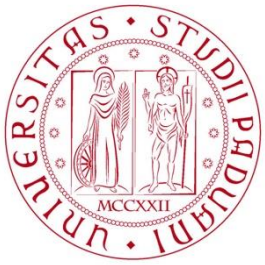

UNIVERSITY OF PADOVA

Dipartimento Territorio e Sistemi Agro-forestali

STRATEGIC PLANNING IN THE FOREST SECTOR A COMPARISON AMONG DIFFERENT NATIONAL INITIATIVES IN EUROPE

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Academic Year

2019 – 2020

Contents

Acknowledgment

First of all, I would like to thank Allah Al-Mighty, for the consistent and countless blessings. Secondly, I would like to thank my Supervisor, Prof. Davide Matteo Pettenella from the TESAF department (University of Padova) for his continuous support, help, and guidance. I would also like to pay him gratitude for putting valuable inputs and technical feedbacks on this research work. I am grateful to the Erasmus Mundus Program and the European Commission for providing financial support. I would also like to appreciate the whole MEDFOR consortium and affiliated partners for providing all kinds of facilities and assisting me to accomplish my master's Degree in Mediterranean Forestry and Natural Resource Management. In the end, I would like to thank my friends and family especially my parents for their moral and emotional support.

Summary

Sustainable management of forest ecosystem resources requires long-term planning approaches. This study presents the comparative analysis of the National Forest Strategies of Germany, Finland, Scotland, and Greece by using different literature resources and official documents. Each country has its own problems related to the forest sector in the form of climate change, biodiversity loss, overexploitation of forest resources and unchecked human interventions that influences the efficiency of the National Forest Sector. All the four National Forest Strategies have a similar basic content structure consisting of: vision, a set of objectives, areas of action, financing bodies, description of a monitoring and valuation system, and involvement of stakeholders. However, due to different forest problems there are also some dissimilarities in the structure as some National Forest Strategies contains additional contents; for instance, Finnish National Forest Strategy additionally includes the socio-economic impacts of the Finnish National Forest Strategy, Scottish Forest Strategy includes strategic drivers, and Greek National Forest Strategy includes horizontal crosscutting and vertical thematic axis depending on the needs of the Greek forest ecosystem. Implementation of these Strategies requires collaboration from the State government, national agencies, and several other stakeholders using modern digital technologies. National Forest Strategies are coordinated with other National Strategies to achieve common goals such as: biodiversity conservation, forest soil protection, better infrastructure, climate change adaptation, and mitigation etc. Comparative analysis of different National Forest Strategies also shows efforts of different state governments towards their commitment to achieve the goals mentioned in the National Forest Strategies.

Keywords: National Forest Strategies, National Forest Programs, forest policy, sustainable forest management, strategic planning

List of abbreviations

NFP	National Forest Program
NFS	National Forest Strategy
IFF	Intergovernmental Forum on Forest
IPF	Intergovernmental Panel on Forest
TFAP	Tropical Forest Action Program
NFSC	National Forest Strategy Coalition
NFSSC	National Forest Strategy Steering Committee
CCFM	Canadian Council of Forest Ministers
GHGs	Green House Gasses
EU	European Union
LULUCF	Land use, Land-use change and Forestry
UNCED	United Nations Conference on Environment and Development
EC	European Commission
CAP	Common Agriculture Policy
ES	Ecosystem service
UKFS	United Kingdom Forest Standards
WDNA	Wild Deer National Approach
SFM	Sustainable Forest Management
EEC	European Economic Community
MAES	Mapping and Assessment of Ecosystem and their Services
SWOT	Strength, weaknesses, opportunity and threat
UNECE	United Nations Economic Commission for Europe
NAP	National Accountability Plan

1. Introduction

Forests are the biggest reservoirs of numerous natural resources and they also serve as long-term business hubs. As a result of the lack of awareness and policy action, forest resources are being increasingly exploited in an unsustainable way. Clearcuttings, forestland conversion and wrong silvicultural practices are common. These extensive practices are affecting the quality of old growth forests and are also impacting biodiversity by destroying habitat of many wildlife species.

According to a study published by NASA, forests are the world's biggest sinks for all the anthropogenic and naturally emitted carbons. It is also observed that almost 30% of our total Earth's land consists of forests. These forests are also holding up to 45% of the stored carbon on land (Carlowicz, 2012). This makes forests the world's largest reservoir of many natural resources. Forests have also traditionally contributed to the welfare of countries throughout the globe by its non-wood and wood products along with many other services (Stridsberg, 1984).

It has been noticed that for the last few decades the over-exploitations of that forests for the consumption of natural resources have been increased at an exponential level. On one hand, due to deforestation and over-exploitation of natural resources the total forest area is decreasing worldwide. But on the other hand, in Europe due to sustainable harvesting of almost 60-70% of total annual increment, forests are covering almost 40% of the EU land area. Also, natural regeneration and afforestation in the European Union's total forest cover have been increasing by 0.4% annually since the last few decades (European Commission, 2013).

Nevertheless, according to the projections of member states under LULUCF (Land use land-use change and forestry), it is estimated that the harvest intensities are highly expected to boost up to 30% by the year 2020 in comparison to the year 2010 (European Commission, 2016). One thing to be noticed here is also that almost half of European forests are owned by millions of private owners and the remaining percentage belongs to public owners or state. However, in central Europe, the percentage of privately owned forests is even more than half of the total central European forest cover (Hirsch, 2007). While competing with the global market, forest management needs planning, even the required operations should be well planned, efficient and effective enough to maximize profitability while minimizing the cost (Andersson, 2005).

One of the major reasons of forest degradation is the lack of good and practicable forest policies which is often an ultimate result of the poor coordination between the needs of local population and indigenous people and the government bodies that are making top-down decisions without considering the interests of local communities. Many mistakes and inconsistences are present in large-scale planning initiatives in the forestry sector, among the others:

- Miscommunication and communication gaps create conflict between government and the local communities;

- The need to improve forest infrastructures, to generate employment opportunities and good working conditions for the local communities is not properly considered by the central authorities;
- Local communities are not aware or able to implement the government's measures;
- Research and development activities are inadequate.

In General, there is a need to establish a well-developed strategic framework with far-sighted and strong objectives. National Forest Strategies or National Forest Programs (NFPs) usually involve actions defined in a long-term planning period (i.e., 5 or more years). The strategic framework should represent the long-term vision (i.e., 5 or more years) of the forest sector and should be based on an active participation of the local communities. The National Forest Strategies should assure a long-term coherence and continuity while dealing with the emerging challenges and issues in the forest sector. They should embrace the existing values and commitments while providing new strategic directions for sustainable forest management for the future forest and woodlands.

After the approval of Agenda 21 of the 1992s UNCED Summit, the features of National Forest Programs have been described through the platform of the Intergovernmental Panel on Forests (IPF) and Intergovernmental Forum on Forest (IFF). National Forest Programs (NFPs) and National Forest Strategies are now well established practices and instruments for overcoming the longterm problems and accepting opportunities to protect and develop forest resources and the forestry sector. National Forest Strategies should be considered as a continuous way of conserving forests for the long term fulfilment of national and international objectives of sustainable development (Schanz, 1999).

Research objective

The objective of this study is to carry a comparative analysis of the National Forest Strategies of selected European countries. More in details, the objective of this study is to understand the public consultation procedures, the contents, the implementation procedure, the monitoring and evaluation systems of these Forest Strategies.

Motivation of the research work

Various experiences of National Forest Programs (NFPs) have been studied by the developing countries in the domain of TFAP (Tropical Forest Action Program) and other similar programmes (Liss, 1999). However, the comparative study among the high-income countries is quite limited; therefore, this study is aimed at a comparative analysis of long-term strategic planning in the forestry sector at the European level. Specifically, this study examines the experiences of National Forest Strategy framework in four different European counties, namely: Germany, Scotland, Finland, and Greece.

2. Background

Natural resources always support or complement significantly our living quality along with the functioning of our global economy. These resources usually consist of biotic and abiotic raw

materials like wood and non-wood forest products, biomass, air, water, minerals, and soil, etc. (European Commission, 2011).

Studies proved that if the world population growth continued increasing at the same rate; then the world population rate is expected to increase by 30%, reaching nine billion by 2050. This population growth is ultimately pushing pressure on our resource consumption increasing the competition for resources all around the world. It has been observed through past experiences that in recent decades unsustainable resource consumption is creating an intensive threat to the equal and ample distribution of the resources. Therefore, continuing the same patterns of resource consumption is not a good decision.

Under a "business as usual" scenario there is a great need to enhance the efficiency of resources which will help the European economy to secure its growth. It will gradually generate opportunities to boost up competitiveness, reduce cost, improve productivity, and create new economic opportunities for people. It is also important to introduce more efficient products and services with a special focus on waste reduction (circular economy). This will ultimately stimulate innovation and will also help in creating employment opportunities and promoting green technology, sustaining European Union trade, and creating novel export markets through benefiting consumers by more sustainable and eco-friendly products.

Thus, the use of forest resources more sustainably and efficiently will help to attain many European Union's targets of combating climate change challenges and reducing GHGs (greenhouse gases) by the year 2050 (European Commission, 2011). It will also help to conserve and preserve precious ecological assets for the future generations showing the reverse of short-term satisfaction at the cost of long term welfare (Gane, 2007).

Most importantly, sustainable use and consumption of forest resources is also a great step to ensure raw material, energy supply, and even food supply associated to conservation of biodiversity, protecting habitats of endangered species and conservation of the environment and our ecosystems. For stakeholders and businesses, it is really important to have a vision of Europe in 2050 along with a long-term policy framework. It is also necessary to keep the actions on right track to get a speedy accomplishment of goals and targets.

The very first EU Forest Strategy which was established in 1998, laid the foundation of a framework for actions related to forestry to support a sustainable management system and was based on shared responsibilities (European Union, 1999). The proposed framework was also based on mutually beneficial links between member states and the European Union's forest initiatives and forest policies. The implementation period was from 2007 to 2011 (Aggestam, 2020). Partial financing of forest management related procedures under "The Rural Development Regulations" has always been the main source of European Union level funding (European Commission, 2006). EU forest strategic planning gain even more importance with the European Union's setup of the second Forest Strategy in 2013, with a special focus on response to challenges in the forest sector. This Strategy highlights key principles to strengthen forest protection, distribution of ecosystem services, ensure sustainable forest management,

developing competitiveness, and job opportunities for local people of rural areas (European Commission, 2013).

The strategic planning may also include strengthening at the level of broad-scale or the sub-regional level (Fürst, 2001). According to a mid-term review report of the European Commission, it is concluded that the EU Forest Strategy is achieving its goals of sustainable forest management not only in the EU but also globally (European Commission, 2013). The success of the new forest strategy depends on its ability to deliver measurable progress related to forest-policy domains (Aggestamand Pülzl, 2018).

Europe 2020 Strategy is aiming to provide smart, inclusive, and sustainable growth for creating jobs and economic growth. It is now one of Europe's main strategies (European Commission, 2010) and "A Resource-Efficient Europe" was introduced as one of the 7 flagship initiatives (European Commission, 2011).

EU institutions and Member States are collectively working to harmonize actions and to bring the essential structural reforms. Following are the three conditions that were required to get the benefits of a "resource-efficient" and "low-carbon" economy (European Commission, 2011):

- It is important to take action in a broad range of policy areas and these actions need to get political support and visibility;
- Act urgently as we know some actions show their positive impact on economic growth in a short time while others need long time and investment to show real a long-lasting economic benefit for European Union's economy;
- Motivate consumers to shift towards sustainable consumption i.e. efficient use of resources, to maintain continuous innovation without compromising efficiency gains.

The flagship initiative specially aims to generate a frame for policies to support a shift towards a low-carbon and resource-efficient economy, which will ultimately help us in the following ways:

- Ensure the security of essential ecological resources;
- Improving economic performance with less resource consumption;
- Limiting the environmental impacts of the overuse of resources and combat climate change;
- Identifying and creating novel opportunities for greater innovation, better economic growth, and boosting the EU's competitiveness.

Till the 1980s, in Europe the planning practices were more focused on the projects that were particularly designed for the improvement of underdeveloped regions. Although some projects were also focused on land use regulations, at that time the concept of strategic planning was

very uncertain and vague (Salet, 2000). However, at the end of the 20th century, new efforts were carried out in many different parts of the world including Europe to define the theme of the strategic planning approach and to produce new strategic frameworks (Albrechts, 2003).

In literature, the historical background of strategic planning meets the military planning approaches and got tied to statecraft, which means the skill of using State power for managing governmental affairs (Bryson, 2018).

In literature "strategy" has been defined as follows:

"Strategy is a system of methods" or *"It is a precise set of actions that are needed to achieve pre-established goals."*

Strategic planning has been defined as follows:

"Strategic planning approach is a deliberative, disciplined effort to produce fundamental decisions and actions that shape and guide what an organization (or other entity) is, what it does, and why" (Bryson, 2011).

In different government sectors, the strategic planning/ management approach that fits the above-stated definition is an increasingly common practice throughout the world these days (Ferlie and Ongaro, 2015).

Generally, the formulation of a National Forest Strategy is a consultative process and comes under the responsibility of the Ministry of agriculture and forestry, the Ministry of environment and related State agencies. The framework of the National Forest Strategy assures the integration of cultural, socio-economic, and environmental policy agendas for the welfare of indigenous communities and the related stakeholders. Whereas, the development and implementation of the National Forest Strategy represents a frequent and ongoing process (Gane, 2007).

An interesting example of the consultative process has been taken place in Canada, under the Canadian National Forest Sector. A National Forest Strategy Steering Committee (NFSSC) has been set down including government representatives with those of the indigenous communities, workers' organizations, forest industries, private forest owners, universities, professional foresters. It worked closely with the organizing committee of the National Forest Congress to report to the Canadian Council of Forest Ministers (CCFM). The NFSSC has conducted numerous regional meetings and consultations to identify the main problems in the forest sector throughout the country. The plan was to open stage for discussion from the participants, invite written comments, and present the draft of summary documents for discussion and approval at the National Forest Congress (Murphy, 1993).

For providing background and set an open stage for discussion and consultations, a discussion document was prepared and presented by the Laval Forestry School University Dean, on orders of CCFM. The forest issues listed in the document were widely distributed to encourage written comments. People were asked to define their opinion on the issues, the point where they see

Canada in few years, how Canada should proceed for getting there and how to measure the success of the whole process.

The consultations were directed in a series of five forums held throughout the country. Great similarities were observed in the comments but there were also some regional differences. For instance, in Fredericton, New Brunswick, the major concerned issue was the management of the private woodlands. In Trois-Rivikres, Quebec, the major concerned issue was related to the aboriginal community along with the management of forest resources with other non-wood natural resources such as: water, fisheries, and wildlife. In Toronto, Ontario, urban forest management was the concerned issue. In Saskatoon, Saskatchewan, global forestry was discussed along with the interest of integrated resource management. Prince George, British Columbia showed a strong concern about industrial and economic benefits from forest resources.

Each forum consists of 60-70 people representing the range of interest groups. Participants were further divided in groups of 10 or 15 making sure to represent and cover all possibly concerned interests. Discussions at these forums were conducted by the professional facilitators to provide a clear, open and transparent environment. All delegates were encouraged to participate and their points of view were recorded on charts and posted around the rooms. Initially the points were numbered in the range of 80 to 100. In the next step the participating working groups were asked to set them in major categories of their choice and list them priority wise to have a more detailed discussion. Later on, during the conduct of detailed discussion (that was held in an open and transparent manner) delegates were asked to draw the situation how they want to see things in future and which suggestions they would like to give to solve these issues. Working groups were also asked to draw a picture (by using drawing papers and coloured pencils) of what they felt about the forest, their vision and the values held about the forest. The results of this activity were remarkable and led to some very positive suggestions. This activity was very helpful for the people to express their feelings in the form of drawing, instead of expressing verbally which was difficult to explain for some people. These points were used to define the values and statement of vision within the final document. Discussion was productive and positive although it did not resolve all the issues, but it did set the frame for better understanding.

Results were effective and remarkable in portraying the feelings of the participants and to contribute harmony among the forest stakeholders. These results also turned out a successful resolution through continuing dialogue and involvement for the implementation of the strategy. During the consultation process almost 400 people participated. Each participant had been given a document named as “workbook” with the space for written comments. Comments on the wall charts and workbook sheets were transcribed. The results turned out into a document called “Towards a National Forest Strategy”. This document was prepared to show participants that their opinions have been recorded fairly. Over 1000 copies of this

document were published and distributed to get both positive responses and corrections (Murphy, 1993).

Following were the most common 12 issues that were identified with respect to the order of frequency:

- forest land use and integrated resource management
- public awareness
- public participation
- forest renewal
- silviculture
- clearcutting
- biodiversity
- environment and forest health
- competitiveness
- old growth
- research and development
- employment and working conditions
- differences in rural and urban views

In 1991, the first draft of the Canadian Forest Strategy was released and was sent for more detailed review and comments before its final release. The active participation showed by the delegates during the forum highlights their keen commitment towards the process. Later on, after describing 96 impressive commitments and 9 strategic directions, the final version was again refined by a specialized reviewing team before making it available in an acceptable form for the National Forest Congress. The final resulting document was a product of efforts of a lot of people who were involved in the whole process.

After formulation of the final document of the Canadian Forest Strategy, a need for a leadership body was expressed for putting the Strategy to work or making it practical. For this purpose, Canadian Council of Forest Ministries agreed to take this responsibility to act as a trustee of the National Forest Strategy. Ministers were committed to develop plans, to review the process each year and to organize a public review along with independent monitoring audits done by third parties. Later in October 1992, a National Forest Strategy Coalition (NFSC) was developed to oversee the implementation, monitoring, annual reviews and evaluation of the Forest Strategy (Murphy, 1993).

Literature also shows that the National Forest Strategies are efficient enough to address the problems of forest governance with correspondence to the international norms. Canada's National Forest Strategy is working to meet its objectives under soft international law. However, evaluation of impacts must be measured under comparative study between National Forest Strategy and National Forest Program (Rayner, and Howlett, 2007).

We can find a different example of the National Forest Strategy where Australia has released its National Forest Strategy. However, due to poor consultation process there were some elements that were missing in the formulation of the Australian National Forest Strategy such as; long-term objectives for the conservation of forests, size of harvesting stands, clearcuttings, and harvesting of non-sawlog materials. For this reason, the National Forest Strategy documents receive very little attention from environmentalists as well as from the foresters (Bartlett, 1988).

In literature we can also find, the comparative analysis of the bio-economy in the National Forest Strategy of Czech Republic and Germany. In 2008 Czech NFP was approved following the pan-European process for the protection of forests in Europe. The NFP does not directly reflect the principles of the EU forest-bioeconomy, because the EU Forest Strategy was introduced in 2013. The Czech NFP goal and objectives are in agreement with the purposes of the EU Forest Strategy. Additionally, most of the key actions of the Czech NFP reinforced the eight priority areas of the EU forest strategy. However, the NFP focuses less on the urban communities because the forested landscapes are mostly located in rural areas. Though the Czech NFP promotes the development of forest-based bioenergy, it does not emphasize the broader green economy, as stated by the EU and German forest strategy. The Czech NFP gives special attention to state forests. This specific attention is not directly correlated with the EU Forest Strategy, but the state forests are expected to be the role model for other forest owners in terms of sustainable forest management practices and other key actions. Therefore, Key Action 17 (state forests) also fits with the priorities of the EU Forest Strategy. Though the current related forest policies in the Czech Republic have acknowledged bioeconomy principles, its strategies are only regulated in this sector, which might limit forest bioeconomy implementation in the country. In this respect, the Czech Republic is currently in the midst of the bioeconomy adoption process.

The next expected step is to extend to multi-sectoral and inter-ministerial committees at the government level. The country can take learn from the existing models from Germany that allow for an open journey towards the development of bio-economic principles. The lessons learned from German experiences are those of the sustainable forest-based production, mixed-tree forests, and multipurpose forests, as emphasized by the National Forest Strategy and the federal state forest policy. Germany also focuses on the link between the research and commercialization of bio-based and high value-added products, along with public support. Following the EU climate and energy targets, in 2020, both the Czech Republic and Germany are presenting a share of bioenergy utilization that fits the country and are approaching the countries' goals, respectively. Following the EU and government policies in the alteration of the energy source in the buildings, further challenges are being faced by the forest-based sector,

not only to fulfil the demand of sustainable forest biomass but also to collaborate with the other related ministries. (Purwestri *et al.,* 2020).

3. Methodology

For this study document, we have visited Scopus website and used this website by using access through the institution. For the research we have used advanced search option using “AND” Boolean operator in between the keywords we have first tried different combination of keywords to get the desired literature. Below mentioned is the list of key words that were used primarily in the literature research trial.

("german forest strategy" AND "ecosystem services" AND "carbon sequestration") =02
("german forest strategy" AND "ecosystem services" AND "comparison") =02 results
("National forest strategy" AND " forest policy " AND " spain") =07 results
("National forest strategy" AND " forest policy " AND " portugal") =07 results
("National forest strategy" AND " france" AND " forest policy") =04 results
("National forest strategy" AND " austria " AND " forest management") =06 results
("german forest" AND "forest strategy") =12 results
("National forest strategy" AND " italy" AND " forest management") =12 results
("National forest strategy" AND " sustainable management " AND " europe") =10 results
("National forest strategy" AND " forest policy " AND " europe") =37 results
("National forest strategy" AND " europe") =55 results
("europe" AND " sustainable management " AND "forest strategy") =61 results
("europe" AND "forest strategy" AND "participation") =103 results
("forest strategy" AND "ecosystem services" AND "comparison") =122 results
("forest strategy" AND "europe" AND "comparison") =177 results

However, after several trials we finally succeed to get the right combination of keywords to get the desired results. We have found more than 28000 papers collectively with different keywords combinations among this huge collection of literature result some papers were selected through applying refining results filter. Following are the list of keywords we have used and the number of papers that we have found for each research:

- ("forest management" AND "strategy" AND "comparison") =16513
  After keyword limitation =8362
  Language limitation =8217
  Open access =2992

- ("forest management" AND "australia" AND "strategy") =7899

After keyword limitation =4424
Language limitation =4376
Open access 1529

- ("forest management" AND "germany" AND "strategy") =6422
  After keyword limitation = 3515
  Language limitation =3437
  Open access =1426

- ("forest management" AND "finland" AND "strategy") =4844
  After keyword limitation =3320
  Language limitation =3282
  Open access =1265

- ("forest management" AND "scotland" AND "strategy") =1544
  After keyword limitation =964
  Language limitation =960
  Open access =405

- ("forest management" AND "greek" AND "strategy") =1408
  After keyword limitation =957
  Language limitation =948
  Open access =398

Along with Scopus we have also used literature documents and reports from official websites (For Example; FAO, Federal Ministry of Food Agriculture and Consumer Protection, Ministry of Agriculture and Forestry, Ministry of Environment and Energy and Scottish Forestry).
In the current study, we have selected four European countries (Germany, Finland, Scotland and Greece) on the basis of availability of the most relevant information from available literature sources and different websites (Table 1). For the comparative analysis we have considered the content structure and the main aspects of the four selected National Forest Strategy initiatives (Table 2).

Table 1: National forest strategies of Germany, Scotland, Finland and Greece

Country	Name of Strategy	Website	Year of Approval	Final reference year	Authority incharge
Germany	Germany's National Forest Strategy 2020	http://extwprlegs1.fao.org/docs/pdf/ger143959.pdf	2011	2020	Federal Ministry of food agriculture and consumer

					protection
Finland	National Forest Strategy of Finland 2025	https://mmm.fi/documents/1410837/2000444/Brochure_National_Forest_Strategy_2025_updated_version.pdf/9e32e0b9-ee2a-b906-8222-8c3a7df5f7d0/Brochure_National_Forest_Strategy_2025_updated_version.pdf	2019	2025	Ministry of agriculture and forestry in Finland
Scotland	Scotland's Forest Strategy 2019-2029	https://forestry.gov.scot/publications/793-scotland-s-forestry-strategy-implementation-plan-2020-2022/viewdocument	2019	2029	Scottish government
Greece	Greek National Forest Strategy 2018-2038	https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupMeetingDoc&docid=29017 http://www.opengov.gr/minenv/	2018	2038	Ministry of Environment and energy

Table 2: Contents of the National Forest Strategies of all four countries; cells with green bullet (●) represents the presence of certain contents in each National Forest Strategy whereas cells with the red text (no information found) represent the absence of particular content from the respective Forest Strategy

Contents	Countries			
	Germany	Finland	Scotland	Greece
Vision	●	●	●	●
Objectives	●	●	●	●
Areas of action	●	●	●	●
Financing	No information found	●	●	●
Monitoring and valuation	No information found	●	●	●

Stakeholder's involvement	●	●	●	●
Implementation	No information found	●	●	●
Impact Assessment	No information found	●	No information found	No information found
Review	No information found	No information found	●	●

4. Results

The four selected countries represent different regions of Europe from North to South and East to West which means the climatic conditions, the geographic location and their forest problems are not the same. In the following the four countries contexts are briefly described.

Germany. One-third of Germany's land consists of forests. One interesting point to be noted here is these forests provide a great service for carbon sequestration and serve as one of the great reservoirs of carbon (Batjes, 1996). Due to the carbon sequestering potential of forests, we can also call them carbon sinks (Six, 2002). However, in Germany forests do not only mean carbon sinks or climate change influencers but they also play a vital role in German culture (Riedel and Polley, 2017). Over time the symmetry of the forest is being shaped by humans depending on their political, social, and economic interests or demands. Due to an increasing trend of timber shortage and the danger of over-exploitation of forest resources German people already came to know almost 300 years ago that sustainable management was the only solution left to ensure the availability of resources for future generations.

However, this principle was primarily applied only to the timber supply, but with time improvement in forestry continuously developed the scope of sustainability. Now, these days sustainable forestry includes the goal of conserving wildlife, protecting and integrating ecological, social, and economic contributions of our forests for present and future generations. This is not a less ambitious goal and in Germany, it is pursued by an integrative approach to multi-functional and sustainable forestry (Weber, 2018).

Finland. The country is one of the most important countries of Europe located in the North East part of Europe. In the context of its forest cover about three fourth of the Finnish land is covered with forest that makes almost 23 million hectares or 76 % of total Finnish land. Almost 11% of the European forest area (that is about 210 million hectares) is in Finland (Parviainen and Västilä, 2011). In Finland, around 95% of forests are certified under the international certification system PEFC. The demands of carbon capture and storage are still not able to fulfil the volume gaps that were created as a result of agricultural shifts and deforestations (Vaivade, 2013).

The climatic conditions in Finland are not very favourable for forest growth due to low temperatures yet the forest resources in terms of wood and non-wood forest products are very important for the country's economy. The Finnish forest sector alone accounts for one-third of

the country's gross income. With an approximately 0.5% of the world's total forest, Finland accounts for 15% of the world's paperboard and paper export (Ahtisaari, 2000).

Scotland. The country falls under the boreal and temperate zones with the forest type resembling the northern latitudes countries like the USA, Canada, Russia, China, and Finland. Without anthropogenic activities, Scottish land would be concealed with natural forest comprised of Birch and Scots pine in the east and north, and Oakwood tree species in the moist and warm side of western Scotland. It was reported that 6000 years ago foresters entered the Scottish forest land and they have been exploited the forest resources since then.

The main reason for that deforestation was urban sprawl due to which more land was required for making infrastructure, shelters, industries, and agricultural activities. According to previous reports, the total forest cover in Scotland along with the UK was reduced by about 5% in the 20th century. This drastic decrease in the forest cover was turned out as a strategic problem for the whole country.

Therefore, in 1919 a forestry act was established to deal with this issue. After this reforestation was carried out but the foremost purpose of these plantations was not to stabilize the timber production. Different species from all around the world were introduced in the Scottish land to get adapt to favourable growing conditions. In the second half of the 20th century, this fact was clear that single-purpose forestry was not sustainable forestry and it requires accepting the new and wider interests of society and the environment. This change of interest for the forest policy ended up in the expansion of forest management standards in the 1990s (Reid, 2018).

Greece. The country comes under the temperate zone of Southern Europe comprising 25% of the total area of Greece. Most of the Greek forests are natural with very few percentages of forests that are plantations (Avtzis, 2001). Since the last second half of the 20th century, forest management is going through developmental reforms by the European Union. Regarding forest management, the European Economic Community (EEC) was established in the 1960s. It has also developed a wide range of initiatives in line with the Common Agricultural Policy (CAP). The joint framework of the European Economic Community (EEC) and Common Agricultural Policy (CAP) proved beneficial for the environmental and socio-economic sustainability of central and southern European countries (Kyriakopoulos, 2017).

Especially the Common Agricultural Policy reforms are of high interest in the context of Greece. These reforms also provide subsidies for agricultural lands (Arabatzis, 2010). Some other regulations of this joint framework also include measures to subsidize the afforestation of different forest tree species at agricultural land (Arabatzis, 2008).

Literature shows that the economic value of Greek forest resources is very important for the national economy. Economic benefits from forest recreational activities are much higher than the timber production and are taken into consideration in latest forest policy reforms (Matsiori, 2012).

Following are the details of the National Forest Strategies of the countries that are under this study.

4.1 Germany's National Forest Strategy 2020

More than 31% of the total country's land is forested (Riedel and Polley, 2017). These forests have great potential of holding a significant amount of carbon not only in its biomass but also in the soils. Forest ecosystems retain more than 70% of soil organic carbon and almost more than 80% above-ground terrestrial organic carbon (Jobbágy, 2002).

We can estimate the importance of forests in German culture by the fact that they use to mention forests in their stories, myths, and above all in their songs as well. Moreover, they have consistently been a highly important source of economic growth, raw-material supply, habitat for flora and fauna, recreation, and most importantly climate change influencer and weather regulator (Riedel and Polley, 2017).

Forests are generally the natural vegetation in Germany. Almost 31% of German's forest cover area is sustainably managed. Over the recent four decades, there is an increase in forest area by a total of one million hectares. Along with agriculture forests are also a long-lasting source of biomass raw material under sustainable management. The tree growth conditions are also favourable in Germany that ultimately led to a significant increase in timber reserves.

As we all know forests are directly linked with climate change therefore, the conservation of wildlife and preservation of forest resources have a positive impact on our forests. On the other hand, climate change deteriorates the overall health of our forests. This means that forests are however affected by the intensity of climate change and hence there is a significant requirement for some suitable adaptive measures.

The forest functions and the measures taken for their sustainable protection are embedded in the forest and the nature conservation laws of the federal government and the countries (*Länder*). Moreover, the maximum of the forest area is certified voluntarily (by following recognized systems and using very strict criteria of sustainable forestry). Among the large population, the understanding and knowledge of sustainable forest management which is a prerequisite for the acceptance of sustainable management are on the decline.

The demands based on forest products will continue in growth among Germans. The growing demands of timber, changing criteria of luxury items and leisure hunting, and at the same time increasing trends of wildlife and nature conservation all should meet the criteria of sustainable management. However, these growing demands vary from region to region. The challenge facing politicians is to evaluate the growing demands and by keeping those all in an overall context establish a framework that should meet all these challenges with sustainable management of timber and other forest products in an optimum manner.

On a national level, Germany's Forest Strategy of 2020 was adopted in 2011 by the German parliament for meeting the challenge of rising demands in various areas of forestry. It was also considered as an alternative to Germany's National Forest Program. The German National Strategy was also considered as an umbrella for all sectors and strategies (Weber, 2018).

Vision

The vision of the German National Forest Strategy describes the sustainable management of forests that ensure the preservation of forests and helps to promote the growth of indigenous species of trees in the forests which also easily adapt to climatic changes. A sustainably managed forest also provides natural raw materials along with natural habitats for many plants and animals. Hence, the ecological stability and diversity of German forests have significantly increased over time (Ainger, 2011).

Objectives

The main goal of the Forest Strategy 2020 is to obtain a stable, well balanced, and resilient forest which can easily adapt to the growing demands with sustainable performance. It is also based on three dimensions of sustainability i.e., ecological, economic, and social. This shows that the goal of sustainable forest management can only be achieved by maintaining a balance between economic viability, ecological responsibility, and social justice. The Forest Strategy should also be in harmony with other Federal government strategies (e.g. the National Sustainability Strategy, the National Biodiversity Strategy, the Biomass Action Plan, and measures to mitigate climate change) (Ainger, 2011).

Areas of action

There are 9 main areas on which the German National Forest Strategy 2020 is focusing to start immediate actions. All these areas of action also come under the subordinate goals of the National Forest Strategy 2020. Following are the brief descriptions of all nine priority areas (Ainger, 2011):

- **Climate protection and adaptation to climate change**
  There is a need for increased input from timber management and the forestry sector for climate protection and climate change mitigation. Forests and woodlands must be able to adapt to the changing climatic conditions to meet the demands of society and to ensure environmental protection.

- **Property, work, and income**
  The economic bases of the forest sector should be preserved. It will help to increase the availability of employment opportunities in the forest and timber industry and to ensure the economic welfare of people.

- **Raw materials, use and efficiency**
  The productivity of timber and other raw materials from sustainable forest management should be ensured. Even after 2020, the (domestic) growing demands of timber should have to be fulfilled mainly by indigenous supplies and sustainable harvesting of raw materials from other sources.

- **Biodiversity and forest conservation**
  Conservation of biodiversity should need to be improved under suitable measures. The relationship between biodiversity and forest management also requires extensive

research. The findings of the research should be incorporated during the planning and decision-making processes.

- **Silviculture**
  Germany's forest area has to be increased, if possible, and it should also be maintained properly. Similarly, the stability, diversity, and productivity of the forest also require further improvement under the proven sustainable forest management strategies. From a pure silvicultural point of view, the key contributory factor is to plant indigenous and site-specific tree species.

- **Hunting**
  Hunting activities also contribute as an essential part sustainable forestry. An efficient and strict hunting practice also ensures the conservation of biodiversity, promotes natural regeneration of the forest, and preserves the forest ecosystem.

- **Protection of soil and water management**
  Soil is an essential component of forest growth. It also provides an effective habitat to many small animal species. It is also important to protect forest soils from the harmful effects of extreme weather events and soil runoff from extensive rainfalls. Therefore, forest management plans should also access the water channels to prevent forest soil loss.

- **Recreation, health, and tourism**
  The eco-tourism activities, recreational activities, and other cultural functions should be maintained under proper measures to avoid any adverse impact on the forest natural resources and forest property.

- **Education, public relations, and research**
  Improved research work is required to reduce the overlapping of conflicting goals in the above-mentioned priority areas. Meanwhile, it is also important to promote a better understanding of the forest ecosystem and to induce the awareness of sustainable forestry and renewable resources in the framework of the educational system.

Involvement of stakeholders

This National Forest Strategy was developed based on the results of 4 symposia that were held in Berlin and Munich. Within the framework of Charter of wood 2.0 (multi-actor governance process for forest bio-economy), a large-scale cluster study was carried out nationwide to analyze the supply and demand potential of wood for present and future time (Purkus and Lüdtke, 2020). In December 2008, a scientific event was held in Berlin with the main focus on forestry and social interests. It also enabled the identification of conflicting interests and their possible solution that need to be developed. In May 2009, another symposium was organized at which the subject of discussion was more extensively discussed by the representatives of associations and political circles. In May 2010, the fourth event was held in which the question

to be addressed was that; *"Which kind of forest will be best equipped to meet the many expectations we will place in it in the future and what will it look like?"*

Representatives of nature conservation associations, timber and energy management, and forest owners were invited to all four events to participate in all sessions for an active discussion. Later on, other groups like the representatives of sports, the German hunting protection association, and nature conservation were also brought in. This showed a wide range of contradictory demands and ideas. They all agreed on the same point that demands are increasing for climate protection, timber, recreation, and biodiversity conservation. Therefore, solution-oriented and well-balanced answers are required.

German Forest Strategy 2020 also considers major findings of the National Forest Program (as it includes a multi-phase process and an involvement of interest groups and was also accepted by multiple stakeholders). Since the recommended goals and actions were not accomplished within the framework of the National Forest Program therefore in the National Forest Strategy of 2020 an alternative pathway is taken into consideration to properly define the forest management goals, finding new ways of resolving conflicts, and generating practical solutions.

The National Forest Strategy 2020 reflects the responsibility of the federal government as an economic resource for the forests. It has not only started a new phase of discussion among different actors and stakeholders but also it is helping to create awareness about the forest ecosystem and sustainable forestry among community people (Ainger, 2011).

4.2 Finland's National Forest Strategy 2025

Finland went through a continuous transformation in the forest policy regime since the 19th century. Three different and distinct policy regimes were identified since the 19th century. First, the German forestry model was introduced with the core concept of sustainable yield. Simultaneously, the Finnish forest service was established later at the end of the 19th century. These actions were aiming towards the changing patterns of local forestry and using long term sustainable utilization of forest resources. Second, during the era of the 20th century, a new national forest sector was established. With the establishment of this national forest sector industrial forestry was seen as an assurance of economic independence for the country. Third, during the current eras, the international forest industries and non-governmental organizations have increased the influence and changed the traditional power relations since issues like biodiversity conservation, global investments, and forest certification have been involved in the discussion. It is also concluded that the latest transformations in forest management should be considered and read as a transformation in the forest industry and should not be considered as a rejection of the industrial forest use models; because the legacy of the German forest science of the 19th century still prevails in the recent Finnish forest management regime (Kotilainen and Rytteri, 2011).

The Finnish National Forest Strategy was established in 2015. Later in spring 2018, it was updated under the Forest council initiative. Under the directions of the Ministry of Agriculture

and Forestry, the National Strategy was updated with the collaboration of different stakeholders on a broad scale. The updates were approved by the Forest Council in December 2018. Moreover, with a resolution on 21st February 2019, the Finnish Government confirmed the updated version of the National Forest Strategy (Matveinen *et al.,* 2019).

Vision

The Finnish National Forest Strategy is having a vision stating that:
"Sustainable forest management is a source of growing welfare".
This vision statement also highlights the importance of welfare derived from forest ecosystem resources. It also clarifies the concept that the forest provides solutions to many challenging problems and they provide sufficient resources to fulfil societal needs/demands. The Finnish National Forest Strategy also defines the measures and precedencies that will be required to develop the forest-based business strategies and activities, on which the state government will need to focus for the development of the forest sector (Ministry of Agriculture and forestry of Finland, 2019).

Objectives

Strategic goals are set by targeting the growing welfare as a central part and are viewed by three mutual and different complementary perspectives. Following are these three perspectives:

- For forest-based business, Finland provides a competitive and operating environment;
- Forest-based activities, businesses, and their structures are diversified and renewed;
- Forests are active economically, socially, ecologically, culturally, and sustainably for diverse use.

The Strategy primarily aims to increase competitiveness. The main competitiveness factors of the forest-based business and activities consist of: sustainability, availability of wood and competitive factors of production, the functioning of infrastructure, advanced technologies, and know-how of the productions in the sector (Ministry of Agriculture and Forestry of Finland, 2019).

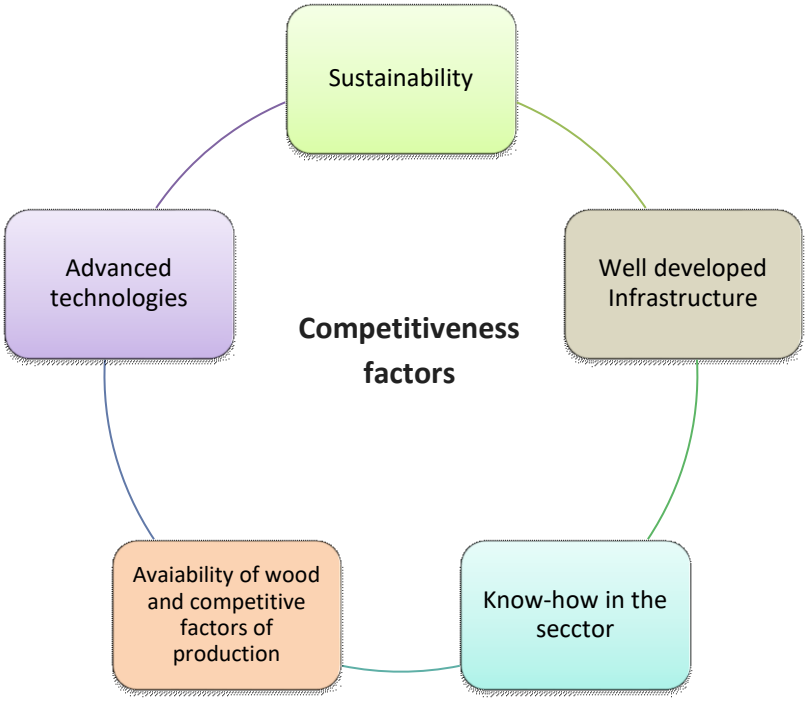

Figure 1: Main competitiveness factors of the forest-based business (Matveinen *et al.,* 2019)

An important point related to the goals is that they will require a predictive and sufficiently long-termed forest policy structure along with a sufficient number of resources to fulfil the needs of the measures.

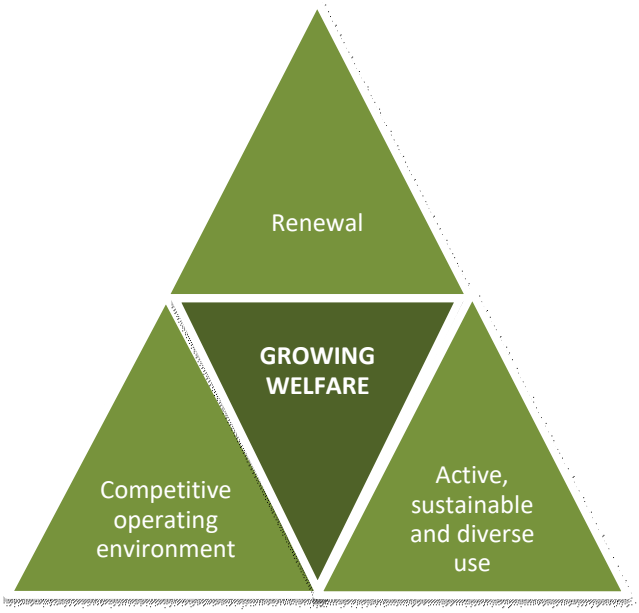

Figure 2: The Forest Strategy's vision and objectives form a triangle the center of which comprises growing welfare that the vision aspires for, while its corners represent the interlinked strategic objectives (Matveinen *et al.,* 2019)

Following are the brief explanation of the three main strategic objectives of the Finnish National Forest Strategy (Ministry of Agriculture and Forestry of Finland, 2019).

a) Increasing competitiveness;

To pursue competitiveness for forest-based businesses, the public sector should provide a functional competitive environment. Tailed policies must endorse entrepreneurship, innovations, resource efficiency, new jobs, and growth of the business, renewal of forest products, investments, and verification of sustainability. A correctly timed forest management assures a healthy forest by promoting timber production, biodiversity protection, and availability of raw materials. It also helps to protect the forest from natural hazards in the forest such as wildfire, insect invasions, and land sliding, etc. At the same time, a properly managed forest helps in carbon sequestration acting as a carbon sink.

Well-developed road infrastructures in forests along will well-established data connectivity also play a great role in promoting forest-based businesses. It also supports the recreational use of forests and prevents forest fires from widespread. Currently, Finland is a part of many international agreements and is working actively to accomplish the targeted objectives.

- **New products and services.**

With time the Finnish wood processing industry has flourished significantly especially during the last few years. With the new investments, it has also integrated with the chemical and energy industrial sectors. Demand for forest-based products and non-wood forest services such as tourism is also growing day by day. New wood-based products have also been produced for value addition. However, the traditional products that are produced by the forest industry are still significantly important.

New industrial service networks and products significantly increase resource efficiency and also support many medium and small-sized enterprises. This development potential of forest-based products and services should also be considered during the public decision-making process. The investments in the wood industry will also encourage wood-based energy production, which is usually produced as a by-product during the process. The active and wise use of forest resources will bring products such as wood chips that will be also used by the market to fulfil their energy requirements.

b) Know-how and good administration as the basis for renewal.

Information provided by the administration and by digital geographical information sources is one of the main competitiveness factors of the forest-based business industry. The growth of forest-based businesses and the knowledge/ awareness (know-how) requirements in this sector will require the development of the education system at all levels. Therefore, to ensure the maintenance of competitiveness at a certain level, it is also important that the research activities will emphasize societal participation.

It will also be an important thing to keep in consideration that there should be a link between training and education to increase know-how so that they cross the traditional boundaries. The well-being and competence of forest workers will be ensured. Forest sector administration will be more flexible in decision making and will be more open to diverse forest base business ideas and strategies. Novel geological information-based digital sources will help to ensure resource-efficient forest management, climate change mitigation, conservation of biodiversity, promotes natural products, and to encourage eco-tourism. Up-to-date and accurate information on forest-based natural resources will help to better investigate the progress of sustainable management.

c) Forests are used actively, sustainably, and diversely.

All different types of objectives will be expected to increase welfare by using all possible means of forest resources. An active, sustainable, and resource-efficient forest creates opportunities for the expansion of the forest bioeconomy. Since most of the Finnish forests are privately owned therefore it is important to encourage, support, and facilitate the forest owners and help them for managing their forest lands according to their own decisions. An increase in the efficiency of forest management requires new operating models for forest management, improved services for forest owners, and a better understanding of geographical information databases.

Moreover, active and flexible decision making will help to get more active participation of forest owners and forest companies. For the development of forest-based businesses, there is a need for an increase in forest growth. Therefore, to achieve that growth, it is important to genetically improve the regeneration stock, on-time thinning, forest management of peatlands, and a balanced nutrient forest soil. An effective forest-based business can be developed by adopting taxation schemes and improving the holding and ownership structure of forests. The incentive scheme of the forest must support all the forest policy objectives that are positioned in the National Forest Strategy.

- **Strengthening of biodiversity, water protection, and climate sustainability.**

Biodiversity conservation is one of the key components of sustainable forest management. With the increasing production of raw and commercial wood, this aim of safeguarding ecosystems and biodiversity conservation can be achieved. However, there is still a need to adopt advanced strategies/ practices for biodiversity conservation. Increasing the land for biodiversity protection or increasing the protected areas are not sufficient we also need to focus on the quality of these lands. According to the Paris agreement and European Union's 2030 climate and energy framework forests plays an important role in climate change mitigation whereas, on the other hand, they are also vulnerable to the natural disturbances that most of the time occurs as a result of climate change such as forest fires and wind-throw events, etc.

- **Cultural continuity of forests should not be interrupted.**

Sustainable forest use does not only mean ecological and economically sustainable, but it also involves the social sustainability of forests. Social sustainability can also relate to cultural

sustainability which means that there should be a cultural continuity of forests and forests should also be examined from their cultural importance. Valuing different relationships that are linked to forests is a step forward for setting tables for new and productive debates. All actors are important for the forest based-businesses are children or young because they are ultimately the sector's future decision-makers, employees, consumers, and forest owners. Getting out the most health benefits from the forests is also important to make it accessible for the people for this purpose good hiking trials network improves road infrastructure and availability of active communication can provide good opportunities for accessibility to the forests.

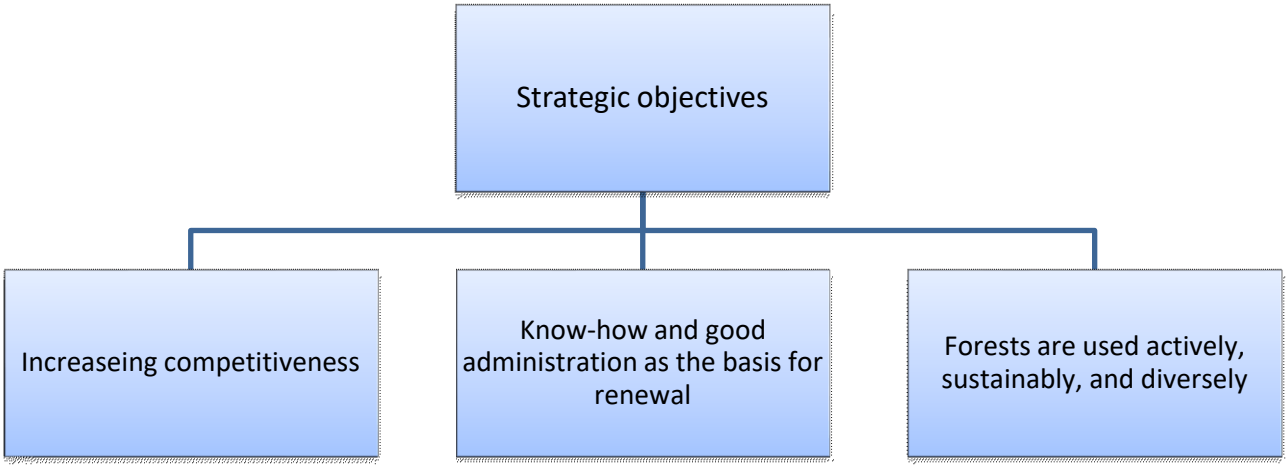

Figure 3: Three strategic objectives (Matveinen *et al.,* 2019)

Areas of Action

Depending on the problems identified in the forest sector regarding wood supply-chain, wood and non-wood product efficiency, climate crisis, integrated use of land, environmental and landscape quality urban forestry and participation of rural communities and the problems related to health and well-being. Following are the main areas of action or policy areas of Finland's National Forest Strategy (Rantala, 2019):

- Wood, wood fiber supply and demand
- Markets, value, and efficiency
- Climate change mitigation
- Integrated land use
- Skills and workforce
- Adaptation and resilience
- Natural assets, environmental quality, and biodiversity
- Sustaining thriving rural communities
- Health and well being
- Urban forestry

- Landscape quality and the historic environment

Financing

Financing the strategic projects of the National Forest Strategy will be decided annually as a part of the Central Government's budget allotment process. The European Union's project funding will also be applied for the implementation of the project. However, the implementation of the Strategy will be done by the financing, allocated by the central government budget spending limits. Ministry of Agriculture, Ministry of Environment, and Ministry of Finance are responsible for the financing (Ministry of Employment and the Economy, 2014). Financing needed for the implementation of the strategic projects of the National Forest Strategy for the following areas (Matveinen *et al.,* 2019):

- Stronger investments will be required for the effective promotion of forest-based businesses without compromising the growth and diversification of the sector. In Particular financial requirements highlight the resource-efficient forest management, climate sustainability, nature management in commercial forests.
- Financial investments will be required to promote eco-tourism and to maintain road infrastructure in forests to promote recreational activities.
- Investments for the platform economy and the promotion of digitalization
- Adequate resources must be needed for the implementation of a program like METSO for the conservation of biodiversity.
- Financing is required for the implementation of European and international guidelines, reporting, international collaboration/cooperation, and development activities.
- Allocation of resources also needs to be distributed among administrative branches of different ministries to attain the target objectives of the National Forest Strategy.

Monitoring and valuation

The National Forest Strategy will be monitored by the coordination of the Ministry of Agriculture and Forestry. Promoting the cooperation between public and private sectors in forestry issues, the National Forest council also supports the Ministry of Agriculture and Forestry. It also helps to promote and monitor the implementation process of the National Forest Strategy. In addition to the Forest council, other working groups will also work for the evaluation of the plan and to promote the implementation of the Strategy. To improve the monitoring process ministry of agriculture and forestry will also establish a group of international forest policy which will work as a subgroup under the Forest Council. The officials in the group will include members from organizations (i.e. international forest public servants working group), relevant ministries, research institutes, and stakeholders will be invited to join the group of board members of the monitoring committee. The monitoring phase of the strategic project portfolio may also depend on the European Union and the cooperation body for international resource policy. Moreover, the National Forest Strategy will also go through external provisional evaluations if required (Matveinen *et al.,* 2019).

Involvement of stakeholders

It was concluded that several ministries will actively participate in the implementation of the National Forest Strategy. The monitoring and implementation of the National Forest Strategy will be coordinated by the Ministry of Agriculture and Forestry. The Forest council, the forest council's working committee, and various participating groups and steering networks will support the ministry of Agriculture and Forestry in the implementation and monitoring of projects (Ministry of Agriculture and Forestry of Finland, 2019).

Implementation of the Strategy

Implementation of the National Forest Strategy must be done by the Ministry of Agriculture and forestry along with different ministries and several other working groups to accelerate the implementation process. However, to implement the National Forest Strategy and to increase its effectiveness some prioritized measures need to be done. For this purpose, a strategic project portfolio has been designed from the strategic measures of the National Forest Strategy (Table 3). These projects could also help in getting better preconditions and enhance the welfare obtained by forest-based businesses, safeguarding biodiversity and conserving ecological, economical, and socio-cultural sustainability. However, the proper implementation of these projects will require funding, social acceptability, political will, commitment, and cooperation among sectoral boundaries.

Along with the strategic project portfolio, there are also some other strategies and programs that are also working alongside to achieve the objectives of the National Forest Strategy. However, special attention must be paid to cooperate and coordinate compatibilities between the National Forest Strategy and various other strategies e.g., the National Biodiversity Program, and the Digital Infrastructure Strategy. There are also some other programs such as METSO (for safeguarding forest biodiversity and the preservation of habitats for endangered forest species are supported by the resolution adopted by the Government on extending the Forest Biodiversity Programme for Southern Finland for 2014–2025) and Rural Policy Program (it will contribute to the achievement of National Forest Strategy objectives in the context of infrastructures, planning, and zoning, promoting entrepreneurship and ecosystem services for 2014-2020). Frequent dialogues need to be done among all the actors and stakeholders that have a part in exploiting forest resources.

Table 3: Project Portfolio (Matveinen *et al.,* 2019)

PROJECT NAME	RESPONSIBILITIES	ACTORS INVOLVED	SDG NO.
FOREST DATA AND THE PLATFORM ECONOMY	Ministry of Agriculture, Ministry of the Environment, Ministry of Finance	Finnish Forest Centre, Natural Resources Institute Finland, National Land Survey of Finland, Finnish Environment Institute, Metsähallitus, Tapio Ltd, actors	9,15
INTERACTION AND COMMUNICATION IN FOREST-BASED BUSINESS AND ACTIVITIES	Ministry of Agriculture and Forestry, Ministry of Economic Affairs and Employment, Ministry of the Environment	Finnish Forest Association, Finnish Forest Centre, Natural Resources Institute Finland, Lusto – The Finnish Forest Museum, Finnish Wildlife Agency, schools and educational institutions, Ministry of Transport and Communications, Ministry of Education and Culture, actors	12,13,15,16, 17

RESOURCE-EFFICIENT AND SUSTAINABLE FOREST MANAGEMENT	Ministry of Agriculture and Forestry, Ministry of the Environment, Ministry of Justice	Natural Resources Institute Finland, Finnish Forest Centre, National Land Survey of Finland, Tapio Ltd, Finnish Wildlife Agency, Metsähallitus, actors	12,13,15
NATURE MANAGEMENT IN COMMERCIAL FORESTS AND FOREST BIODIVERSITY	Ministry of Agriculture and Forestry, Ministry of the Environment	Natural Resources Institute Finland, Finnish Environment Institute, Finnish Forest Centre, Tapio Ltd, Finnish Wildlife Agency, Metsähallitus, actors	12,13,15
CLIMATE SUSTAINABLE FORESTRY	Ministry of Agriculture and Forestry, Ministry of the Environment	Natural Resources Institute Finland, Finnish Environment Institute, Finnish Meteorological Institute, Tapio Ltd, Finnish Forest Centre, Metsähallitus, Finnish Wildlife Agency	12,13,15
FOREST ROADS AND THE ACCESSIBILITY OF FORESTS	Ministry of Transport and Communication, Ministry of Agriculture and Forestry, Ministry of the Environment	Finnish Forest Centre, Metsähallitus, municipalities, actors	9,11
NEW WOOD-BASED PRODUCTS	Ministry of Economic Affairs and Employment, Ministry of Agriculture and Forestry, Ministry of the Environment	Business Finland, the Academy of Finland, Natural Resources Institute Finland, VTT Technical Research Centre of Finland Ltd, Ministry of Transport and Communications, the sector's companies	8,9,12
NATURE TOURISM, NATURAL PRODUCTS SECTOR AND OTHER	Ministry of Agriculture and Forestry, Ministry of Economic Affairs and Employment, Ministry of the Environment	Metsähallitus, Finnish Forest Centre, Natural Resources Institute Finland, Ruralia Institute, Tapio Ltd, Finnish Wildlife Agency, companies, landowners	8,12
KNOW-HOW AND EDUCATION	Ministry of Education and Culture, Ministry of Agriculture and Forestry, Ministry of Economic Affairs and Employment	Finnish National Board of Education, education providers, Metsäkoulutus Työtehoseura, companies and organizations in the sector, Natural Resources Institute Finland, Finnish Forest Centre, Business Finland, Academy of Finland, Metsähallitus, Lusto – The Finnish Forest Museum, Tapio Ltd	4,9,16,17
INTERNATIONAL FOREST POLICY AND INFLUENCING EU POLICIES	Ministry of Agriculture and Forestry, Ministry for Foreign Affairs, Ministry of Economic Affairs and Employment, Ministry of the Environment,	Business Finland, Natural Resources Institute Finland, research institutes, organizations and companies, other countries, international organizations and processes	SDGs

National strategies belonging to other sectors must also work accordingly for the fulfilment of goals of the related strategies. For instance, Implementation of the Finnish Bioeconomy Strategy (for increasing capital funding and investments in the bio-economy, financing the piloting, demonstrations of new bio-economy solutions, and promoting renewal in forest-based businesses and activities) and the Finnish Energy and Climate Strategy are working with collaboration and having considerable links with Finnish National Forest Strategy. Concerning the aims of the National Forest Strategy the Climate and Energy Strategy also have goals that include actions for preventing forest loss, promoting afforestation, and use of biomass as biofuel to produce energy.

In a nutshell, there are two ways of implementing the strategies i.e., either in addition to the implementation of different other strategies implementing the National Forest Strategy or the

National forest Strategy should facilitate the execution/ implementation of the other strategies (Matveinen *et al.,* 2019).

Assessment of impacts

The assessment was carried out by the research officials of the Natural Resource Institute Finland (Luke). Although there are different estimates for the assessment process some are used for the assessment of the National forest Program such as separate impact assessments. As the National Forest Program differs from the National Forest Strategy in terms of targeted objectives therefore the National Resource Institute Finland carefully selected a built-in process assessment for the effective implementation and monitoring of the process. In addition to this, the process was supported to predict the impact of the updates done during the process related to the targeted objectives (that will remain unchanged during the update) of the National Forest Strategy. The impact assessment also focuses on the assessment of the project portfolio concerning the strategic objectives. Natural Resource Institute Finland has been supporting the National Forest Strategy 2025 in the update process in the following ways (Matveinen *et al.,* 2019):

- Conducting the environmental analysis
- Promotion of sustainable wood production
- Organizing workshop for the working committee of forest council for the assessment of the projects
- Presenting estimates to the forest council on the impact of the project portfolio

Significance and impacts of National Forest Strategy

The National Forest Strategy aims to improve the welfare derived from the forest resources and to enhance the Finnish bioeconomy by ecologically, economically, and socially sustainable utilization of forest resources. The progress of the National Forest Strategy can be assessed by estimating the quantitative and qualitative indicators. However, the overall assessment of the project portfolio is not possible due to unknown monetary values and implementation costs. It shows that the whole cost efficiency of the projects cannot be measured easily. Although, there are some assessment indicators available that are very sensitive to the international market of forest products (Matveinen *et al.,* 2019).

Following are the descriptions of economic, social, and ecological impacts of the National Forest Strategy (Matveinen *et al.,* 2019):

Economic impacts

The Finnish forest lands and business activities have experienced a structural change for the last 15 years. The focus of wood biomass usage has been changed from printing writing papers (due to digitization of communication) to the packing, pulp, and biofuels for which Finland has increased production capacity due to the investments made in recent years. Similarly, new investments for the use of pulpwood consumption are in the planning phase waiting for a final decision on the budget allotment. Decisions on investments require confirmation of the sufficient and continuous supply of the raw materials from the forest with the monetary value decided by the production technology and the world markets.

Decent economic status, which has been maintained its position from past years, has also increased the revenue for forest-based business activities. It was predominantly based on increased production of cardboard and pulp volumes. In addition to this the use of solid wood fuels has also increased in heating and for power generation in power plants. According to the 12th National Forest Inventory of Finland, the yearly growth of Finnish forests is 107 million cubic meters. This increased growth is due to effective forest management with sustainable timber production, which was taken place in Finland for the last few decades.

Social impacts

The growing demand for forest-based products and the increase in the timber production industry have a significant impact on the forest sector for employment opportunities. It has also been estimated that with the improvement in the work along with harvesting and transportations activities and with the improved forest management, the forest industry will experience a much slower decline in the working force. Increasing other forms of forest-based businesses and ecotourism will also offer numerous job opportunities. Education and competence are essential for inducing the structural change in the forest sector for increasing employment. New job opportunities will be expected to be offered in Northern and Eastern Finland.

With the increasing urbanization, people are more linked with busy urban life especially young people and they are getting disconnected from the natural forests. This kind of behaviour shows the consumer preferences, their attitudes towards nature and hence it impacts the operating practices. Studies show that eco-tourism and the use of forests for recreational practices induce healthy effects on our health. As urbanization is more centered in Southern Finland therefore it is important to maintain a healthy relationship of citizens with the forest. For this purpose, nature tourism has seen to have an increase in the number of visitors to the national parks along with an improvement in customer satisfaction. This shows that with the diverse means of recreation and modern infrastructure and digital communication techniques (Wirén, *et al.,* 2019) it will be possible to create forest awareness among citizens and it will improve citizen relationship with forests which is also one of the goals of National Forest Strategy.

Ecological impacts

Forest ecosystems are significantly important for the preservation of biodiversity. Forest soils and wood biomass are also important for carbon sequestration. Therefore, forest management practices should take into account biodiversity hotspots while developing management plans. Data from recent studies show that the rate of species becoming threatened in Finland is now slowed down as compared to the past years but yet it is not stopped completely. More detailed information on this will be available very soon once the fifth assessment results of the threatened species in Finland will come out. However, the recent inventory results revealed that the amount of deadwood has increased in Southern Finland.

The METSO program has received an investment of over 300 million euros for the implementation procedures (with environmental subsidies and nature management by) Ministry of Agriculture and Forestry and (nature protection procurements from) Ministry of environment. However, there is still a need for forest management in a way to restore biodiversity, preserve natural habitats of flora and fauna, and to protect the forest resilience. According to this objective, the updated version of the Finnish National Forest Strategy 2025 has a link with the National Strategy for the conservation sustainable use of biodiversity in Finland.

Along with biodiversity Finnish forests are also significantly important for the carbon sinks. Wood from these forests can be used as fossil fuels and raw material for many forest-based products. Therefore, from the perspective of climate change mitigation, it is important to increase the lifecycle of the products for the long term carbon storage in them. For this purpose, structural changes in the product portfolio will need new products and services along with the behavioural change on the consumer side, which can be achieved by effective communication strategies and techniques.

4.3 Scotland's National Forest Strategy 2019-2029

Since, last two decades of the 20th century, working relations among different actors (such as government, environment and forestry sector, and community groups) have become strong enough that they collectively feel the need to adopt and promote international principles of sustainable forestry. These are those principles on which modern forest legislations and forest policies are based in Scotland. Promoting the sustainable management practices in forests second ministerial conference was held in 1993 for the protection of European forests. In that conference the sustainable management in the forest sector was defined as:

"The stewardship and use of forest lands that maintains biodiversity, productivity, regeneration capacity, vitality and 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".

The Scottish government and all other governments in the UK have accepted this definition and it has also supported the use of woodlands and forests through proper legislation, brought together under the UKFS (UK Forest Standards). The UKFS is a benchmark for sustainable forest management practices that are accepted by all the UK administrations. It is also reviewed by the input to stakeholders and actors every five years. The UK forest standards also provide a regulatory set of requirements for getting forest management plans and felling licenses. The Scottish government is committed to using the UK forest standards to ensure the implementation of international conventions and agreements and to help the forest sector with the balanced forest management plans related to woodlands and forests.

The National Forest Strategy of Scotland has been prepared in line with the forestry and land management activities. It shows an overview of modern Scottish Forestry with the vision of 10-

years of the framework for action. This Nation Forest Strategy is the main source of achieving sustainable forest management in Scotland (Reid, 2018).

The National Forest Strategy portrays forestry as an art and science of managing forests and woods. It also gives the core importance to the forest policy, for supporting the aims of NFP (the National Performance Framework) to assess the economic sustainability (McDonald and Richmond, 2019) and to promote the vision and main aims or principles of the Land-use Strategy.

Vision

In the last century, the forest cover in Scotland has increased from 5% to 18% in 2018. This valuable increase in forest land cover requires careful management plans to keep the flow of forest resources available for future generations. Since the productive life of trees in Scotland ranges from 30 to 150 years, it is important to consider a long-term strategic approach for forest management. Therefore, the Nation Forest Strategy of Scotland has a long term vision of steering practical approaches to deliver maximum benefits utilizing Scottish woodlands and forests and sharing national capital. Scotland's National Forest Strategy shares a vision of 50 years:

"In 2070, Scotland will have more forests and woodlands, sustainably managed and better integrated with other land uses. These will provide more resilient and adaptable resources, with the great natural capital value that will support a strong economy, a stable environment, and healthy and flourishing communities" (Reid, 2018).

Objectives

Keeping in view the 50-year vision of Forest Strategy, three main objectives were selected to deliver the desirable outcomes at least over the next decade. Following are the three objectives that are selected for the period of the next 10-years:

- Increase the share of Scottish woodlands and forests in the sustainable economic growth of Scotland
- Improve the Scottish forest resilience in to ensure their contribution as a high quality and healthy environment
- Enhance the utilization of forest resources to increase the welfare of people and to enhance their quality of life.

However, to achieve the positive and effective outcomes of these objectives forest policies will need to be developed as an important component of an integrated approach and need proper implementation (Reid, 2018).

Areas of action

After identifying the key strategic drivers for change in Scotland, the National Forest Strategy has recognized six priority areas that need to be a focus for the next 10 years. These priority areas for action cover all types of forests from local to national level. Considering the principles of integrated forest management, each priority area is focused to deal with more than one strategic forest driver. Following are the six priority areas that are focused in the National Forest Strategy of Scotland (Reid, 2018):

- Ensuring the sustainable management of woods and forests
- Increasing the area of forest cover and woodland by considering diverse land-use related objectives
- Improving productivity and refining the efficiency of developing markets
- Increasing the resilience and adaptability of woods and forests
- Improving the environmental welfare and benefits offered by woods and forests
- Increasing participation by local communities, people and businesses in the utilization of forest resources and forest management

Financing

The National Forest Strategy is getting financial support from the Scottish government for different project funding. The grant-aid is provided through the Strategic Timber Transport Fund and Forestry Grant Scheme. The Scottish forest department is also committed to work more closely with the associate partners to secure more fundings and investments (Reid, 2018).

Monitoring and valuation

To ensure the monitoring and appropriate surveillance of Scottish forests, Scottish government bodies will require collaboration with the government of the United Kingdom. This will support the planning decisions on the protection, expansion, and sustainable management of forest resources. This support will also provide working space with the international research institutes (e.g. the James Hutton Institute, University of Edinburgh, and the University of Highlands and Islands).

The Scottish government is determined to collaborate and invest in the forest research area with the UK government and devolved administrations to get enhance understanding in areas like forest resilience, wood properties, plant pathology, and plant breeding.

It is also important to understand the significance of relevant information, guidance, and technical advice and to communicate it to the relevant forest managers and landowners (Reid, 2018).

Involvement of stakeholders

Working with potential stakeholders is important for the successful implementation of the National Forest Strategy. In this regard, Scottish ministries offer leadership opportunities through their responsible planning of national forest management. The Scottish Government collaborates with UK administrations to work on cross-border issues such as forest health and with different institutes in the UK to work on different forest research projects. The Scottish government is also responsible to provide funding for the implementation of the National Forest Strategy (Reid, 2018).

Strategic drivers

Achievement of the desired outcomes of the objectives and vision of the Nation Forest Strategy may be influenced by various factors these factors are also called strategic drivers. Following are the description of key strategic drivers of the National Forest Strategy (Reid, 2018).

i. Wood and wood-fiber demand and supply

The main wood-fiber in Scotland is the softwood which is obtained from the fast-growing conifer species. A major portion of this soft-wood is being harvested by private forests. Recent forecast studies for the year 2030-2050 predict that due to urbanization, industrial development, and less productive planting there will be a significant decline in the availability of softwood in Scotland. Therefore, to secure economic development it is important to address this issue on time with effective measures.

ii. Climate change mitigation

Since climate change is one of the major global issues. Therefore, the Scottish government is also committed to play its role in global mitigation of climate change under the directions of the Paris agreement. It is estimated that in Scotland the woodland areas will increase from 10,000 ha to 15,000 ha/year. It is expected that with each new hectare of woodland there will be a removal of an average of seven tonnes of carbon dioxide from the atmosphere. It shows the importance of forests for the emission of greenhouse gases.

iii. Market, value, and efficiency

Modern technology and new techniques are providing new ways of research in the field of forestry. New bio-products are expanding the product portfolio (such as cellulosic plastic from bio-refineries) these products are also helping to increase the efficiency of wood fiber from Scottish woodlands. These advancements are enhancing the potential to increase the overall efficiency of the supply chain.

iv. Adaptation and resilience

According to a 50-years prediction, it is likely to find the increasing tree growth rate trend in the Scottish forests due to longer spans of hot summers and shorter spans of low winter temperatures. But at the same time, there is also a threat of wildfires along with pest and herbivores attacks. Increasing global activities of trade and travel are also making this threat more obvious. To combat the challenge of herbivory, attack the National Forest Strategy of Scotland also supports the implementation of WDNA (Wild Deer National Approach) for the protection of trees. Protection of trees from pest attack and making them more resilient also comes under sustainable forest management.

v. Integrated land-use

Forest management without taking into consideration the surrounding or neighboring land uses was a matter of conflict in past days. At some places, tension has been created due to a lack of knowledge and understanding of the benefits of integrated land use. Therefore, the Scottish Landuse Strategy has provided a proper framework to properly address this issue by supporting integrated land use management and to get maximum revenues from the land.

vi. Skills and workforce

The Forest sector is growing day by day including small, medium, and large-scale businesses. Therefore, to meet the future requirements of an advanced skilled workforce it is important to

address this issue. It is also important to train the existing workforce with new skills and attract diverse young talent with appropriate qualifications and skills.

vii. Natural assets, environmental quality and biodiversity

The Scottish government is determined to play its part in protecting, valuing, and enhancing the stocks of natural forests. Scottish woodland and forests are of significant importance and are home to many wildlife species. These forests are also important to support different management plans and strategies (such as Biodiversity Strategy, Scottish Soil Framework, and River Basin Management Planning).

viii. Sustaining thriving rural communities

Due to a lack of employment opportunities and facilities, rural communities of Scotland are facing problems of depopulation. In these situations, Scotland's woodlands and forests can play an important role for rural communities by creating new job opportunities, new and affordable housing schemes, and by providing enough revenue generation sources from recreation activities and nature tourism.

ix. Landscape quality and the historic environment

Scotland's forests are internationally recognized for their aesthetic beauty. Many of the country's natural landscapes are the favorite hot spots of tourist attraction. They also have some cultural and historic landscapes and few of them are of great importance about the historic monuments. However, in the future, it is required to ensure the positive expansion of these woodlands, not only to restore these landscapes but also to conserve the historic features and monuments.

x. Health and wellbeing

Community wellbeing is one of the key elements of the Scottish Government's priority areas. Various studies show the positive relationship between green spaces that include trees and public health. Forestlands also provide opportunities for recreation and outdoor activities. Forest managers can also provide these opportunities by the careful management of the existing forests and designing new forest areas.

xi. Urban forestry

Almost 2/3 of the Scottish population is urbanized. People living in urban areas need to recognize the fact that urban forests and woodlands also have significant importance in managing a healthy ecosystem. Urban forestry offers an opportunity to get benefit from accessible forest spaces which not also provide numerous health benefits but also provide a place for recreation. Urban forests also help to improve air quality by reducing levels of air pollution. The Central Scotland Green Network and NPF (National Planning Framework) demonstrates that well managed urban forestry also helps to reduce the effects of urban development, reducing intense effects of rainfall and flooding.

Implementation

The Nation Forest Strategy will have to be in line with the other strategies and plans of the Scottish Government. The Scottish Government will support the implementation process of the Strategy. The Scottish forest sector will take lead for the coordination, monitoring, delivery, and reporting. Within a year of presenting this National Forest Strategy to the Scottish Parliament, the Scottish Government will be required to publish a framework of implementation, monitoring, and reporting. The framework will take account of:

- Core delivery milestones
- Set of indicators to monitor the progress of strategic goals and objectives
- A reporting schedule including the publication dates of the statutory required three-yearly progress reports

The establishment of a national stakeholder group is required to support and give advice for the implementation of the National Forest Strategy (Reid, 2018).

Review

It is the responsibility of the Scottish ministries to review the Strategy and keep it revised within the assigned duration of nine years of its publication. In case if they have not reviewed it then they must have to do so. It also requires adding a review of the Strategy under the planned reporting process of the National Forest Strategy (Reid, 2018).

4.4 Greek National Forest Strategy 2018-2038

An extensive study has been conducted to support the accounting process of natural capital and MAES (Mapping and Assessment of Ecosystem and their Services) implementation process for Greece, at the national level. It also revealed that the indicators can also provide the baseline for ecosystem assessment, using ecosystem extent data with the combination of biodiversity datasets. It also guides conservation strategy for decision making under the European Union and national environmental policies (Kotsiras, 2020). During a workshop at Greece National Forest Governance Council, a survey analysis was conducted for SWOT (strength, weaknesses, opportunities, and threats) analysis of SFM (sustainable forest management) assessment and evaluation in Greece. SWOT analysis also provides a framework for performing SFM assessment and for the analysis of strategic planning of the Greek forests (Kazana, 2015).

National Forest Program generally covers the formulation of plans and its implementation for SFM (sustainable forest management) in different countries at sub-national and national levels. However, the Greek National Forest Strategy is not a National Forest Program; rather it is a “forest statement” with a set of goals and targets. It also aimed at resolving forest issues within a wide frame of principles and goals. It also supports the multi-functionality of the Greek forests. Greek National Forest Strategy also represents a shift from forest practices aiming at economic welfare to forest practices aiming at meeting sustainable environment goals and meeting the needs of local communities (Papageorgiou, 2004).

Vision

Greek forests are the Mediterranean in nature. They also comprise of 25% of the total land area of the country (Avtzis, 2001). The Greek National Forest Strategy has adopted the model of Mediterranean forestry with the following vision (Kourakli, 2018):

"To develop and adopt the Mediterranean forestry standard".
and
"To ensure sustainability and to increase the forest contribution to the national economy through multi-functionality, adaptability, socio-economic role enhancement and taking into consideration climate change".

Objectives
The main aim of the National Forest Strategy is to adopt the Mediterranean Forestry Model for the management of Greek forest ecosystems. It is also looking forward to incorporating the local knowledge for making forest management plans. This adaption of the Mediterranean Forestry Model will help to ensure flexibility and to enhance the multi-functionality of the forest ecosystems in future. By adapting the Mediterranean Forestry Model, the National Forest Strategy is also aiming to preserve the variety of land uses by incorporating knowledge from local communities in the management plans and techniques. Along with this, the National Forest Strategy is also aiming to increase the economic prosperity, conservation of biodiversity and genetic resources and prevention of forest ecosystems from biotic (insect attack, diseases) and abiotic (climate change, forest fires) natural hazards (Food and Agriculture Organization, 2018).

Areas of action
Greece also needs actions in certain areas of forestry to ensure sustainable development goals and sustainable management of the Greek forests. Following are the indicative priority areas of the Greek National Forest Strategy (Kourakli, 2018):

- Re-establishment of the regional and central forest services for the optimization of sustainable forest management;
- Development of road maps at a local, regional, and national level for preventing the risk of forest and improving fire management plans;
- Considering the sustainability of forest products and forest ecosystem services, systematic management of the forest ecosystems should be done to prevent forest wildfires;
- Development of a new flexible and permanent mechanism for the monitoring and evaluation of the national forest inventory;
- Acknowledgment of forest contribution and improvement of forest value for the growth of bio-economy;
- Designing forest management plans for the mitigation of climate change;
- Improvement of ecosystem services by conserving and restoring forest ecosystem;
- Improving coherence and networking between non-governmental and institutional stakeholders for better forest governance;
- Coherence of National Forest Strategy and national forest policy with European and

International polices, their targeted objectives and commitments.

Financing

Financial resources are the means of implementation to achieve the objectives of the National Forest Strategy. Various stakeholders are involved in offering financial support to the Greek National Forest Strategy such as: "GREEN FUND" by special forest authority and by the Ministry of Economy and Development. Fundings are also provided by the Interior Ministry and by "European structural and investment funds". Regional, local, and central forest services are also obliged to report the annual budget detail.

Monitoring and valuation

The duration of the Nation Forest Strategy is from 2018-2038 (20 years). Before the conduction of the final evaluation and review in 2037, some intermediation evaluations are expected to be done after 10 years (in 2028). Additionally, after every five years (2023-2033) midterm evaluations are expected to be done for partial review (Food and Agriculture Organization, 2018).

Involvement of stakeholders

In Greece the Greek National Forest Strategy (NFS) has been legislated with Ministerial Decision No. 170195/758 of 28 November 2018. The prior leadership of the Ministry of Environment, Energy and Climate Change in Greece has also set an ambitious goal on the occasion of the announcement of National Forest Strategy, to improve the forest contribution in the overall country's GDP by 1% which was previously 0.05% (Tsiaras *et al.,* 2020).

Horizontal axis of the National Forest Strategy

Following are the three horizontal or cross-cutting axis of the Greek National Forest Strategy (Food and Agriculture Organization, 2018).

a) Forestry governance

The overall main objective of this theme is to have good governance in the forest sector. According to UNECE (United Nations Economic Commission for Europe), there are five key principles of good governance such as: participation, citizen respect, transparency, accountability, and justice.

i. **General goals**

Following are the four general goals of good governance:

- Optimizing the sustainable management of the ES (ecosystem services) by reconstruction of forest service
- Enhance public participation in decision making
- Increase collaboration and networking of institutional and non-institutional bodies to simplify procedures and enhance efficiency
- Enhancing digital technologies by using modern tools for monitoring of forest ecosystem

ii. Directions for action

- Improving open public participation at local, regional, and national levels between non-institutional and institutional bodies and development of collaboration between forest service and other structures of the civil society and state.
- Institutionalization and review of the policy structures of the regional and central forest services
- Meeting new demands of forest legislation and forest management based on overall objectives of the National Accountability Plan (NAP)
- Efficiency improvement of forest services by conducting special trainings of existing staff
- Interconnecting all forest ecosystems related and protected areas related plans for advance management of forest ES within the framework of sustainability principles.
- Formation of geospatial web portals and monitoring databases and improving accessibility for the local community.

iii. **Monitoring indicators**

- Evaluation of the efficiency of new modern technologies
- Number of new cooperation networks of different bodies
- Recruitment of administrative, technical and scientific research staff
- Recruitment of staff for the management of forest services
- Utilization of existing staff for special skills and training
- Implementation and institutionalization of different cooperation procedures with various structures
- Formation of new geospatial web portals and databases
- Formation of new forest plans based on forest ecosystem management and total forest ecosystems
- Elimination of duplicate responsibilities from the forest services

b) Inventory Monitoring

The methods of forest inventory vary from country to country. However, in all cases, inventory monitoring depends on field sampling and remote sensing. These inventories provide information about timber volume production, biodiversity, and overall forest health. The result of ecosystem services assessment can be used to meet national and international obligations, to support economic decisions, political decisions, and scientific innovations.

i. General goals

Formation of flexible and permanent mechanisms for the monitoring of national forest inventory will:

- based on central forest service and it will require implementation in direct cooperation with regional authorities
- cooperate with other bodies dealing with inventories and monitoring
- contribute to the formation of national and advanced databases compatible with the international standards

ii. Directions for action

- Defining outline for inventory and monitoring of forest ecosystem, defining roles of stakeholders
- Improving inventory and legal monitoring tools for the institutional shielding of forest ecosystems
- Development of national network for the monitoring of sampling areas of forest ecosystems
- Development of accessible forest databases for transparency in monitoring procedures
- Forest inventory and monitoring should be done according to the guidelines provides by international conventions and current legislations.

iii. Monitoring indicators

- Application of inventory within first 5 years
- Formulation of open database and keeping it updated
- Ratio of regular and extraordinary reports per decade should be monitored
- Monitoring of reports after every five years
- Estimating every ten years the total number of variables measured with those proposed in the NAP
- Estimating every ten years the total number of variables used to meet the country's international agreements
- Estimating the percentage of approved forest maps in the first five years
- Estimating the total forest development percentage within forest maps
- Comparing the number of forest ecosystems with management studies in implementation stage with the forest ecosystems without management study

c) Research Innovation

Development in forest management techniques, innovation in forest research, and training of forest workers and other actors must be linked with climate change, societal demands, economic growth, and biodiversity conservation.

i. General goals

- Strengthening forest research to support Greek Forestry and to meet national and international requirements
- Promoting innovation in forest products, services, and management
- Continuous information, education, and training of forest workers and integrating research into forest management practices.

ii. Directions for action

- Creation and formulation of an open structure for the collection and proper utilization of research results
- Conducting two-way communication between institutional and non-institutional bodies for research and innovation.

- Better utilization of University forests and other national forests, with special priority given to those that come under Natura 2000 Network to enhance innovation and other forest management practices.

iii. Monitoring indicators

- Formulation and operation of research along with innovation in training structure
- Systematic training of forest staff for research and innovation
- Distribution of publications in media related to forest research and information services among general public and relevant bodies
- Utilization of innovative products and legalization of open licenses and patents
- No. of forest researchers per institution
- Areas of application of innovative management
- Number of publications per institution and per thematic axis of the National Accountability Plan
- No. of research projects to which regional forest service contribute

Vertical axis of the National Forest Strategy

Following are the four vertical or thematic axis of the National Forest Strategy (Food and Agriculture Organization, 2018).

a) Forest economy

Forest ecosystems are essential for the economic development of a country. In Greece the economic importance of the forest ecosystem is undervalued. Due to this reason, timber production is one of the main sources of income from the forest ecosystem in Greece. Forest biomass utilization for the production of energy from renewable resources also plays a significant role in the context of sustainable consumption of forest resources. Apart from the wood-products forest ecosystem also offers a wide range of non-wood products such as honey, resins, mushrooms, and a wide range of aromatic and medicinal plants. They also provide ecosystem services such as biodiversity conservation, protection of soil from soil erosion, recreational points, and regulation of weather patterns.

i. General goals

- Increasing the role forest sector in economic growth and GDP of the country
- Promotion, identification, monitoring and evaluation of those ecosystem services that contribute directly to the national GDP
- Improving methods of recording forest ecosystem services and forest products, considering the socio-economic role of forest ecosystems
- Improving the value and contribution of forest resources to the circular and bioeconomy

ii. Directions for action

- Formation of a modern institutional system for the integration of eco-friendly and profitable processes

- Remodeling of timber production system based on long-term production planning, and production of different products depending on market demands
- Sustainable use of forest biomass for energy production
- Certification of timber and non-timber products and sustainable management of the forest
- Conservation of good quality forest through afforestation and reforestation methods to combat all kind of natural disasters
- Promoting entrepreneurship in the forest sector in the light of principles of sustainable forest management

iii. Monitoring indicators

All indicators require annual monitoring.

- Contribution of the forest sector to promote national GDP
- Number of institutional interventions
- Amount of wood products manufactured per category
- Number of non-wood forest products produced per species
- Amount of biomass energy produced per product category
- Number of certified forest products
- Number of certified reproductive-planting material
- Estimate of annual increase in wood-producing forests
- Extent of afforestation and reforestation, utilized and restored forest ecosystems

b) Climate change

Due to the increase in greenhouse gasses, global warming is increasing as a result of this global climate is changing drastically. Climate change is affecting the distribution of weather patterns and threatening the stability of forest ecosystems. Climate change is also expected to create major destruction on the Mediterranean forests, resulting, and an increase of 2-4°C in temperature by the year 2100. However, in Greece, the expected increase in temperature is 3-4.5°C. Moreover, in Greece, the effects of climate change are already visible by the increasing trend of forest fires each year, the increase in insect infestations, and pieces of evidence from tree necrosis in the forest borders. It has been noticed that forests can help in the mitigation of climate change due to their large capacity of storing carbon-dioxide gas (CO_2) from the atmosphere. Paris agreement also shows the commitment to mitigate GHGs by the second half of this century using forest ecosystems. Therefore, environmental and natural disaster management policies should cooperate to prevent the effects of climate change.

i. General goals

- Assessment of forest vulnerability in response to climate change
- Management of forest ecosystems to combat climate change
- Contribute to the climate change mitigation and adaptation by increasing carbon storage and sequestration in forest ecosystems

ii. Directions for action

- Assessment of forest ecosystem vulnerability plans to combat climate change
- Implementation of appropriate measures and policies for land-use sector and forestry aiming towards mitigation and adaptation of climate change
- Preservation of forest area to reduce population fragmentation and to improve conservation of biodiversity
- Restoring the genetic diversity in forest ecosystem by promoting afforestation in rural areas
- Evaluation and selection of genetic material that is more resistant to climate change
- Reduction of carbon footprint by increasing carbon stocks and using sustainable forest management techniques

iii. Monitoring indicators

- Assessment of climate change projections, vulnerability and risk assessment for different forest ecosystems
- Amount of carbon sequestration in forest ecosystems.
- Impact of climate change on forest ecosystems
- Assessment of previous and future carbon emissions and absorption from the atmosphere by implementing environmental policies
- Alteration of land fragmentation in forest ecosystem
- Number of new measures related to land-use and forestry sector

c) Forest Ecosystem Protection and ES optimization

Protection of forest ecosystem is an important part of the optimization of forest ES (ecosystem services) and forest management. In this regard, the implementation of legislation concerning the protection of forest ecosystem services and products is important. Therefore, ecosystem services need to be included in the state obligations to ensure the preservation of the natural beauty of forest ecosystems.

i. General goals

- Forest ecosystem management with the view of conservation of biodiversity
- Improvement, maintenance and restoration of ecosystem services

ii. Directions for action

- Establishment of a coordination office for the implementation, protection, and improvement of forest ecosystem services
- Development of early detection mechanisms to avoid biotic and abiotic risk factors
- Development of suitable plans or policies and their promotion through transparent approaches
- Prevention and reduction of the risk of forest fires in forest ecosystems
- Implementation of proper management techniques to ensure the conservation of biodiversity according to the international conventions

iii. Monitoring indicators

- Development of fire protection plans and formation of technical specifications for the forest ecosystem
- Annual reports on natural and man-made disasters
- Annual reports on preventive measures from the protection offices of local forest services
- Annual publications for the protection of forest ecosystems
- Recording of violations by using electronic indexing and incident books by using yearly reports of regional forest services
- Formulating and maintaining a relevant database
- Number of days that are used to create education and awareness among local communities

d) International and European Policies

The importance of forest ecosystem services in international environmental policies has gained much importance in recent years. The main reason to contribute to the environmental policies is the contributions of forest ecosystem services for the mitigation of climate change. As a participating country of the United Nations and a member of the EU member state, Greece is also actively participating in the policy procedures at regional, national, and international levels. Greece has also the potential to play a leading role in implementing policies to deal with emerging environmental problems.

i. General goals

- Relevance of national forest policies, commitments, and objectives of the forest ecosystems at regional, European, and international level
- Strengthening of Greek international forest policy initiatives and interventions regarding forest ecosystems and with special emphasis on the Mediterranean region.

ii. Directions for action

- Monitoring and analysis of possible similarities between the National Forest Strategy and related international forest policies
- Distribution of information to all stakeholders for better recording of the information
- Identifying needs and strengthening cooperation with the European Union to address common environmental problems more effectively
- Strengthening cooperation with other Mediterranean countries to adopt those common practices that will show an impact on the European Union policies
- Strengthening the national participation and its role in international collaboration of policies for the sustainable management of forest resources

iii. Monitoring indicators

- Formulation of web portal concerning European and international dimensions of forest ecosystems
- The total number of yearly publications, reports and participation in communication networks

- Yearly report with the duration of five years, based on the national performance in the international space
- Estimation of total training institutes and training seminars of European bodies with relevant duties
- The total number of postgraduate programs focusing on international mechanisms and related forest policies.

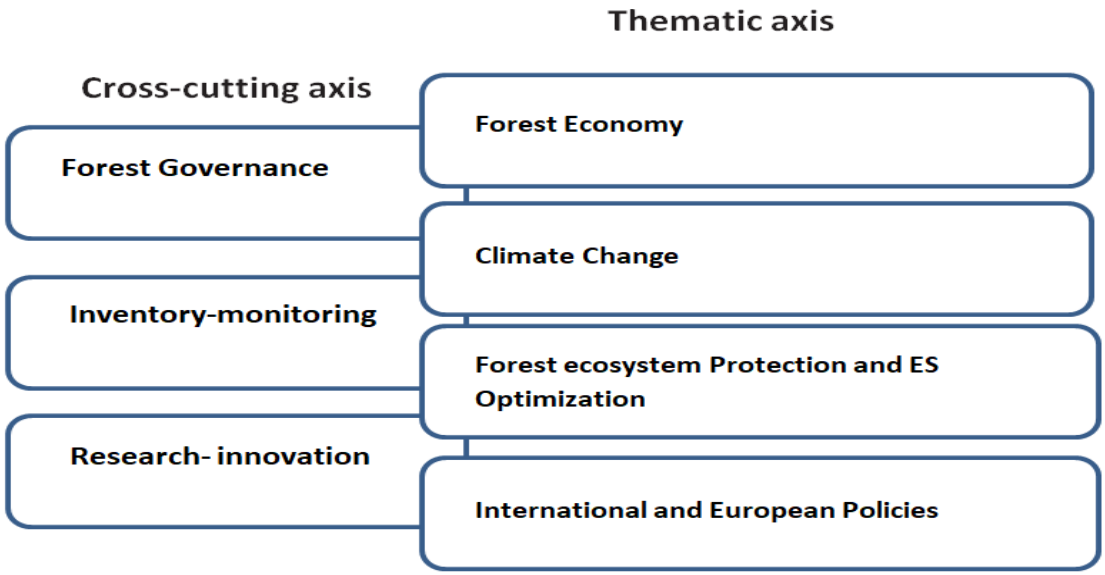

Figure 4: Horizontal crosscutting and vertical thematic axis (FAO, 2018)

Implementation

Implementation is an important step to ensure the practicability of the National Forest Strategy. Therefore, the Greek national Forest Action Plan supports the implementation of the National Forest Strategy.

Review

All review procedures are associated with public consultation procedures with the participation of potential actors and society.

5. Discussion

Following are the results of the comparison among the contents of the four National Strategies previously described.

Vision

The vision is set by considering the main problem and future goals of the forest sector. The vision of the German Forest Strategy emphasizes more the sustainability of ecologically stable and diverse forests considering mainly the forest instability due to climate crisis, monoculture silvicultural practices and anthropogenic activities in the form of over exploitation of forest

resources and recreational activities (Ainger, 2011). The Finnish forest sector is going through a transformation phase. According to which the entire forest management will have more diverse needs, which will ultimately have the potential to increase the benefits gained from the forest ecosystem. Therefore, the vision of the Finnish Forest Strategy states a sustainable forest management as a source of growing welfare (Matveinen *et al.,* 2019), while the considering the long-term productive life span of forest trees in Scotland, the Scottish Forest Strategy shares a long-term vision of 50-years stating that Scotland will have more sustainable forests with improved integration with other land uses (Reid, 2018). For strengthening the multifunctional role and to ensure the increased level of flexibility of the forest ecosystems; the Greek National Forest Strategy have a vision stating that the Greek forestry should adopt the model of Mediterranean forestry to ensure the sustainability of forest ecosystems by contributing to the national economy and adapting to the changing climatic conditions (Kourakli, 2018).

Objectives:

In accordance with the vision of the German National Forest Strategy and based on the undergoing challenges in the German forest sector the main targeted objectives of the German National Forest Strategy are set to achieve well-balanced, stable, and resilient forests with ecological and socio-economical forest sustainability, and to ensure the harmonization of the Forest Strategy with other National Strategies (Ainger, 2011).

Keeping in view, the transformation dynamic of the Finnish forestry and vision of the Finnish National Forest Strategy; the Finnish National Forest Strategy has set three strategic objectives, among them the first and most important objective of the Finnish Forest Strategy is to increase the competitiveness of the forests the second strategic objective is to have know-how and good administration as the basis for renewal and the third strategic objective is that forests are used actively, sustainably and diversely (Matveinen *et al.,* 2019).

Considering the long and productive lifespans of Scottish forest tree species, on behalf of the needs of future generations and in accordance to a 50-years long vision of the Scottish National Forest Strategy, three main objectives are expected to get accomplished in the next ten years. These objectives include the increased share of Scottish woodlands in the sustainable economic development of Scotland, improved forest resilience to ensure the forest quality, and improved utilization of forest resources for the welfare of the people and to improve the quality of life (Reid, 2018).

Greek National Forest Strategy is mainly aiming to adopt the Mediterranean Forestry Model for the management of Greek forest ecosystems for increasing the flexibility of the forest and to enhance the multi-functional role of the forest sector. It is looking forward to incorporating the local knowledge for making forest management plans. Along with this, the National Forest Strategy is also aiming to increase the economic prosperity, conservation of biodiversity and genetic resources and prevention of forest ecosystems from biotic (insect attack, diseases) and abiotic (climate change, forest fires) natural hazards (FAO, 2018). Unlike the other three National Forest Strategies, the Greek National Forest Strategy defines additionally the horizontal also known as a cross-cutting axis with three aspects considered (forestry

governance, inventory-monitoring, and research-innovation) each with general objectives, directions for action and monitoring indicators (horizontal axis contain general objectives and corresponding directions concerning the vertical axis**)** and vertical (thematic) axis with four categories (forest economy, climate change, forest Ecosystem Services protection and optimization, and International and European policies) each with general objectives, directions for action, and monitoring indicators (FAO, 2018).

Areas of Action:

Areas of action include the key problem areas in the field of forestry for which the National Forest Strategy is mainly formed. Strategic planning for areas of action also covers challenges and their possible solutions. In the case of Germany, responding to the problems related to climate sensitivity, employment, efficient utilization of raw materials, biodiversity, silvicultural, over exploitation of forest resources and anthropogenic activities within the forest premises the National Forest Strategy identifies nine priority areas that are listed below (Ainger, 2011):

- Climate protection and adaptation to climate change
- Property, work, and income
- Raw materials, use and efficiency
- Biodiversity and forest conservation
- Silviculture
- Hunting
- Protection of soil and water management
- Recreation, health, and tourism
- Education, public relations, and research

Considering the main problem areas in the forestry sector the Finnish National Forest Strategy has identified the main priority areas for the forest policy action. Following are the main areas of actions that are mentioned in the Finnish National Forest Strategy (Rantala, 2019):

- Wood, wood fiber supply and demand
- Markets, value, and efficiency
- Climate change mitigation
- Integrated land use
- Skills and workforce
- Adaptation and resilience
- Natural assets, environmental quality, and biodiversity
- Sustaining thriving rural communities
- Health and well being
- Urban forestry
- Landscape quality and the historic environment

The Finnish National Forest Strategy is also working on a project portfolio with ten different projects (each covering more than one Sustainable development goal) (Matveinen *et al.,* 2019).

Recognizing the strategic drivers in the Scottish Forest lands six areas of action for the next ten years are being identified. It has also been assumed that these priority areas will provide structural framework for the coordination of partnership and government action (Reid, 2018):

- Ensuring the sustainable management of woods and forests
- Increasing the area of forest cover and woodland by considering diverse land-use related objectives
- Improving productivity and refining the efficiency of developing markets
- Increasing the resilience and adaptability of woods and forests
- Improving the environmental welfare and benefits offered by woods and forests
- Increasing participation by local communities, people, and businesses in the utilization of forest resources and forest management

Keeping pace with the sustainable development goals and sustainable forest management following are the indicative priority areas of the Greek National Forest Strategy (Kourakli, 2018):

- Re-establishment of the regional and central forest services for the optimization of sustainable forest management
- Development of road maps at a local, regional, and national level for preventing the risk of forest and improving fire management plans.
- Considering the sustainability of forest products and forest ecosystem services, systematic management of the forest ecosystems should be done to prevent forest wildfires.
- Development of a new flexible and permanent mechanism for the monitoring and evaluation of the national forest inventory
- Acknowledgment of forest contribution and improvement of forest value for the growth of bio-economy
- Designing forest management plans for the mitigation of climate change
- Improvement of ecosystem services by conserving and restoring forest ecosystem
- Improving coherence and networking between non-governmental and institutional stakeholders for better forest governance
- Coherence of National Forest Strategy and national forest policy with European and International polices, their targeted objectives and commitments

Financing

The budget of the Finnish National Forest Strategy will be designed annually as a part of the central government's budget allotment process. Besides this, the European Union's project funding will also be applied for the implementation of the updated version of the National Forest Strategy 2025.

Similarly, the National Forest Strategy of Scotland is getting funds from the Scottish government. Along with this grant-aid is provided through the Strategic timber Transport fund and Forestry Grant Scheme. The Scottish forest department is also working more closely with the associate partners to secure more funding and investments (Reid, 2018).

Whereas, Greek National Forest Strategy includes various stakeholders for offering financial support to the National Forest Strategy such as: “GREEN FUND by special forest authority, Ministry of economy and development, fundings are also provided by the interior ministry and by “European structural and investment funds” etc. Regional, local, and central forest services are also obliged to report the annual budget detail. However, the financial resource of the German National Forest Strategy implementation is still not clear in light of the literature review (FAO, 2018).

Monitoring and valuation

Monitoring and valuation is important for accountability and to ensure the proper implementation of the National Forest Strategy. The National Forest Strategy of Finland will be monitored by the co-ordination of the Ministry of Agriculture and Forestry. In addition to this Forest council with other working groups (that will work under the Forest Council including members from organizations, ministries, and research institutes) will also be responsible to evaluate, monitor and promote the implementation plan. Moreover, the National Forest Strategy will also go through external provisional evaluations if required (Matveinen *et al.,* 2019).

On the other hand, to monitor the implementation of the National Forest Strategy, the Scottish government needs collaboration with the government of the UK and other administrations and research institutes of the UK (Reid, 2018). Duration of the Greek Nation Forest Strategy is from 2018-2038 (20 years). Before the conduction of the final evaluation and review in 2037, some intermediation evaluations are expected to be done after 10 years (in 2028). Additionally, after every five years (2023-2033) midterm monitoring evaluations are expected to be done for partial review (Food and Agriculture Organization, 2018).

Unlike, the monitoring bodies of the above-mentioned National Forest Strategies the monitoring procedure and monitoring bodies of the German National Forest Strategy are not yet clear due to the lack of information available in the literature resources.

Stakeholder’s Involvement

Since the formation of the German National Forest Strategy was based on a result of a large-scale cluster study that was carried out nationwide. It involves the representatives of nature conservation associations, timber and energy management, and forest owners were invited to participate in all sessions for an active discussion. Later on, other groups like the representatives of sports, the German hunting protection association, and nature conservation were also brought in. This showed a wide range of contradictory demands and ideas. They all agreed on the same point that demands are increasing for climate protection, timber, recreation, and biodiversity conservation. Therefore, solution-oriented and well-balanced answers are required (Ainger, 2011).

In the case of Finnish National Forest Strategy it was concluded that the Forest Council, the Forest Council’s working committee, and various participating groups and steering networks

will support the Ministry of Agriculture and Forestry in the implementation and monitoring of projects (Ministry of Agriculture and Forestry of Finland, 2019).

Working with potential stakeholders is important for the successful implementation of the National Forest Strategy. In this regard, Scottish ministries offer leadership opportunities through their responsible planning of National Forest Management. The Scottish Government collaborates with UK administrations to work on cross-border issues such as forest health and with different institutes in the UK to work on different forest research projects (Reid, 2018).
The Greek National Forest Strategy (NFS) has been legislated with Ministerial Decision. The leadership of the Ministry of Environment, Energy and Climate Change in Greece has also set an ambitious goal on the occasion of the announcement of National Forest Strategy, to improve the forest contribution in the overall country's GDP by 1% which was previously 0.05% (Tsiaras *et al.,* 2020).

Implementation

Implementation of the Finnish National Forest Strategy needs collaboration from the Ministry of Agriculture and Forestry along with different other ministries. For this purpose, a strategic project portfolio has been designed to increase the effectiveness of the National Forest Strategy. Along with the project portfolio, some other programs and strategies are also working in line with the National Forest Strategy to achieve the desired objectives (Matveinen *et al.,* 2019). Similarly, the Scottish National Forest Strategy has been implemented with the support of the Scottish government. In this regard, the National Forest Strategy has to be aligned with the objectives of other strategies and plans of the Scottish government. The Scottish government is also responsible to publish a progress report of the implementation framework of the National Forest Strategy (Reid, 2018). In the case of the German National Forest Strategy, the authority in charge of the implementation of the National Forest Strategy is the federal ministry of food, agriculture, and consumer protection (Ainger, 2011). The implementation of the Greek National Forest Strategy will be done under the Forest Action Plan (FAO, 2018).

6. Conclusion

The results of this study show that all National Forest Strategies are distinct concerning their vision, objectives, areas of action, financing, monitoring and valuation and stakeholders involvement. The German National Forest Strategy consist of a vision, goals and nine areas of action (priority areas) with the explanation of their initial situation, challenges, and possible solution (Ainger, 2011), while the content of the Finnish National Forest Strategy consists of: vision, goals, and strategic objectives with indicators **(**Rantala, 2019**).** The Scottish National Forest Strategy consists of vision, goals, strategic drivers, priority areas, financial resources, implementation, monitoring, and review (Reid, 2018). The Greek National Forest Strategy involves vision, objectives, horizontal and vertical thematic axis, priority areas, financial resources, implementation, monitoring, and review (Food and Agriculture Organization, 2018).

This comparison study document did not find the complete implementation structure of the German National Strategy 2020 (Purwestri *et al.,* 2020). In contrast to this, Scotland's National Forest Strategy, Finnish Forest Strategy, and Greek Forest Strategy explain the whole implementation structure. No information was found about the funding body of German National Forest Strategy. However, Scottish central government and Finnish national government are also supporting financially their countries National Forest Strategies (Reid, 2018; Rantala, 2019). Similarly, the Greek Ministry of Economy and Development, Interior Ministry, and many other funding programs are financially supporting the Greek Forest Strategy (Food and Agriculture Organization, 2018).

Due to different visions and objectives, all four National Forest Strategies are working on different areas of action with different strategic measures and different stakeholder's involvement. Unlike, German National Forest Strategy, Scottish National Forest Strategy, and the Greek National Forest Strategy, the Finnish National Forest Strategy document additionally explain the environmental, economic, and social impact assessment of the Finnish National Forest Strategy. Similarly, the Greek National Forest Strategy additionally defines the horizontal and vertical thematic axis (Food and Agriculture Organization, 2018).

The Finnish National Forest Strategy, Scotland's National Forest Strategy, and the Greek National Forest Strategy explain the financing bodies of three Strategies. However, there is still a need for more collaboration with different stakeholder organizations, companies, and institutes to secure more investments for the research projects especially in the domain of SFM sustainable forest management (Egenstad, 1999). It is also essential to ensure the proper monitoring of the implementation process of National Strategies by using modern technology (Cinq-Mars, 2006). However, literature studies also showed the recommendation to take into account the integrated data management and to conduct cost-benefit and impact analysis of the National Forest Strategies (Purwestri *et al.,* 2020).

After the implementation of the National Forest Strategy the final evaluation of the National Strategy should be done by an independent external panel of experts to ensure the transparency of the process. In addition to the above-mentioned recommendations, it is also important to make amendments and updates in the upcoming Strategies based on monitoring results and reviews from the previous versions of the National Forest Strategies (Reid, 2018; Food and Agriculture Organization, 2018).

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