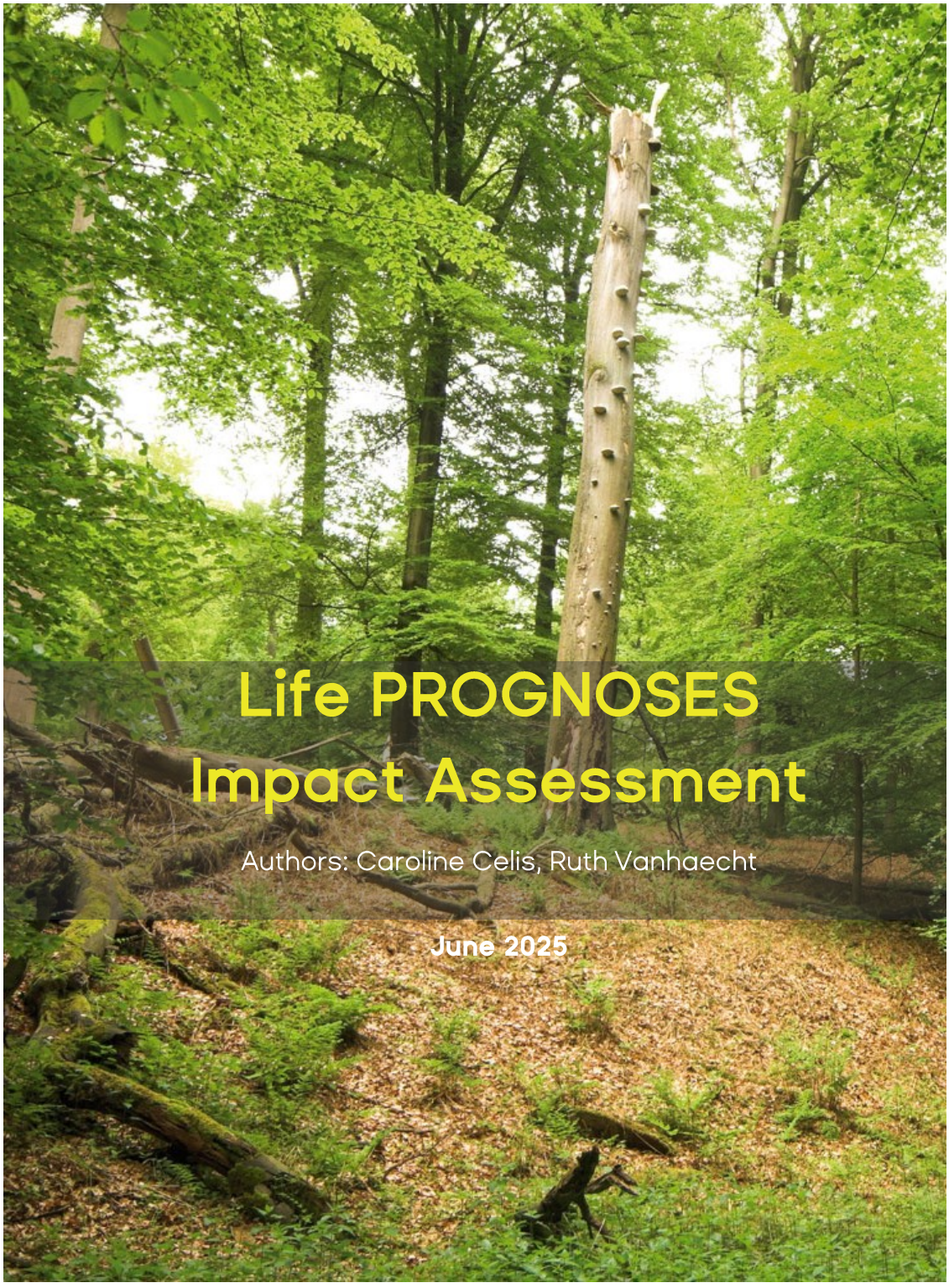


Life PROGNOSES Impact Assessment

Authors: Caroline Celis, Ruth Vanhaecht

June 2025

Picture: Sonian forest, Belgium. © Yves Adams.

Life PROGNOSES Project Summary

Title

Life PROGNOSES - Life Protection of Old-Growth forests in Europe: Natural Heritage, Outline, Synthesis and Ecosystem Services

Website: www.lifeprognoses.eu

Project duration

January 2021 – June 2025

Project budget: € 1.382.855
Project eligible costs: € 1.370.853
European Commissions contribution: € 794.471

Co-financed by

- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of Germany
- Austrian Ministry of Climate

Coordinating beneficiary

Sonian Forest Foundation, Belgium
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Associated beneficiaries

- City of Angermunde, Germany (CANG)
- Carpathian Biosphere Reserve, Ukraine (CBRE)
- Czech University of Life Sciences (CZU)
- E.C.O, Austria (ECO)
- INBO, Belgium (INBO)
- Johanneum Research, Austria (JORE)
- Ministery of Natural Resources and Spatial Planning, Slovenia (MESP)
- Abruzzo, Lazio & Molise National Park, Italy (NPAB)
- Kalkalpen National Park, Austria (NPKA)
- Central Balkan National Park, Bulgaria (NPCB)
- Nordwestdeutsche Forstliche Versuchsanstalt (NW-FVA)
- University of Eberswalde, Germany (UNIE)
- University of Ljubljana, Slovenia (UNIL)
- University of Tuscia, Italy (UNITUS)

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IMPACT SUMMARY

- ✓ At least on 16 occasions, the insights and results of the project were shared with policymakers at the regional, national and European level.
- ✓ 8 scientific articles were drafted, of which 2 have been published in peer-reviewed journals within the project implementation period.
- ✓ 5 scientific reports have been published.
- ✓ At least 10 collaborations with partners outside of the project were established for scientific purposes.
- ✓ 19 new datasets were created about the features of old-growth forests
- ✓ On at least 19 occasions, the scientific insights of the project were communicated to fellow scientists.
- ✓ At least 1.711.340 people were reached through awareness-raising activities.
- ✓ The project offered unique opportunities to enhance the quality and creativity of awareness-raising activities.
- ✓ The project inspired the development of at least 9 new projects, of which some have started already.
- ✓ 751 partners outside of the project got involved in the development of the awareness-raising activities.

1. Introduction

The Life Prognoses project is a preparatory project undertaken in the framework of the Life Programme – Sub-programme Nature and Biodiversity. The project was developed and carried out in the knowledge gap that emerged by formulating the objective to strictly protect all old-growth forests in Europe; it was not known what would qualify as an old-growth forest in Europe, nor where these forests could be found once we would have a clear idea of what conditions they had to comply with. Life Prognoses focused on bridging multiple gaps between the policy goals regarding strict protection of old-growth forests and the actual, theoretical capacity to achieve them. In this context, Life Prognoses also focused on capacity building. Public support is a highly important factor for the success rate of policy implementation; nature conservation policies thrive in a supportive environment. The project developed, implemented, and exchanged best practices regarding awareness raising at multiple levels (local, national, European) and for different target groups (local communities, visitors, nature guides, etc.).

Given the 'preparatory' nature of this project, compliance with the KPIs of the Life Programme is not required. Nevertheless, an impact assessment ought to be made to evaluate the effectiveness of the project beyond its direct and explicit objectives, not accidentally as a further result, an impact of the achievement of these explicitly stated objectives. For the assessment of this impact, we will consider the contribution of the project outputs to the 'specific objectives' formulated for the sub-programme Nature and Biodiversity. The impact indicators will be selected to give information about the project with these objectives as the background for evaluation.

2. Problem definition and rationale for action

The Life PROGNOSES project contributes to the implementation of the EU Biodiversity Strategy for 2030 and the EU Forestry Strategy for 2030. More specifically, the project supports the implementation of strict protection of all European old-growth forests (Directorate-General for Agriculture and Rural Development (European Commission), 2021; Directorate-General for Environment (European Commission), 2020).

Scientific literature is consistent in the fact that primary and old-growth forests in Europe, although occupying a very limited area, are irreplaceable in harbouring biological diversity, stabilising terrestrial carbon storage, regulating hydrological regimes, enabling ecosystem adaptation to disturbances, and providing public health benefits (Barredo et al., 2021). The importance of forest habitats for European biodiversity and their function to remove carbon from the atmosphere, convert CO2 into biomass and create significant carbon sinks is underlined by the European Biodiversity Strategy 2030. The strategy clearly states the crucial demand to define, map, monitor and strictly protect all the EU's remaining primary

and old-growth forests. Up to now, the protection of primary and old-growth forests is limited by several shortcomings, which need to be overcome:

1. There was no European-wide standard to assess the status of old-growthness of a forest, and there is no set of broadly acknowledged indicators and thresholds between the forest sector and nature conservation across the EU.
1. As the indicators and thresholds were not agreed upon, there was no homogeneous mapping guideline or map set of primary or old-growth forests available across the EU.
3. Besides these technical limitations of getting a European-wide overview on these important forests, the importance of ecosystem services provided by the old-growth forest ecosystem must be communicated to policymakers and the broad public. Awareness of the importance of old-growth forests had to be strengthened.

The first work package, WP1, deals with the development of criteria and methods to assess and map old-growth forests in Europe. The objective of this thematic work package is the development of a robust methodological approach to assess and map primary and old-growth forests and apply the method in situ on a representative set of old-growth forests in the EU (within the beech forest network). As addressed in the call, this component shall contribute to an EU-wide assessment and mapping of primary and old-growth forests.
The value of ecosystem services of primary and old-growth forests still requires further clarification. The objective of work package WP2 is to identify and quantify ecosystem services such as carbon storage, biodiversity, micro- and meso-climatic impact, the potential for recreation, and the creation of green jobs (e.g. ecotourism) on a selected set of sites. These methods and results can then be applied and extrapolated to other old-growth forests all over Europe.
There is a need to raise awareness among stakeholders at various levels and in different sectors, on the outstanding value of remaining primary and old-growth forests in Europe, and on the necessary actions to be taken for their conservation. The main target of work package WP3 is to communicate the values of old-growth forests both to local stakeholders and communities and the wider public. Different audiences are targeted: Local authorities, stakeholders and communities, Policy makers at regional/national/international level and the general public.

The project builds on the UNESCO World Heritage site "Ancient and Primaeval Beech Forests of the Carpathians and Other Regions of Europe". This way, it benefits from the solid network that has already been created and from the strong engagement of landowners, local communities, and authorities to conserve these areas and integrate them into local sustainable development strategies. In general, the Natural World Heritage sites in EU countries overlap with Natura 2000 sites.

The positive attitude towards the Natural World Heritage and the strictly protected forest ecosystems is used to strengthen the protection and recognition of old-growth forests in Europe.

The project contributes to the implementation of the EU Biodiversity Strategy to 2030, to the achievement of the objectives and ambition of the European Green Deal on forest protection and to the better implementation of the Habitats and Birds Directives. All activities account for the existing European policy and legal framework applicable to primary and old-growth forests.

3. Assessing impact: methodology

3.1. Specific objectives of the Sub-programme Nature and Biodiversity

The Life Prognoses project is implemented in the context of the Life Programme – sub-programme Nature and Biodiversity, installed for boosting and integrating the implementation of the EU's policy objectives for halting and reversing the loss of wildlife habitats and species across all sectors. For this sub-programme, three specific objectives were formulated.

1. Provide Innovation, Knowledge & Best practices for implementation EU legislation: to develop, demonstrate, promote and stimulate scale up of innovative techniques, methods and approaches (including nature-based solutions and ecosystem approach) for reaching the objectives of the EU legislation and policy on nature and biodiversity, and to contribute to the knowledge base and to the application of best practices, including through the support of the Natura 2000

2. Create support base for EU legislation: to support the development, implementation, monitoring and enforcement of EU legislation and policy on nature and biodiversity, including by improving governance at all levels, in particular through enhancing capacities of public and private actors and the involvement of civil society, also taking into due consideration the possible contributions provided by citizen science

3. Catalyse deployment of outputs for implementation of EU legislation: to catalyse the large-scale deployment of successful solutions/approaches for implementing EU legislation and policy on nature and biodiversity, by replicating results, integrating related objectives into other policies and into public and private sector practices, mobilising investment and improving access to finance.

We assess the impact of our project with these specific objectives as the background. Preparatory Life projects specifically address ad hoc Legislative and Policy Priorities (PLP).

Based on the objectives of the project, the specific objectives of the programme, and the outputs of the project, impact indicators were developed (see Annexe A).

The Life Prognoses project was executed in cooperation with fifteen partners from eight countries. The partners were several universities, several research institutions, a national ministry, a city administration, a foundation, and several national parks. Given the specific expertise of the involved partners, the activities they participated in and the output they contributed to differ. From the impact indicators that had been developed, we selected a subset for each partner, corresponding to their contribution and field of expertise.

We assess the impact of our project with these specific objectives as the background. Preparatory Life projects specifically address ad hoc Legislative and Policy Priorities (PLP).

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3.2. The impact indicators

Impact 1: Enhanced support regarding the identification and mapping of old-growth forests.

The Life prognoses project provides knowledge and assesses, and develops best practices to support the protection of old-growth forests. To advance the protection, the partners scientifically developed tools such as an EU-wide definition and criteria for old-growth forests and mapping methods to identify and delineate old-growth forests in the field and by using remote sensing techniques. The project partners actively participated in policy-making processes and discussions from their expertise.

Indicator 1.1: The instances in which project partners shared the expertise developed in the context of the project for policy-making processes.

Impact 2: Enhanced scientific knowledge about old-growth forests.

The project closely examined old-growth forests and their characteristics in the field. Scientific insights into these forests' value were obtained by assessing several ecosystem services, i.e. carbon stock, microclimate, biodiversity and

recreation and tourism. The developed techniques, methods and the generated knowledge were documented in scientific guidelines, journal articles and databases. The characteristics of these outputs give a first idea of the impact of the scientific work. Furthermore, impact was fostered by presenting the developed methodologies and results at several conferences throughout Europe.

Indicator 2.1: Number of scientific articles submitted for publication.
Indicator 2.2: Number of new datasets compiled.
Indicator 2.3: Number of scientific presentations about the project findings.

Impact 3: enhanced awareness of the importance of OGFs at the local, national and European level.
The Life Prognoses project dedicates an entire work package to outreach to create the needed support for old-growth forest protection among the broad public as well as among government officials. To assess the impact of the outreach, first of all, the number of people reached by the implemented awareness-raising activities has been traced. Furthermore, the project partners examined how the quality of their activities had been influenced by the project.
Indicator 3.1: Number of people reached.
Indicator 3.2: Change in quality of awareness-raising. [Qualitative indicator]

Impact 4: Strengthening the European forest conservation network (scientifically and on the ground).
The Life Prognoses project fostered cooperation between multiple institutions and researchers throughout the whole of Europe. In many cases, the networking that has unintentionally happened by tackling specific scientific issues together will have a lasting impact in terms of sharing expertise and data in the future, as well as for the development of new projects and research beyond institutional and national borders. As an indicator of the network that has been expanded and created at the scientific level, publications with other institutions than only project partners, projects in the pipeline and scientific 'cross-pollination' in other ways are assessed.
Indicator 4.1: New projects developed.
Indicator 4.2: Collaborations with forest experts that are not project partners in the context of the project or because of the project.

These indicators form a basis from which it can be judged to what extent the outputs of the Life Prognoses project contribute to the predetermined project goals they are to serve – definitions, indicators, criteria and mapping of old-growth, ecosystem services of old-growth and awareness-raising about old-growth. – and hereby, the specific objectives of the Life Programme – (1)

innovation, knowledge and best practices, (2) support base, (3) catalysis of deployment.

In this report, we provide the integrated findings regarding these indicators based on the assessment at the level of the individual beneficiaries as well as at the project level.

4. Results

4.1. Impact 1: Enhanced support regarding the identification and mapping of old-growth forests.

4.1.1. Indicator 1.1: The instances in which project partners shared the expertise developed in the context of the project for policy-making processes.

In summary, the scientific insights of the project were shared with policymakers on at least 16 occasions, listed in Table 1. The occasions ranged from taking up an expert role in working groups and workshops organised by the European Commission and a thematic session in the context of the IUCN regional conference 2024, to lectures, webinars, high-level stakeholder meetings, and a conference organised by the project partners. At last, a policy brief was drafted to give a comprehensive overview of the project's scientific results tailored to the needs of policymakers.

Table 1: Overview of the occasions at which the scientific expertise developed during the project was shared with regional, national, and European policymakers.

Occasion	Involved partner
Participation of the project partners in the expert working group for forest and nature (WGFN).	INBO, ECO
Presentation to share expertise regarding old-growth forests during the meeting of the WGFN	INBO
Presentation to share expertise regarding old-growth forests during the meeting of the WGFN	ECO
Participation in the Mapping EU Primary and Old-growth forests webinar (5/03, 14:00 - 16:30 CET)	INBO, ECO
Scientific partners were invited to moderate the Mapping EU Primary and Old-growth forests webinar.	INBO, UNIL
The scientific partner moderated the Mapping EU Primary and Old-growth forests webinar.	UNIL

Scientific partner invited to the Chamber of Agriculture and Forestry (Austria) to defend involvement in OGF topics.	JORE
Meeting with Adrian Tistan (DG ENV) to discuss future possibilities for mapping and protecting old-growth forests.	CZU
Following the Mapping EU Primary and Old-growth forests webinar, a discussion with the Romanian representative took place, including the exchange of best practices.	CZU
"Life Prognoses: Bridging Science and Policy for the Protection of Europe's Old-Growth Forests". Thematic session at the IUCN regional conference, Bruges, Belgium. 30.09.2024. (No of attendees: 26)	INBO, ECO, JORE, UNIT, SOFO
Life Prognoses conference. Bruges, Belgium. 02.10.2024.	All partners
Presentations concerning old-growth indicators and awareness-raising during the excursion trip to the Sonian forest were organised for the participants of the IUCN regional meeting. Brussels, Belgium. 03.10.2024. (No of attendees: 42)	INBO, ECO, NPCB
Life Prognoses-Europarc webinar. 03.06.2025.11	INBO, ECO, JORE, SOFO
First High-Level Stakeholder Meeting. Slovenia.	UNIL, MESP
Second High-Level Stakeholder Meeting. Slovenia.	UNIL, MESP
Policy Brief Life Prognoses	SOFO, INBO, ECO, UNIL

4.2. Impact 2: Enhanced scientific knowledge about old-growth forests.

4.2.1. Indicator 2.1: Number of scientific documents and articles submitted for publication.

In total, 8 scientific articles were drafted, of which 2 were published in peer-reviewed journals within the project implementation period. Furthermore, 5 scientific reports were published via the INBO website within the project implementation period. Table 2 gives an overview of these articles and reports together with the journal in which they are published and their impact factor. Eventually, 9 scientific papers will be published in peer-reviewed journals.

Table 2: Overview of the scientific reports and articles drafted and published in the context of the Life Prognoses project.

Title and authors of the submitted article	Journal	2024 Impact Factor
Vandekerkhove, K., Meyer, P., Kirchmeir, H., Piovesan, G., Hirschmugl, M., Larrieu, L., Kozàk, D., Mikolas, M., Nagel, T., Schmitt, C., & Blumröder, J. (2022). Old-growth criteria and indicators for beech forests (Fageta). LIFE-PROGNOSES -Work Package 1.11. https://doi.org/10.21436/inbor.74600059	INBO website	
Hirschmugl, M., Sobe, C., Di Filippo, A. et al. Review on the Possibilities of Mapping Old-Growth Temperate Forests by Remote Sensing in Europe. Environ Model Assess 28, 761–785 (2023). https://doi.org/10.1007/s10666-023-09897-y	Environmental Modelling & Assessment	2,7
Kirchmeir, H., Vandekerkhove, K., Di Filippo, A., Priori, S., Di Fiore, L., & Vanhaecht, R. (2023). Mapping guideline and field survey protocol for the Assessment of Old-Growth status and Ecosystem Services (Biodiversity & Carbon) in Beech Forests: Life PROGNOSES - ACTION A.1.21 Field Mapping and Testing of Indicators: final version June 2023. https://doi.org/10.21436/inbor.97064651	INBO website	
Posch, L., Kirchmeir, H., Fuchs, L., & Vandekerkhove, K. (2025). LIFE-PROGNOSES Action A.1.12. Compilation of existing mapping products: methodology and results. **(Rapport niet door INBO uitgegeven). Instituut voor Natuur- en Bosonderzoek. https://doi.org/10.21436/inbor.124595329**	INBO website	
Remote sensing paper		
Moser-Sturm, H., Vandekerkhove, K., Hirschmugl, M., Kirchmeir, H., & Vanhaecht, R. (2025). Life PROGNOSES – Action 1.25: WP1 - Compilation of final outputs: definition, mapping and evaluation of old-growth beech forests through field surveys and remote sensing. **(Rapport niet door INBO uitgegeven). Instituut voor Natuur- en Bosonderzoek. https://doi.org/10.21436/inbor.122867589**	INBO website	
Beech buffers: microclimate regulation in temperate old-growth forests, surroundings and forest edge	Planned for Ambio	5,8
Adhikari, Yojana & Bachstein, Nadine & Gohr, Charlotte & Blumroeder, Jeanette & Meier, Caroline & Ibisch, Pierre. (2024). Old-growth beech forests in Germany as cool islands in a	Scientific Reports	3,8

warming landscape. Scientific Reports. 14. 10.1038/s41598-024-81209-0.	
Scientific paper on biodiversity potential and human impact	In progress
Scientific paper on carbon stocks in old-growth forests (1)	In progress
Scientific paper on carbon stocks in old-growth forests (2)	In progress
Scientific paper on the assets of old-growth for tourism and recreation	In progress
Technical report on ecosystem services valuation	In progress
Scientific paper on the old-growth indicator (OGI)	In progress

4.2.2. Indicator 2.2: Number of new datasets compiled.

In the context of the project, 19 new datasets were created with data about different features of old-growth forests (Table 3). The datasets can be found on the repository ZENODO under open or restricted access. The details about these datasets can be found in the dedicated data management plan (see Data Management Plan Life Prognoses).

Table 3: Overview of the datasets compiled in the context of the Life Prognoses project.

Dataset title	Dataset description from the data management plan
Prognoses_Oldgrowthness_polygon (Geodataset)	GIS –file (polygon layer) compiling the existing information on stand age and level of old-growthness for the 8 sites involved in PROGNOSES (Krokar, Zdrocle, Sonian Forest, Kellerwald, Hainich, Kalkalpen, Abruzzo and Central Balkan) and Uholka as additional site (= 9 sites in total). Polygon maps of the additional sites (Klenovsky Vepor, Stara Planina, Sinca forest) are not included.
PROGNOSES dendroplot layer (Geodataset)	GIS–layer (point layer) with the point location of the centre of the dendrometric sample plots used in the PROGNOSES project. Attribute table contains information on exposure, slope, geomorphology, Elevation ASL, soil type, rockiness, forest type, former/current management, TSA, presence/absence of Very Large Trees and Coarse woody debris, type of regeneration and if the plot was selected for soil sampling (1/0) ... - total of approx. 2200 plots from 12 sites

PROGNOSES_sites_data.csv	CSV with description of the sample sites (n = 12) with overview of the sampling methodology, thresholds, etc.
PROGNOSES_plots_data.csv	CSV file with data per sample plot (n = 2308) based on existing information or field assessment, including: site and plot ID, coordinates, exposure, slope, geomorphology, elevation, soil type, rockiness, forest type, former/current management, TSA, presence/absence of Very Large Trees and Coarse Dead Wood, type of regeneration and if the plot was selected for soil sampling (1/0)
PROGNOSES_trees_data.csv	CSV –file with data on living and dead standing trees (n >56.000): siteID, plotID, treeID, species, native status, diameter at breast height (DBH) (cm), status (alive, dead standing, snag), measured height (m), decay stage for dead trees and snags (3 stages), calculated height based on local height-diameter curves (m) and calculated tree volume based on one- or two-entry tariffs or allometric functions (m3) (see Vanhellemont, 2025 for details).
PROGNOSES_treemicrohabitats_data.csv	CSV file with presence/absence data of a predesigned set of Tree-Related Microhabitats (TReMs) on standing living (and - for part of the sites - also dead) trees with diameter at breast height (DBH) of 20 cm and more (>25.000 trees). Tree-related microhabitats recorded are: bark pocket; bark loss; crack; trunk woodpecker cavity; trunk rot-hole; treebase rot-hole; root buttress concavity; treebase dendrotelm; perennial polypore; crown deadwood; broken crown; exudates; epiphyte cover mosses; epiphyte cover vascular plants; cankers.
PROGNOSES_lyingdeadwood_data.csv	CSV-file containing information on lying dead wood; in case Full Area Sampling was applied, the file contains for every registered dead wood fragment: species, decay stage (3 stages), diameter (top and base), length and volume; in case of Line Intersects (aimed at at least 40 m of line per plot, see Vanhellemont for details), raw data contain species, decay stage (3 stages), and diameter at the intersection with the line.

PROGNOSES_plotsummary_values.csv	CSV –file with calculated derived values for the individual plots, based on the dendrometric data (described in the files below). File contains following information per plot: site_id, plot_id, DBH minimum maximum and range (cm), Basal area for living and standing dead trees (m²/ha), aboveground volume in different fractions (living, standing dead, lying dead, only the very large trees, only coarse dead wood) (m3/ha), number of Very Large Trees (VLT), number of trees with one or more tree-related microhabitats (TReM).
Prognoses_C_stock_standing	CSV-file (Prognoses_C_stock_standing.csv) containing calculated C-stocks per plot, per species and decay stage Carbon stock for standing trees (alive and dead) = (aboveground volume + root biomass according to Forrester (xx)) x density x 1/2
Prognoses_C_stock_lying.csv	CSV-file containing Carbon stock in lying deadwood per plot, subdivided by species and decay stage.
PROGNOSES_soil_data.csv	CSV-file (PROGNOSES_data_soil.csv) containing the results of soil sample analysis (bulk density, concentrations of C and N) from 5 sites (SONIAN FOREST, KALKALPEN NP, ABRUZZO NP, KELLERWALD NP, KLENOVSKY VEPOR)
PROGNOSES_organiclayer_data.csv	CSV-file containing the results of sample analysis from 4 forests (SONIAN FOREST, ABRUZZO NP, KELLERWALD NP and KLENOVSKY VEPOR) – 88 plots; samples of forest floor: plotID, dry weight; C and N concentration
Prognoses_C_stock_soil.csv	CSV-file containing Carbon stock in organic layer and soil per fixed depth (0-10, 10-30, 30-60, 60-100 cm) per plot.
Prognoses_recrea_results	file containing the results of the recreational survey at 3 test sites: SONIAN FOREST, KALKALPEN and ABRUZZO NP
Beech Buffers: microclimate regulation in temperate old-growth forests, surroundings and forest edge	a set of TXT files, containing both raw data and aggregated data sets (per plot and per forest category) for the microclimate-loggers on 250 plots in 4 UNESCO component parts (HAINICH, KELLERWALD, GRUMSIN and SERRAHN).

Old-growth Beech Forests in Germany as Cool Islands in a Warming Landscape	data accompanying the published journal paper: Adhikari, Y., Bachstein, N., Gohr, C., Blumröder, J. S., Meier, C., & Ibisch, P. L. (2024). Old-growth beech forests in Germany as cool islands in a warming landscape. Scientific Reports, 14(1), 30311. https://doi.org/10.1038/s41598-024-81209-0
PROGNOSES Microclimate plot locations (Geodataset)	Plot-ID and coordinates of the 250 microclimate loggers used in the microclimate study of LIFE-Prognoses.
PROGNOSES Old Growth Mapping using Remote Sensing (Geodataset)	GIS –file (raster layer) with the assessment of level of old growthness for 4 test sites (each at least 1000 ha located in the UNESCO components Sonian Forest, Abruzzo, Central Balkan and Kalkalpen

4.2.3. Indicator 2.3: Number of scientific presentations about the project findings.

On at least 19 occasions—mostly at academic conferences—the scientific insights of the project were communicated to fellow scientists (Table 4). At least 7 prognoses partners communicated in this way. Audiences in at least 6 different countries were reached, covering the Mediterranean, Atlantic, continental, alpine, and boreal European regions, as well as North America (Canada). On June 3rd, a webinar about the scientific results was co-hosted with Europarc. The webinar has been recorded and can be viewed here: EUROPARC and LIFE Prognoses Joint Webinar: Characteristics, ecosystem services and protection of European old-growth beech forests Insights from the pan-European research project Life Prognoses - EUROPARC Federation

Table 4: Overview of the presentations given about the results of the Life Prognoses project in a scientific context.

Title and occasion of the presentation	Involved partner
Wald monitoring im National Park Kalkalpen. LTSER Plattform Eisenwurzen Vernetzungstreffen. Manuela Hirschmugl. Online. 01.06.2021. (No. of attendees: ~ 25)	JORE
'Potential and Challenges for GI Sciences in the context of Long-Term Ecosystem, critical zone and socio-ecological Research (eLTER)'. Manuela Hirschmugl. GI_Salzburg22, Salzburg, 5.7.2022. (No. of attendees: ~ 50)	JORE
'Assessment of potential old-growth Beech Forests in the Kalkalpen National Park by Means of Remote Sensing'. Manuela Hirschmugl. Presentation at LTER conference, Wien. 11.11.2022. (No. of attendees: ~ 35)	JORE

"Structure and Change: Some Insights in Current Remote Sensing-based Forest Monitoring Trends in Europe". Manuela Hirschmugl. UBC Lunch Seminar Series, Vancouver, BC, Canada, 14.02.2023. (No. of attendees: ~ 70)	JORE
'Conservation strategies for large old trees to promote natural forest restoration and climate-change mitigation'. Alfredo Di Filippo. IBC XX International Botanical Congress 2024, Madrid, Spain. 21.07.2024-27.07.2024.	UNIT
'Life Prognoses: Bridging Science and Policy for the Protection of Europe's Old-Growth Forests'. Thematic session at the IUCN regional conference, Bruges, Belgium. Alfredo Di Filippo, Caroline Celis, Hanns Kirchmeir, Kris Vandekerkhove & Manuela Hirschmugl. 30.09.2024. (No of attendees: 26)	INBO, ECO, JORE, UNIT, SOFO
'What is an old-growth forest? Towards a Europe-wide definition of "old-growth". Kris Vandekerkhove. Life Prognoses conference, Bruges, Belgium. 02.10.2024. (No of attendees: 38)	INBO
'Identifying European old-growth forests based on field data: The old-growth indicator'. Peter Meyer. Life Prognoses conference. Bruges, Belgium. 02.10.2024. (No of attendees: 38)	NW-FVA
'Identifying European old-growth forests with remote sensing techniques'. Life Prognoses conference. Manuela Hirschmugl. Bruges, Belgium. 02.10.2024. (No of attendees: 38)	JORE
'Carbon stock and sequestration in European old-growth forests. Life Prognoses conference. Alfredo Di Filippo. Bruges, Belgium. 02.10.2024. (No of attendees: 38)	UNIT
'Tree-related microhabitats in European old-growth forests: a proxy for biodiversity?'. Hanns Kirchmeir. Life Prognoses conference. Bruges, Belgium. 02.10.2024. (No of attendees: 38)	ECO
'The significance of European old-growth forests for recreation and tourism'. Hanns Kirchmeir. Life Prognoses conference. Bruges, Belgium. 02.10.2024. (No of attendees: 38)	ECO
'A Method to Assess the Level of 'Old-Growthness' in European Beech Forests: Results from a Network of World Heritage Beech Forests'. Kris Vandekerkhove. Poster presentation. IUFRO World Congress, Stockholm, Sweden. 23-29.06.2024.	INBO
'Potential Carbon Accumulation in European Forests: insights from a network of old-growth beech forests covering widely different environmental conditions within the UNESCO World Heritage Site 1133'.	UNIT

Poster presentation. Alfredo Di Filippo. IUFRO World Congress, Stockholm, Sweden. 23-29.06.2024.	
'Changes in carbon accumulation, tree microhabitats, structural complexity according to naturalness degree and environmental gradients in old-growth beech forests in Italy'. Alfredo Di Filippo. IUFRO World Congress, Stockholm, Sweden. 23-29.06.2024.	UNIT
Presentations on the topic of old-growth and the scientific findings of Life Prognoses during workshops and courses for practitioners and stakeholders.	NW-FVA
Presentations concerning old-growth indicators and awareness-raising during the excursion trip to the Sonian forest were organised for the participants of the IUCN regional meeting. Brussels, Belgium. 03.10.2024. (No of attendees: 42)	INBO, ECO, NPCB
EUROPARC and LIFE Prognoses Joint Webinar: Characteristics, ecosystem services and protection of European old-growth beech forests. Insights from the pan-European research project Life Prognoses	JORE, INBO, ECO, NW-FVA, SOFO
Presentation 'Mapping Old-growth Forest by Means of Sentinel-2 and LiDAR Data in Various Regions of Europe.' By Manuela Hirschmugl (Presenter), Carina Sobe, Peter Meyer, Kris Vandekerkhove. At ESA's Living Planet Symposium 2025 (LPS25).	JORE
International workshop on long-term monitoring of old-growth forests	UNIL, MESP

4.3. Impact 3: enhanced awareness of the importance of OGFs at the local, national and European level.

4.3.1. Indicator 3.1: Number of people reached.

The awareness-raising activities reached a wide range of different target groups. In the context of the organisation of the activities, different types of partners, stakeholders and volunteers were involved. The activities ranged from online outreach to educational excursions in the forest, as well as artistic explorations of the values of old-growth forests.

Table 5: Overview of the reach of the awareness-raising activities.

Statistic	Value
Total number of people reached	1.711.255
Number of people reached online (website, Facebook, Instagram, YouTube)	724.733
Number of people reached through press releases	1.193.086

Number of people reached through excursions in the forest	2669
Number of people reached through artworks (theatre show, silent book, virtual reality walk)	3521
Number of people reached through lectures, workshops, webinars and other 'info sessions' (indoors, online or at info fairs; excluding excursions in the forest).	2375
Number of partner organisations involved in the development of the activities	751
Number of (school) children and students reached	964
Number of teachers and pedagogists reached	154
Number of policymakers reached	327

4.3.2. Indicator 3.2: Change in quality of awareness-raising. [Qualitative indicator]

In Germany, the Life Prognoses project was the main driver for the reignition of the working group for education regarding the world heritage series 'Ancient and primaeval beech forests of the Carpathians and other regions in Europe'. Thanks to the project, the City of Angermunde established deep-running partnerships with actors in the educational sector, facilitating continuation of the activities developed within the project implementation time. National Park Abruzzo developed the expertise and made the necessary connections with artists to create a virtual reality walk in the old-growth forest. This expertise and connections will be used in subsequent projects, such as the Life BEECH project. In the country of Uckermark, CANG managed to install a public bus connection so that students could reach the forest easily. For many partners (SOFO, CBRE, NPCB), this project was the first project that helped the development of activities for the public, specifically concerning old-growth forests and awareness-raising about them.

4.4. Impact 4: Strengthening the European forest conservation network (scientifically and on the ground).

4.4.1. Indicator 4.1: New projects developed.

At least 9 new projects were developed, of which some have already, inspired by the insights of the Life Prognoses project and as a result of the collaboration and professional connections established in the context of the project.

Table 6: Overview of the projects developed in the light of, or inspired by, the Life Prognoses project.

Project description	Involved partners	Status

Project on Nature Restoration together with ECO: RestorEO – one focus also on forest parameters, deadwood. Details see: https://www.joanneum.at/digital/en/projects/restoreo/	JORE, ECO	Started in September 2022
New project with National Park Gesaeuse on long-term forest monitoring (HabitAlp 2.0).	JORE	Started
ERASMUS+ project BESTNATURE - Boosting EU Biodiversity Strategy by empowering higher education curricula and green skills for NATURE protection and restoration. Details see https://bestnature.unitus.it/	UNIT, ECO, UNIBologna, etc.	Started in November 2023
EO for monitoring ecosystem change in Alpine protected areas, BIODIVERSA+, 2nd joint call for international projects together with TU Munich, WSL, Uni Torino.	UNIT, TU Munich, WSL, Uni Torino	Submitted, not funded
FORBEST: SAFEGUARDING CARBON AND BIODIVERSITY ACROSS EUROPEAN FOREST ECOSYSTEMS.	UNIT	Submitted
THROUGH MULTI-ACTOR INNOVATION in the call HORIZON-CL6-2024-BIODIV-01-8 together with several PROGNOSES partners (UNITUS, UNIBO, CZU, ...)	UNIT, CZU, INBO etc.	Submitted
CZU: Submitted Interreg Europe project: Old-Growth forests and Veteran Trees for Biodiversity and Resilient Landscapes, Project ID: 03C0817;	CZU	Submitted
WILDCARD – HORIZON Europe project	NW-FVA	Started in January 2024
Identifying old-growth and new strict forest reserves in Slovenia, Croatia, and BiH.	UNIL	In development

4.4.2. Indicator 4.2: Collaborations with forest experts that are not project partners in the context of the project or because of the project.

There were at least 10 occasions, listed in Table 7, at which the project partners collaborated with experts outside of the project. These occasions range from writing scientific articles to data sharing and collaborations for awareness-raising.

Table 7: Overview of the different collaborations with experts beyond the project partners.

Occasion for collaboration	Involved project partner	Involved external partner
Joint publication: 'Protect old-growth forests in Europe now'. Martin Mikolāš et al., Protect old-growth forests in Europe now. Science380,466-466(2023). DOI:10.1126/science. adh2303	CZU, UNIT	See authors: Lund University, Humboldt-Universität zu Berlin, KU Leuven etc.
Meyer, P., Bauhus, J., Farwig, N., Lang, F., Müller, J. (2024): Managing old near-natural deciduous forests (in German: Zum Umgang mit alten, naturnahen Laubwäldern). AFZ-Der Wald, 6, 43-45.	NW-FVA,	See authors: European Forest Institute, University of Freiburg, University of Wuerzburg, etc.
Policy report of the Scientific Advisory Board on Forest Policy (2023): Managing old, close to nature deciduous forests in Germany in the context of biodiversity conservation, climate protection and adaptation to climate change, December 2023, Berlin, 29p.	NW-FVA	See authors: Scientific Advisory Board on Forest Policy, etc.
Associated partner in the Healthy Forest Regions project.	SOFO	Nature and Geopark Styrian Eisenwurzen (Austria), National Forest Centre (Slovakia), Slovenia Forest Service (Slovenia), etc.
Partners in the Project Group "Naturwälder".	NW-FVA:	FVA Baden-Württemberg, LWF Bavaria, FWAF Rheinland-Pfalz etc.
Scientific Advisory Board for Forest Policy at the German Federal Ministry for Food and Agriculture	NW-FVA	German Federal Ministry for Food and Agriculture
We are working with Croatian researchers (Uni of Zagreb, Forestry Faculty) on potential new forest reserves.	UNIL	Croatian researchers (Uni of Zagreb, Forestry Faculty)
In total, 12 stakeholder organisations in the (environmental) educational sector were regularly involved in the organisation of the awareness-raising activities. This enhances efficiency and effectiveness. Moreover, it ensures that the developed activities continue after the project implementation term.	CANG	Stakeholder organisations around the forest

Joint social media (Facebook, Instagram, X) campaign about the ecosystem services of old-growth forests and the old-growth forests in Europe.	SOFO, UNIE	(Interreg) Beech Power Project
Regular exchanges with the Biosphere Reserve responsible for the overall management and public outreach of the WH component part near Angermunde (Grumsin). We cooperated for awareness raising with new stakeholders like the German UNESCO Team for the alumni programme of the voluntary service kulturweit, as well as with local stakeholders like the information centre for the biosphere reserve and the WH component part Blumberger Mühle.	CANG	Biosphere reserve and World Heritage component part Grumsin, UNESCO Germany, Information centre for the biosphere reserve, World Heritage component part Blumberger Mühle

5. Synthesis of the project impact

The impact assessment of the Life Prognoses project covers the development of suitable impact indicators and their evaluation against the project's results. Impact consists of the contribution the project delivers beyond its concretely specified outputs (deliverables). As the nature of the project is 'preparatory', specifically tailored to supporting and EU strategy for nature conservation, the specific objectives of the sub-programme Nature and Biodiversity are pivotal to this assessment, namely:

1. Provide Innovation, Knowledge, & Best practices for the implementation of EU legislation.
2. Create a support base for EU legislation.
3. Catalyse the deployment of outputs for the implementation of EU legislation

The relevant impact of this type of project is the contribution of its outputs to the mentioned specific objectives. Therefore, the indicators are tailored to assess the extent to which the project outputs contribute to these objectives; to assess the 'project impact' on these objectives:

1. Provide Innovation, Knowledge & Best practices for the implementation of EU legislation
    a. Project impact 2: Enhanced scientific knowledge about old-growth forests.
    b. Project impact 4: Strengthening the European forest conservation network (scientifically and on the ground).
2. Creation support base for EU legislation
    a. Project impact 1: Enhanced support regarding the identification and mapping of old-growth forests.
    b. Project Impact 3: Enhanced awareness of the importance of OGFs at the local, national and European level.

    c. Project impact 4: Strengthening the European forest conservation network (scientifically and on the ground).
3. Catalyse the deployment of outputs for the implementation of EU legislation
    a. Project impact 4: Strengthening the European forest conservation network (scientifically and on the ground).

The assessment of the indicators showed that the Life Prognoses project brought (and still brings) significant contributions to the specific objectives in the context of European old-growth forest protection. It is shown that:

1. Innovation, knowledge and best practices, for identification and mapping of old-growth forests, for evaluation of their ecosystem services, as well as for nature education and awareness-raising, are developed, implemented and promoted by the project.
2. A support base for the protection of old-growth forests Europe-wide is construed and fostered by a variety of awareness-raising activities, at all relevant levels (local, national, and European), including a wide range of different target groups.
3. The deployment of the developed knowledge, tools and approaches is promoted for implementation and further development, currently by the strengthened network, and in the future by the follow-up projects that were developed in the wake of the Life Prognoses project (see Life Prognoses After Life Plan).

References

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ANNEXE
A. Development of the impact indicators

Link between the objectives of the Life sub-programme, the impact indicators of the Life prognoses project and the impact of the Life prognoses project

In the table below, the specific objectives of the Life sub-programme are listed in the first column. In the columns next to it, the specific objectives are linked to the operational objectives and outputs stated in the project description of Life Prognoses – and further to the right to concrete potential outcomes and eventually, the impact of these. The outcomes will in most cases, serve as the basis for the development of impact indicators.

Specific objective of the Life Sub-programme Nature and Biodiversity	**Operational objective of the Life prognose project**	**Output (deliverables of the Life prognoses project and project indicators**	**Outcome (related to impact indicators)**	**Impact of the Life prognoses project**
SP1: Provide Innovation, Knowledge & Best practices (scientific objective to support legislation)	Develop criteria to assess OGF	Scientific publication about the definition and criteria of OGF in Europe	Citations of publications by Life prognoses project	Contribution to science about OGF
			Knowledge shared with partners and beyond	Contribution to New collaborations
				New (scientific) projects building on the generated insights.
	Develop methods to assess OGF	Field protocol for the mapping of OGF in Europe	Citations of publications by Life prognoses project	Contribution to Scientific/methodological support for policy-making and legislation at EU level
				Contribution to maps standardized at EU-level
	Develop methods to map OGF	Field protocol for the mapping of OGF in Europe	Citations of publications by Life prognoses project	Contribution to Scientific/methodological support for policy-making and legislation at EU level
				Contribution to maps standardized at EU-level
		Ground truth data collected	Citations of publications by	Increased confidence in the

		for 8 sites in Europe: five biogeographic regions	Life prognoses project	OFG assessment results of the member states
		Validation of JRC mapping database	Increased confidence in the existing mapping	Seizing and contributing to the EU FAIR data standards
		Review paper RS methodologies	Citations of publications by Life prognoses project	Contribution to science about RS methods for OGF assessment
		RS methodology for OGF + validation	Citations of publications by Life prognoses project	Methodological progress regarding RS for OGF assessment
	Develop methods to valuate ESS in OGF and compare OGF & managed forests	Field protocol to assess microclimate, biodiversity, and carbon stock	Citations of publications by Life prognoses project	Methodological progress regarding assessment of ESS in OGF
		Review/summary of the habitat-related proxy's to assess biodiversity.	Citations of publications by Life prognoses project	Methodological progress regarding proxy's for biodiversity assessment in OGF
		Questionnaire to assess ESS recreation and tourism.	Citations of publications by Life prognoses project	Methodological progress regarding mixed-methods for ecosystem valuation based on recreation and tourism
	Calculate ESS in OGF compared to managed forests	Publications and conference presentation	Citations of publications by Life prognoses project	Contribution to science about RS methods for OGF assessment
			Scientific support (reasons) for the protection of OGF	Scientific support for policy-making and legislation at EU level
	Deliver a comprehensive database with the ESS results (EU-wide) + including already existing	Comprehensive database	Knowledge about the ESS delivered by OGF compared to managed forests at EU-level.	Seizing and contributing to the EU FAIR data standards

	data of extra sites			
SP2: Create support base (societal objective to support legislation)	Improved Awareness-raising at the local/national level: general public (visitors and tourists)	Excursions- Fostering direct contact between the public and the OGF	Number of people reached	Increased societal support for policy-making and legislation at EU level
		Social media and website	Number of website visits, number of (Facebook, twitter, insta) posts/campaigns, number of likes, reactions, shares. Number of followers...	Increased societal support for policymaking and legislation at EU level
		Activities for youth/schools and in cooperation with teachers - Disseminating (up to date) information about OGF to school pupils	Number of people reached	Increased societal support for policymaking and legislation at EU level Contribution to nature education for youth (integrated into the school program)
			Cooperation with educators	New collaborations between education sector and the nature conservation sector
		Support and information for local guides - Dissemination of (up to date) information about OGF through the existing network of nature guides	Number of people reached	Increased societal support for policymaking and legislation at EU level
			Cooperation with local nature guides	New collaborations
		Theatre shows about ecosystem services/virtual reality	Number of people reached by cultural activities	Increased societal support for policymaking and legislation at EU level

		walk/silent book - Awareness raising about OGF through art	Cooperation with artists	New collaborations
		Yearly Day of the OGF - Awareness raising about OGF through the services of the stakeholders	Number of people reached	Increased societal support for policymaking and legislation at EU level
		Newspaper publications - Awareness raising about OGF for a broad public	Number of people reached	Increased societal support for policymaking and legislation at EU level
	Improved Awareness-raising at the local/national level: local communities	Visits paid to the local communities - Bridges built for further cooperation with the local people	Number of people reached	Increased societal support for policymaking and legislation at EU level
	Improved Awareness-raising at the local/national level: local authorities	Meetings with the local authorities - increased awareness of local authorities of OGF	Number of people reached	Increased societal support for policymaking and legislation at EU level
	Improved awareness-raising at the European level: European policy makers	High level stakeholder meeting	Number of exchanges	Increased societal support for policymaking and legislation at EU level
		Policy brief	Number of exchanges	Increased societal support for policymaking and legislation at EU level
		Conference presentation	Number of exchanges I	Increased societal support for policymaking and

				legislation at EU level
	Improved Awareness-raising at the European level: forest stakeholders	Webinar/workshop about awareness raising	Number of Information/materials sharing between participants	Societal support for policymaking and legislation at EU level
		Inspiration book	Number of downloads	Societal support for policymaking and legislation at EU level
		Video film	Number of views	Societal support for policymaking and legislation at EU level
SP3: Catalyse deployment of outputs for implementation (technological/operational objective to support legislation)	Contribution to the deployment of generated scientific/scientific-methodological knowledge for policymaking and legislation at EU level	Scientific publication about the definition and criteria of OGF in Europe	Number of mentions of paper on mapping of OGF in EC publications	Deployment of the generated scientific knowledge of the project by the EU policymakers: mapping guideline EC