.1.3. Direct causes of reduced forest health

The main stress drivers, i.e. factors directly causing and enhancing those symptoms, identified in the workshop included:

- unsuitable silvicultural and harvesting practices ignoring specific site conditions and forest vulnerability, and
- climate change

Less pronouncedly but also identified as causes of ecological stress were:

- inadequate recreational activities,
- inappropriate wildlife management,
- removal of standing deadwood and habitat trees, and
- land use in the surrounding landscape.

A closer look at the impacts of climate change as a significant cause of ecological stress in some project regions – revealed the following factors increasing vulnerability to climate change in some HFR target regions:

- decreasing structural diversity,
- low level of natural regeneration and undergrowth and the dominance of planted forest stands,
- low tree species diversity and the dominance of tree species not adapted to site conditions,
- degraded and degrading soils (incl. drought, erosion, compaction, acidification, eutrophication), as well as
- a high degree of fragmentation and isolation of forest stands.

3.1.4. Underlying factors and drivers of reduced forest health

3.1.4.1. Administrative and institutional framework

Forest health in HFR regions could be weakened not only by ecological stressors but also by shortcomings in governance and gaps in institutional and administrative frameworks, responsible for decision-making, implementation and supervision of measures.

If responsibilities for forestry, game, nature conservation, spatial and development planning or land-use are fragmented, there is a chance of uncoordinated or even contradictory measures.

In case of misaligned legislation, short-term timber use could be prioritised over long-term ecosystem functionality.

Centralised or insufficiently participatory decision-making can result in limiting legitimacy and adaptive capacity for the maintenance of forest health, especially if human well-being is not taken in the account.

Local administrations frequently lack resources, training, and authority, while lack of cross-sectoral cooperation can lead to unintegrated approaches across forestry, land-use, and conservation, putting forest health at risk.

Weak supervision and enforcement, in combination with inconsistent funding for biodiversity protection and restoration or silvicultural measures, could further reduce resilience. Lack of transparency or limited public access to forest health data or data on planned or taken measures, could lead to evading responsibilities and obligations or undermining accountability.

The systemic analysis of forest health in HFR target regions also revealed, that different responsibilities for forest and game management can cause contradicting measures in the forest and hence affect forest health.

3.1.4.2. Economic factors

Inadequate forest management, high timber harvesting rates and industrial production of wood are driven by a general societal need for timber, not only regionally but also in terms of a globalised economy. Timber production is the ecosystem service that receives the most attention disregarding the various ecosystem services forests provide, some of them even vital to human well-being and health (regulating services like climate regulation, air quality regulation, water purification). This focus on timber puts (economic and financial) pressure on forest companies, private and state forest owners who follow their wish to intensify the production of timber for economic use. Moreover, financial resources for implementing conservation measures are comparably low in HFR target areas.

3.1.4.3. Socio-cultural background

Lack of public demand for regulating forest ecosystem services mitigating local climate change impacts

Forests provide essential regulating ecosystem services, such as carbon sequestration, water regulation, temperature regulation, and microclimate stabilisation — that play a critical role in mitigating local climate change impacts. However, public demand for regulating these services often lags behind interest in more tangible provisioning services (e.g., timber) and cultural services (e.g., recreation), which are easier to perceive and monetise.

This limited demand is rooted in several factors. Regulating services deliver benefits that are indirect, long-term, and less visible compared to the immediate economic returns from land conversion or resource extraction. Public awareness of how forests buffer extreme heat, manage water cycles, and reduce local climate hazards remains low. Furthermore, policy and media narratives tend to emphasise global-scale climate issues, overshadowing the importance of local forest-based adaptation strategies.

The public mostly perceives the forest as a stable, unchanging part of the landscape (the framework of their life) and is unaware of, or takes for granted, ecosystem services related to climate. They do not realise that if the complex network of relationships in the ecosystem is disrupted, the forest can collapse within a short time and that this would also negatively affect the surrounding landscape.

Conservation for climate mitigation is often underfunded, poorly implemented, or sidelined, heightening vulnerability to local climate risks such as heatwaves, droughts, and flooding. Increasing public understanding of the climate-regulating functions of forests is therefore essential to build the political will necessary to protect these irreplaceable natural assets.

Traditional mindsets

By maintaining mixed species and uneven-aged stands, the close-to-nature forest management supports biodiversity, creating varied habitats for a wide range of plants, animals, and microbes. This contrasts with the traditional "tidy, clean, airy" forest mindset rooted in older forestry practices where deadwood, undergrowth, and dense canopy were seen as signs of neglect. Many people tend to see clean, tidy forests - those free of fallen branches, dense undergrowth, and decaying logs as healthier and better managed than "messy" forests. This perception often arises from cultural, aesthetic, and safety-related associations. In many cultures, neatness is equated with human care, order, and safety, while a messy appearance is linked to neglect or danger. A forest that looks "manicured" can resemble urban parks or landscaped gardens, reinforcing the belief that such spaces are more attractive and healthier.

The absence of visible decay, dead trees, or brush also reduces perceived hazards, such as tripping, fire risk, or encounters with wildlife. Furthermore, popular media and educational resources often depict healthy nature as green, open, and easy to navigate, shaping our expectations of what a "good" forest should look like.

However, this tidy aesthetic overlooks important ecological realities. What might seem messy, such as fallen logs, leaf litter, and tangled vegetation actually plays a crucial role in nutrient cycling, habitat creation, and biodiversity. While tidy forests may appeal to human preferences, they do not necessarily represent the healthiest or most resilient ecosystems.

Opposite interests of forest and game management

The relationship between forest management and game management is inherently characterised by conflicting objectives: while game managers seek to maximise populations of ungulates and other wildlife for hunting and biodiversity purposes, forest managers prioritise the regeneration, structural integrity, and

long-term productivity of tree stands. Elevated game densities, particularly of browsing species such as deer, can severely hinder natural regeneration, alter species composition, and compromise silvicultural objectives, leading to economic losses and reduced ecosystem resilience. Conversely, intensive silvicultural practices that minimise undergrowth or prioritise rapid timber production may reduce habitat quality and carrying capacity for game species. From the perspective of close-to-nature forest management, which relies on natural regeneration, mixed species stands, and structural diversity, excessive game browsing poses an even greater challenge, as it selectively suppresses palatable species and disrupts the natural successional dynamics that are essential for maintaining ecological stability.

Lack of communication amongst stakeholders

One of the most persistent barriers to sustaining the HFRs is the absence of effective communication among stakeholders. Residents, municipal officers, forest managers, conservation agencies, and tourists all interact with the forest in different ways, but too often their perspectives remain isolated. This lack of dialogue results in fragmented strategies, duplication of efforts, and even mistrust. For example, residents may feel excluded from decision-making, while conservation agencies may struggle to convey ecological priorities to forest managers, municipalities, residents or visitors to the region. The absence of communication not only slows down the responses to challenges like forest degradation or climate stress but also undermines the shared responsibility that defines an HFR. Without inclusive discussions, policies risk being disconnected from local realities, while community knowledge and concerns remain underutilised.

3.1.4.4. Lacking forest management approach at landscape level

There is currently no forest management concept that considers the broader landscape context, including surrounding land uses. However, these adjacent areas significantly impact forest health. Warming agricultural lands, solar panel installations, and large open spaces contribute to localised heating and potential drought conditions that affect nearby woodlands. Regional precipitation differences may also be linked to these open areas.

Infrastructure such as roads and tracks intensifies edge effects, which are exacerbated by climate change. These edge effects—higher temperatures, increased light, and reduced humidity—can lead to forest degradation and even loss, especially in smaller or heavily managed areas. Forestry interventions, particularly canopy openings in old beech stands, amplify these conditions, making forests more vulnerable.

Heat islands often develop within forests near settlements and cleared areas, creating a cascade of stress factors from the surrounding landscape into forest patches. Therefore, a landscape-level management approach that integrates surrounding influences is essential for maintaining and enhancing forest health.

3.2. Significance of regional forest ecosystems for human well-being

Both, the general public as well as experts in regional forest management valued the opportunity to use forests for recreation, sports and relaxation very highly. Experts additionally accented the ecosystem services such as clean water availability, hydrological cycle with water flow regulation and landscape-shaping element or erosion control to be very important. It was generally stated that forests form an important source of income (i.e. timber and related products and materials) that is particularly important for the regional residents.

Most of the public survey respondents stated they visit forests in the HFRs at least once a week and consider the opportunity to carry activities contributing towards improving their human wellbeing in the local forests as important or very important as these activities contribute towards improving their mental and physical health. Recreational and leisure activities and the possibility to have forests as a cultural place or a place

for social interaction and learning was also scored very highly in terms of contributing towards improving human wellbeing. However, it is also important to note that over quarter of the respondents considered income, and the livelihood based on forest products to play important role for their personal wellbeing which corresponds to the fact that a part of the local community relies on forests as on a source of income.

The expert respondents valued rather highly forest as a provider of key ecosystem services (e.g., clean water availability, hydrological cycle with water flow regulation and landscape-shaping element or erosion control). However, great importance of forests in HFR were also given to the opportunity to carry out activities in these forests that are related to recreation, relaxation, recovery, and leisure and sports. When the expert respondents were asked about the importance of availability of some of the key forest products and services created and sold for profit in order to support the regional human wellbeing, leisure and sport were also considered to be very important. Timber-based products and materials were considered as important for almost two thirds the expert respondents who additionally also stated that the availability of forest products and services was mainly important for forest companies and forest owners who sell timber for profit.

4. Objectives for maintaining and enhancing forest health

In order to fulfill the main goal of maintaining and enhancing forest health for human well-being in HFR, two major objectives are set for this *General Forest Health Strategy*:

- Objective 1: Promote and implement ecosystem-based and multipurpose forest management.
- Objective 2: Promote landscape development that aims to support forest health

4.1. Objective 1: Promote and implement ecosystem-based and multipurpose forest management

Ecosystem-based forest management aims to maintain and enhance forest health by recognising forests as complex, dynamic, interconnected ecosystems, with management decisions guided by natural processes, biodiversity, and long-term ecological integrity. Unlike forest management, which prioritise timber production and short-term economic outputs, ecosystem-based management emphasises maintaining natural forest structures, biodiversity, long-term productivity and ecological functions such as water and climate regulation, nutrient cycling, and habitat provision. By mimicking natural disturbance regimes and considering multiple forest values, this approach supports forest functionality and health, increasing resilience to disturbance and environmental changes. Overall, ecosystem-based management promotes healthy and functional forests that can continue to provide essential services like clean water, carbon storage, and habitat for future generations.

The following forest management concepts are the most important, best known and widely accepted concepts forest management with forest health as a major focus:

- Ecosystem-based forest management,
- Pro Silva Close-To-Nature Forestry,
- Closer-To-Nature Forestry.

Depending on the specific region and forest, these approaches vary in their suitability for meeting the requirements of adequate forest management in an HFR with the aim of maintaining and enhancing forest health. Their implementation should be pursued in HFR for areas that are aimed for regular forest management and are not under some kind of nature protection designation or intended for non-intervention.

Forest management certification can be a helpful tool to ensure the application of adequate forest management in HFR, e.g. FSC, PEFC certification. An existing forest certification status can show that those forests already follow certain guidelines for appropriate forest management and are already on their way to applying HFR-adequate forest management.

4.1.1. Ecosystem-based forest management as part of a socio-ecological approach

Social-ecological forest management[6] refers to the management of forests based on our knowledge and non-knowledge of forest physics, forest ecology, and ecosystem theory. It reflects humbly, cautiously and ethically on the diverse forest ecosystem services, on which our existence and well-being depends, and serves to manage forests for the benefit of people living today and in the future. It advocates the management of all ecosystem services as scarce and potentially dwindling resources.

The social-ecological approach applies principles of ecosystem-based forest management – an approach that focuses on structures and processes, and thus on cooling, the ability to store water, and the self-regulation and resilience of the forest ecosystem. The guiding principles[7] include:

I. Thermodynamics

1. Forest management aims to ensure that the ecosystem functions as efficiently as possible in terms of thermodynamics and can absorb and convert as much free energy as possible.

2. Forest management allows forest ecosystems to store more biomass (and biogenic substances) than is regrown.

II. Ecohydrology

3. Promoting ecohydrological capacity is a priority objective of forest management.

III. Organisation, growth and function

4. Forest management promotes the maturation of forest ecosystems, which is associated with an increase in biomass, biological diversity, and interactions between ecosystem components.

5. Forest management should support the preservation of appropriately large proportions of mature forests and old forest soils.

6. Forest management is carried out with an awareness of the pronounced ecosystem integration of organisms and aims in particular to preserve and promote symbiosis.

7. The open-ended development of forest ecosystems is permitted and promoted within the framework of adaptive management.

IV. Sufficiency, efficiency, resistance and resilience

8. Increasing cyclical processes and material, hydric and thermodynamic efficiency, as well as buffer capacity, is an important objective of forest management.

9. The management of forest ecosystems and ecosystem components such as trees or herbivores must always be carried out with an awareness of feedback loops and must be designed accordingly in a systemic manner.

10. Continued self-organised ecosystem renewal, which also includes the collapse of subsystems, should be permitted and encouraged.

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[6] https://www.wald-fuer-menschen.de/konzept/
[7] Ibisch, Pierre (2022), An ecosystem-based approach for addressing the forest crisis amid the climate crisis. Natur und Landschaft 97(7). Available at https://www.wald-fuer-menschen.de/konzept/

4.1.2. Close-To-Nature (CTN) forestry

PRO SILVA[8] is a European federation of foresters who advocate forest management based on natural processes. Based on an expanded approach to sustainability, PROSILVA presents policy statements on issues of major importance to present-day forest management. They invoke a standard of commitment upon forest owners and managing foresters. These issues concern: the basic principles of responsible forest management and forest utilisation, the maintenance of biodiversity, the adaptation to man-made changes to environmental conditions related to the ecologically sustainable use of energy, the use of exotic species, and the ecological role of forests in the landscape.

PROSILVA promotes forest management strategies which optimise the maintenance and utilisation of forest ecosystems in such a way that the ecological and socio-economic functions are sustainable and profitable. The general approach to management which is advocated by PROSILVA, includes both market and non-market objectives, and takes the whole forest ecosystem into consideration.

With reference to sustainability in its broadest sense PROSILVA believes that forests provide four categories of benefit to society:

- Conservation of ecosystems
- Protection of soil and climate
- Production of timber and other products
- Recreation, amenity, and cultural aspects

Basic characteristics of forest management aiming to provide complex benefits for society include[9]:

- Preservation of natural environment and ecological balance of the landscape;
- Sustainability of all forest functions;
- Integrated approach to a forest ecosystem;
- Imitation of natural processes and forms;
- Tree species suited to the site conditions;
- Based on cognitive approach – constant monitoring and learning;
- Based on long-term economic efficiency;
- Plans designed at a broader and more detailed level.

The "imitation of natural processes and forms" is considered a key characteristic describing forest management practices as reflected in the CTN title itself. Some of natural processes reflected in CTN guiding principles:

- Use of natural regeneration and native tree species,
- following natural processes and mimicking historical disturbance regimes,
- favouring complex vertical and horizontal forest structures,
- respecting tree individuality.

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[8] https://www.prosilva.org/
[9] https://www.zgs.si/assets/uploads/files/vsebine/3/3/1/zgs-sonarg-ang_small.pdf

Within these principles, free combination of silvicultural systems may be applied: planter / selection system, irregular shelterwood system and free-style silviculture / free silvicultural method.

4.1.3. Closer-to-Nature (CrTN) forestry

Closer-to-Nature Forest Management is a concept proposed in the EU Forest Strategy for 2030, which aims to improve the conservation values and climate resilience of multifunctional, managed forests in Europe. Building on the latest scientific evidence, this report[10] proposes a definition of the concept, a set of seven guiding principles and a framework/checklist for flexible European-wide implementation.

The report analyses the current pressures on forest biodiversity as well as on health and resilience in managed forests. It examines existing nature-oriented forest management approaches and analyses their ability to support biodiversity, stability in and adaptability to uncertain future conditions. Finally, it evaluates the barriers and enablers for the implementation of basic 7 principles of CrTN Forest Management:

- Retention of habitat trees and dead wood

- Promoting native tree species as well as site-adapted non-native species

- Promotion of natural tree regeneration

- Partial harvests and promotion of stand structural heterogeneity

- Promoting tree species variation and genetic diversity

- Avoidance of intensive management operations

- Supporting landscape heterogeneity and functioning

The CrTN forestry respects the necessity to diversify approaches between regions. *"While the general principles of CrTN Forest Management should be similar across all regions, varying but related management approaches should be used in different regions of Europe. This reflects the variation in forest types across the continent, differences in the intensity and scale of natural disturbance regimes, and the ways forests have been used in the past and will have to be managed in the future."*

4.2. Objective 2: Promote landscape development that aims to support forest health

Promoting landscape development that is conducive to forest health is essential for maintaining resilient, diverse, and productive forest ecosystems. Healthy forests depend not only on individual trees but also on the broader landscape context – how forests are connected, situated in the landscape and impacted by the surrounding ecosystems. The healthier the landscape, the better are the chances for forests to be, stay and become healthy. Not only the forest, but also surrounding ecosystems must be able to rejuvenate, regenerate and develop. Water is an essential resource that tightly binds forest ecosystems into the landscape – only if the landscape water household is functional, forests will have sufficient water to maintain their functioning. Forests are embedded in landscapes that in many places also consist of non-forested areas. The size, management, design and ecological health of those non-forest areas is crucial for the degree of isolation, fragmentation, and connection of forest patches.

Landscape properties that support forest health include:

- High share of forest area

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[10] https://efi.int/publications-bank/closer-nature-forest-management

- Appropriate transition areas (ecotones) to embedded forest ecosystems
- High levels of living and dead plant biomass
- High level of (vertical) green structures with (evaporative) foliage
- Continuous vegetation cover and tree canopy connectivity
- Functional and self-regulated water bodies, wetlands and water retention areas
- High share of unsealed areas
- High level of soil health with intact soil structure and soil development
- High level of ecosystem-typical, self-regulated species diversity
- High level of structural diversity
- High share of unmanaged areas
- Self-regulated ecosystem development and regeneration (incl. disturbances)

Landscape development that aims to support forest health includes three action lines in descending priority:

(1) Preserve existing landscape properties supporting forest health

(2) Decrease negative impacts on forest health from land use in the surrounding landscape

(3) Assist the restoration and development of the ecological functionality of the landscape

4.2.1. Preserve existing landscape properties supporting forest health

The preservation of landscape features supporting forest health should have highest priority. This means preventing additional human intervention that goes beyond what has already been altered in the associated ecosystems. Specifically, this action line can be translated into the following three strategic approaches:

(1) Preserve existing green areas, green structures and plant biomass

(2) Preserve soil structures that support soil health

(3) Preserve existing water bodies and wetlands with their vital structures

Preserve existing green areas, green structures and plant biomass

This approach focuses on protecting the current natural vegetation and plant life to support biodiversity, ecosystem stability, and climate resilience. It involves avoiding the removal of living plants – except invasive species that threaten functional ecosystems – and retaining dead trees and plant biomass, which provide essential habitats, water storage and nutrients. Shrubby vegetation along forest edges should be maintained as buffer zones, offering protection against external disturbances and enhancing ecological connectivity. Additionally, certain areas can be designated for minimal intervention to allow the development of old-growth forest characteristics over time.

Preserve soil structures that support soil health

This strategic approach aims at maintaining the natural structure and function of soils to support healthy ecosystems. It involves preventing or minimising soil sealing (e.g., through road construction), which

disrupts water infiltration and root growth. Soil wounding from activities like intensive agriculture should be reduced to protect soil life and stability. Additionally, avoiding soil compaction – caused by heavy machinery or driving on unsealed ground – is essential, as compacted soils lose porosity, hindering water movement, root development, and microbial activity.

Preserve existing water bodies and wetlands with their vital structures

Here the aim is to maintain the ecological integrity and natural functions of water bodies and wetlands. It includes preserving the natural flow regime and protecting riparian buffer zones that filter pollutants and provide habitat. Natural floodplains and retention areas should be safeguarded to support water storage and reduce flood risks. Key structural elements – such as boulders, fallen logs, and gravel beds – must be retained, as they are crucial for stream flow, habitat diversity and water quality. Preventing artificial drainage or water discharge helps maintain functional (landscape) hydrology. Additionally, species like beavers that enhance water retention and wetland formation could be recognised in their ecological impact and supported/protected accordingly.

4.2.2. Decrease negative impacts on forest health from land use in the surrounding landscape

The surrounding landscape, and especially human land use and resulting ecosystem degradation can pose negative impacts on forest health. Heat radiation, water scarcity, emissions and isolation of forest patches are only some impacts that challenge forest health. Strategic approaches that aim at reducing the human intervention with ecosystems surrounding the forest and the landscape embedding it include:

(1) Reduce soil wounding, compaction, erosion and sealing

(2) Reduce the extraction/removal of local ecosystem components

(3) Reduce the input of site-external substances

Reduce soil wounding, compaction, erosion and sealing

This approach focuses on enhancing soil health by reducing physical disturbances and surface sealing. Where possible, sealed surfaces like roads should be unsealed or converted to (semi-)permeable materials to improve water infiltration and reduce runoff. Built structures should be removed from sensitive areas such as wetlands and riparian zones. The use of heavy machinery should be minimised in agriculture, green space management, and construction to prevent soil compaction. Additionally, practices like intensive tillage and driving on open ground – especially during critical weather conditions – should be reduced to avoid erosion and structural damage to the soil.

Reduce the extraction/removal of local ecosystem components

This involves reducing the removal of trees and other woody plants, as well as limiting the harvesting of living plant biomass. Dying and dead plant material – such as leaf litter, deadwood, and woody debris – should be left in place, as they play a vital role in nutrient cycling, water storage and habitat formation. The extraction of non-living materials like soil, gravel, and stones should also be avoided to maintain natural soil structure and landscape stability. Additionally, reducing water withdrawal helps preserve local hydrological balance and supports ecosystem resilience.

Reduce the input of site-external substances

To protect ecosystems and maintain natural processes, it is important to minimise the introduction of substances from outside the site. This includes reducing the use of artificial fertilisers and toxic chemicals such as pesticides, which can harm soil life, water quality, and biodiversity. Wastewater discharge and the disposal of waste and garbage should be avoided to prevent pollution. Additionally, efforts should be made to reduce air-borne emissions from traffic, industry, and residential sources, as these can negatively impact air, soil, and water quality, even far from their origin.

4.2.3. Assist the restoration and development of the ecological functionality of the landscape to support forest health

This line of action involves the much more active human intervention with ecosystems in order to restore ecosystem structures and processes that were degraded or even entirely lost before. It includes the strategic approaches:

(1) Establish and develop new and connect existing forest area

(2) Establish functional forest edges and ecotones

(3) Establish and develop long-term viable permanent green structures and promote accumulation of plant biomass

(4) Revitalise and establish long-term viable water bodies and wetlands

Establish and develop new and connect existing forest area

This approach focuses on expanding forest cover and improving connectivity between existing forest fragments to support biodiversity and ecosystem resilience. Creating new forest areas and linking them—through corridors, stepping stones, or by connecting isolated patches—enhances habitat networks and allows species to move and adapt more easily. Further, natural regeneration and succession should be encouraged, for example by protecting sites, collecting local seeds, or supporting growth through initial seeding. In some cases, initial planting of native broadleaf trees can help establish a diverse and stable forest structure. Recreating floodplains along water bodies and restoring riparian forests further strengthens ecological connectivity and supports both forest and water ecosystems.

Establish functional forest edges and ecotones

Functional forest edges play an important role to minimise edge effects and general negative impacts on forest health from non-forest areas. The development and maintenance of shrubby buffer zones along forest edges is therefore essential where functional forest edges and ecotones are not present or working well.

Establish and develop long-term viable permanent green structures and promote accumulation of plant biomass

Here the focus lies on actively establishing and maintaining long-lasting trees, woody plants, groves, hedges, and tree rows to form stable green structures. It includes to encourage the greening of built environments and establish permanent green areas using perennial and ground-cover plants. Plant biomass in green spaces and croplands with low organic matter should be enhanced by adding dead plant material like biochar, compost, humus, and deadwood. Further aspects include the integration of trees and hedges into agricultural landscapes through agroforestry practices and to set aside areas to allow natural vegetation to develop over time.

Revitalise and establish long-term viable water bodies and wetlands

This involves restoring small water bodies, wetlands, and watercourses to ensure their ecological health and long-term functionality. Key actions include creating buffer zones and riparian strips along water bodies and wetlands, allowing natural vegetation with complex, site-typical structures to develop without human intervention. Recreating floodplains supports the natural dynamics and water flow regimes of these ecosystems. Re-establishing riparian forests – through seeding or initial planting – along water bodies helps stabilise banks, shading the water and improve habitat quality. Enhancing near-natural features in watercourses, such as gravel beds, fallen logs, and boulders, provides vital microhabitats for aquatic species. Efforts also focus on recreating small, vital water bodies and retention areas to improve water storage and biodiversity. Lastly, planting water-cleansing tree species like willows and alder along water bodies supports natural water purification processes.

5. Operational requirements that enable the achievement of the objectives

In order to pursue the two objectives, it is not only important to understand exactly what they entail and what specific strategic approaches and measures are required to achieve them but it is also necessary to identify concrete starting points and to provide operational levers for the implementation of those strategic approaches and for overcoming identified barriers. There are barriers of different dimensions hindering the achievement of objectives. Accordingly different are the approaches and measures to overcome them.

5.1. Overcoming institutional and administrative barriers

Strengthening cross-sectoral coordination, participatory governance, and enforcement capacity is critical for sustaining forest health.

Legislation level

By reinforcing the recognition of ecosystem services and prioritising the maintenance and enhancement of forest ecosystem functionality within legal frameworks, regional governance can focus on the preservation and restoration of forest ecosystems while also considering economic and social factors, thereby positively impacting general regional development.

Organisation level

Strengthening the capacity of regional and local bodies ensures more effective implementation of forest policies and provides better oversight of forest health and ecosystem functionality.

Integrated management approaches foster coherence across sectors and improve the overall effectiveness of policies in maintaining forest health and ecosystem functionality.

Process level

Planning processes

Planning processes of specific forest management targets for a respective HFR on both forest and landscape levels should enable transparent participation of all stakeholders as a vital condition for further processes'

success. These targets may be specified using the FSC criteria and indicators specified for the ecosystem services in the forest.

Decision making processes

Clear and efficient decision-making helps ensuring that all stakeholders are aware of their responsibilities and can contribute meaningfully to the management of forests and other land use issues, with respect of nature conservation.

Forest plays a key role in climate regulation, and anticipating and planning for climate change is critical to ensuring continued forest ecosystem functionality in the future.

Transparent processes and involvement of different stakeholders encourage greater accountability, foster greater public support and ensure that strategies and plans are socially acceptable among the public, local communities, and stakeholders and root in local knowledge.

Cross-sector participation is important and necessary to achieve broad acceptance among the stakeholders involved and to enable the implementation of sustainable measures. This enables a shift from sectoral thinking to cross-sectoral discussion, thinking and action. Industry, politics, farmers and others should therefore be included in forest health strategies.

Implementation processes

Effective management requires collaboration across multiple levels of government to address both global and local challenges.

An adaptive management ensures flexibility and resilience, enabling regions to adjust management practices in response to unforeseen changes or challenges that may affect forest health and forest ecosystem functionality.

Supervision processes

Effective enforcement ensures that policies and plans are being adhered to, reducing uncoordinated, undesirable or even illegal activities like deforestation or land encroachment while supporting long-term forest conservation goals.

5.2. Overcoming economic barriers

Prioritising ecosystem services at the regional level

Healthy forest regions are the foundation for a wide array of ecosystem services that contribute to regional economic resilience. At the regional scale, prioritising ecosystem services requires an integrated approach that goes beyond timber production and considers the full spectrum of benefits forests provide—such as carbon storage, water purification, soil fertility, biodiversity conservation, recreation, and other cultural values.

Regional planning can support this by mapping and assessing ecosystem services, identifying hotspots where forests deliver high-value benefits, and aligning management objectives with broader development goals. By integrating ecosystem service valuation into regional and sectoral policies, decision-makers can balance economic growth with long-term ecological stability and social acceptance. For example, in regions where agriculture and hydropower are are of crucial importance, the water regulating service of forests could be prioritised , while in areas at high risk of natural hazards like avalanches or landslides the protective function of forests should be given top priority.

Creating local benefits for local stakeholders

Ensuring that forest-dependent communities benefit directly from sustainable forest management is key to maintaining healthy forest regions. Local stakeholders – including landowners, forest workers, traditional forest-dependet communities and small businesses – are more likely to support conservation and restoration efforts when they experience tangible economic gains.

Mechanisms such as community forestry programs, cooperative business models, and participatory governance can strengthen local ownership and distribute benefits more equitably. Income diversification through non-timber forest products (e.g., mushrooms, berries, medicinal plants), eco-certification schemes, or nature-based tourism also provides opportunities for rural livelihoods. Strengthening local value chains ensures that the majority of economic value stays within the region instead of being extracted by external actors.

Marketing forest ecosystem services for regional development

Healthy forests can be positioned as strategic assets for regional development by effectively marketing their ecosystem services. This involves creating an innovative mix of policy instruments that translate ecological benefits into economic opportunities. Examples include payment for ecosystem services (PES) schemes, including carbon credits, biodiversity offsets, or "green branding" that highlights products and tourism experiences linked to sustainably managed forests.

Regional development strategies can also leverage forests as a key part of place-based marketing—framing them as symbols of natural wealth, cultural identity, and sustainability. By branding the region as a source of high-quality forest products, renewable energy, or nature tourism, policymakers can attract investment, create jobs, and enhance competitiveness. Importantly, transparent governance and trust among stakeholders are essential to ensure that marketed ecosystem services truly contribute to both ecological health and community well-being.

5.3. Overcoming socio-cultural barriers

Education, communication, and cooperation play an important role in overcoming the socio-cultural barriers to implementing ecosystem-based forest management in HFR. This includes:

- Education and awareness raising
- Regional communication and participation
- International cooperation and knowledge exchange

Education and awareness raising

Education and awareness-raising on healthy forest ecosystems, their properties and role in coping with the climate crisis rely on a combination of instruments and methods, for example structured interpretation planning, targeted educational programmes, and the integration of current research findings but also offers for forest experiences. Together, these instruments and methods create a comprehensive framework that strengthens environmental awareness, encourages positive behavioural change, and fosters sustainable relationships with forest ecosystems.

The Interpretation Plan for HFR[11] serves as a central guiding tool, providing clear key messages on forest health, ecosystem-based forest management and the importance of forest health human well-being as well as for climate change mitigation and adaptation.

Each audience group requires tailored strategies to maximise their engagement and minimise their ecological impact, making nature interpretation a vital tool for fostering sustainable relationships with the environment[12]. Potential target groups include:

- local communities
- tourists and visitors
- recreational users, such as hikers, bikers, etc.
- educational institutions (teachers, pupils and students, schools, universities)
- conservation organisations, rangers and volunteers
- forestry stakeholders
- policy makers and governmental institutions
- youth and families
- special interest groups, such as enthusiasts with a specific focus on certain aspects of nature (e.g., birdwatchers, botanists, amateur scientists)
- media and influencers

The *Interpretation Plan for HFR* suggests key messages that can function as foundational phenomena for communicating the importance of complex forest health for mitigating the impacts of climate change. These are understandable formulations that can be used in various proposed communication tools and in general in communication about the importance of forest health.

The links to climate change are mainly the content of these key messages:

- *Healthy forests are our life insurance.* They can lessen the impacts of climate change and help us to adapt to its consequences.
- *Healthy forests function like a natural air conditioning system.* They evaporate water and cool their surroundings providing a cool shelter during hot summer days.
- *Healthy forests play an important role in the mitigation of natural hazards:* They act as a natural buffer against extreme weather conditions and rapid changes in their surroundings.
- *Healthy forests are climate protectors.* As carbon sinks, they can store CO_2 over a long period of time.

The Interpretation Plan provides appropriate communication tools that have been designed with the interpretation goals in mind. The key benefits of these tools and activities are their accessibility as they ensure inclusivity for different knowledge levels, interests, and needs; engagement as they propose interactive and hands-on approaches to foster a deeper connection with nature and its importance and sustainability by involving local communities and stakeholders encouraging long-term commitment to forest health. By employing diverse interpretive methods and activities, HFR can effectively promote

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[11] Interpretation plan for HFR: available from https://www.interreg-central.eu/wp-content/uploads/2025/08/Interpretation_Plan_for_HFR.pdf,, p. 51 - 53

[12] Interpretation plan for HFR: available from https://www.interreg-central.eu/wp-ontent/uploads/2025/08/Interpretation_Plan_for_HFR.pdf, p. 58-60

environmental awareness, drive positive change, and ensure forests remain healthy ecosystems for future generations[13].

The Interpretation Plan for HFR with its key messages can guide the development of educational programmes for schools, which can introduce age-appropriate explanations and experiences of healthy forests as essential fundaments of human well-being. Hands-on activities and interactive formats help students connect emotionally with forest ecosystems and understand why their long-term protection matters. A set of new environmental education programmes for schools of all levels - as developed and tested in Germany, Slovenia, and the Czech Republic within the *HealthyForestRegions* project – translate complex concepts such as ecosystem services, natural cycles, and forest resilience into accessible and engaging learning experiences.

For the broader public, guided tours and interpretive activities offer opportunities to highlight the distinctive characteristics and benefits of healthy forests and to foster appreciation for nature's complexity, including its inherent "chaos." Similarly, activities specifically geared towards experiencing the forest, such as nature therapy or tourist offers can help to raise awareness on the topic. These activities should be designed with accessibility in mind, ensuring they engage people with different backgrounds, knowledge levels, and interests.

To keep communication accurate and relevant, practitioners should incorporate findings from current research projects, which provide updated insights into forest dynamics and on potential risks emerging from traditional forest management approaches.

Regional communication and participation

In order to support forest health at the regional level, fostering effective communication and participation of various stakeholders is a key. Structured platforms like stakeholder forums, participatory workshops, and joint monitoring initiatives help bring together diverse interest groups and facilitate transparent, inclusive dialogue. Digital tools, such as the *Healthy Forest App*[14] (developed within the *HealthyForestRegions* project), and transparent reporting systems can bridge gaps, ensuring that information flows freely across all levels of governance and among local stakeholders. By mapping all relevant groups and creating a common space for open discussions, these participatory processes address concerns, prevent misunderstandings, and promote shared responsibility for forest health. While forest health measures may limit economic activities, such as timber production, these platforms help mitigate tensions and encourage collaboration. When combined with up-to-date research and tailored communication strategies, these approaches create a strong foundation for long-term stewardship of healthy forest ecosystems.

International cooperation and knowledge exchange

The network of Healthy Forest Regions brings a consensus over the importance of forest health for human well-being across several European countries. Education and communication activities within each region can benefit from this international agreement, cooperation and knowledge exchange. The HFR network provides a range of good practice examples over a range of different forest ecosystems. Via the network it is possible to bring these examples and approaches to stakeholders and the public within Europe.

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[13] Interpretation plan for HFR: available from https://www.interreg-central.eu/wp-ontent/uploads/2025/08/Interpretation_Plan_for_HFR.pdf, p. 61 - 62 (Table 5)

[14] https://econics.projects.earthengine.app/view/healthyforest

6. Priority setting

Setting priorities can help to organise the implementation of measures, in assigning resources and to coordinate efforts amongst relevant actors. Priorities should be set at the level of specific measures rather than for objectives or general strategies. This is best done at the regional level when translating the *General Forest Health Strategy* into *Regional Forest Health Strategies*. Prioritisation can follow different approaches and criteria.

6.1. Prioritisation based on criteria-based assessment

Strategies and measures can be prioritised using clear criteria to evaluate them – such as feasibility, effectiveness, probability of undesired side effects, level of regret or cost of implementation. Strategies and measures can be ranked based on these criteria, with defined thresholds used to identify high-priority actions.

6.2. Spatial prioritisation

Certain areas can be prioritised for implementing measures to support forest health. Selection can be based on fixed criteria like land ownership, administrative responsibility, or protection status (which are more linked to feasibility), as well as ecological indicators such as forest health, connectivity, vitality or temperature regulation capacity (which are more linked to effectiveness).

6.3. Prioritisation according to logical sequence of an effect chain

Strategies and measures can also be classified according to the degree to which they interfere with existing systems, to which they prevent further degradation of forest health and the steps within a logical sequence according to the chain of effects. This could also lead to prioritisation, when less disruptive and rather preservative interventions are preferred over those that more actively change the ecosystem or its components and depend on the presence of other strategies.

Highest priority would be given to those strategies and measures that aim at preserving existing ecosystem characteristics supporting forest health, both within the forest as well as on landscape level. This would include preventing or avoiding new human disturbance of ecosystems or individual ecosystem elements and processes, in order to prevent a) existing stresses from intensifying and b) new stresses from emerging.

Second priority is assigned to strategies and measures that aim at reducing human intervention within the forest ecosystem as well as in the surrounding landscape causing ecological changes in the forest that consequently lead to reduced forest health. This reduction of ongoing disturbing human activity however can only be really effective, if new human interventions are prevented from the outset – which explains the lower priority.

The lowest priority would be given to strategies and measures aiming at actively developing specific ecosystem elements and processes in the forest and/or the embedding landscape in order to enhance forest health by targeted human intervention (e.g., ecosystem restoration efforts). This lower priority arises from the fact that measures in this action line can only be truly effective if measures in the other two lines of action are also implemented to prevent ongoing or new human intervention potentially causing negative impacts on the positive effects that had just been achieved.

Appendix

Table 1: Selected strategic approaches to support forest resilience to climate change as identified in HealthyForestRegions project workshops and their coverage by existing forest management principles. x = corresponds with principles, x*= corresponds with FSC biodiversity conservation approach, - = not referred to in the respective principles.

HFR strategic approach	FSC principles	Close-To-Nature principles	Closer-To-Nature Principles
Reduce use of heavy machinery in forest	-	X	X
Reduce density and number of forest roads & skid trails	-	-	-
Reduce infrastructure development and forest roads	-	-	-
Avoid (artificial) crown openings for infrastructure development, roads etc	X	X	X
Avoid sealing in the forest			
Close drainage channels	-	-	-
Recreate and increase water retention	x	x	x
Preserve forest continuity	x	x	x
Let grow forests older and thereby more biodiverse	x*	x	x
Biodiversity conservation	x*	x	X
Retain dead wood in forest/reduce wood extraction	x*	x	x
Promote good examples of individual, sustainable tourism (WP1)	-	-	-
Keep water in the forest (dead wood, close drainages, ...)	x	x	x
Full conservation status of forest sites without any management	x*	-	-