



# A knowledge baseline on Mediterranean forests supported by innovation

International Workshop Report

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## Glossary

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<b>AI</b>	Artificial Intelligence
<b>ASTER</b>	Advanced Spaceborne Thermal Emission and Reflection Radiometer
<b>BISE</b>	Biodiversity Information System for Europe
<b>CBD</b>	Convention on Biological Diversity
<b>COPERNICUS</b>	EU programme aimed at developing European information services based on satellite Earth Observation and in situ (non space) data
<b>EFE</b>	Spanish Forest Strategy
<b>EFIMED</b>	European Forest Institute – Mediterranean Facility
<b>EFINET</b>	European Forest Information Network
<b>EEA</b>	European Environment Agency
<b>ESA</b>	European Space Agency
<b>ETC-UMA</b>	European Topic Centre on Spatial Analysis and Synthesis-University of Malaga
<b>EO</b>	Earth Observation
<b>EUNIS</b>	European Nature Information System reuniting European data from several databases and organisations into three interlinked modules on sites, species and habitat types
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>FAWS</b>	Forest Available for Wood Supply.
<b>FGR</b>	Forest Genetic Resources
<b>FISE</b>	Forest Information System for Europe
<b>FMPL</b>	Flexible Microwave Payload
<b>FLR</b>	Forest Landscape Restoration
<b>GEDI</b>	Global Ecosystem Dynamics Investigation: High resolution laser ranging of Earth's forests and topography from the International Space Station
<b>GFG</b>	Global Forest Goals
<b>ICP Forests</b>	International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests
<b>IEPNB</b>	Spanish Inventory of Natural Heritage and Biodiversity (Inventario Español del Patrimonio Natural y la Biodiversidad)
<b>INRGREF</b>	National Research Institute of Rural Engineering, Water, and Forestry
<b>ISPRA</b>	Institute for Environmental Protection and Research
<b>IUCN</b>	International Union for Conservation of Nature
<b>IUCN-MED</b>	IUCN Centre for Mediterranean Cooperation
<b>JRC</b>	Joint Research Centre
<b>KBA</b>	Key Biodiversity Areas
<b>LIDAR</b>	Light Detection and Ranging, remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth.
<b>LULUCF</b>	Land use, land-use change, and forestry, also known as Forestry and other land use (FOLU)
<b>LPIS</b>	Land Parcel Identification System
<b>MFE</b>	Spanish Forest map (Mapa forestal de España)
<b>MFRA</b>	Mediterranean Forest Research Agenda
<b>MSPA</b>	Morphological Spatial Pattern Analysis, a customized sequence of mathematical morphological operators targeted at the description of the geometry and connectivity of the image components

<b>MITECO</b>	Spanish Ministry for the Ecological Transition and the Demographic Challenge
<b>NFI</b>	National Forest Inventories
<b>OECM</b>	Other effective area-based conservation measures
<b>RADAR</b>	Radar remote sensing and imaging is the use of radar waves to detect, measure, and map the properties and features of objects and surfaces on the Earth or in space
<b>REDIAM</b>	Environmental Information Network of Andalusia ( <i>Red de Información Ambiental de Andalucía</i> )
<b>ROAM</b>	Restoration Opportunities Assessment Methodology
<b>RS</b>	Remote Sensing
<b>SFM</b>	Sustainable Forest Management
<b>SIEX</b>	Spanish Information System of Agricultural Holdings ( <i>Sistema de Información de Explotaciones Agrarias</i> )
<b>UMA</b>	University of Malaga
<b>UNDP</b>	United Nations Development Programme
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change

## EXECUTIVE SUMMARY



Following the completion of a four-day hybrid course on remote sensing technologies applied to forest mapping with the participation of 32 students (14 in person and 18 online) at the end of May 2023, the international workshop for **A knowledge baseline on Mediterranean forests supported by innovation** was held on 2 June 2023 hosted by the University of in Malaga, Spain, followed by a guided visit to the Natural Park of Montes de Málaga.

Co-organised by the European Environment Agency (EEA) and the European Topic Centre on Spatial Analysis and Synthesis and of the University of Malaga (ETC-UMA) in the frame of the EU ERDF funded project EnBiC2-Lab, this two-day event brought together a community of European and Mediterranean key players to address the status of regional political and research agendas in support of forests at various levels.

The international workshop, which included time and space for an exhibition and bilateral networking, was structured in four sessions addressing Mediterranean forest information to support and guide action from several angles. The panellists invited to contribute with their findings and engage in a dialogue ranged from European and Mediterranean institutions to national level public organizations, researchers and intergovernmental institutions, as well as practitioners, students and interested parties, with an overall participation of around sixty people.

The workshop was held in English in person, with only two online interventions, to foster interactions with the audience and roundtable discussions based on questions and answers. Main messages are summarized below:

- an overall need to better coordinate forest data collection and processing methodologies both across countries and among researchers and public bodies responsible for national reporting to EU/international obligations to agree on a feasible transnational model to follow;
- the benefits of combining traditional monitoring practices in-situ with new technologies stemmed from satellite and remote sensing available data combined with artificial intelligence tools to facilitate up-to-date information regularly, including alert systems for land changes as in the case of fires or urbanization;
- the advantages of producing different thematic geospatial maps, data and tools to answer the multiple needs of EU, Mediterranean, national and local stakeholders, contributing at the same time to monitoring and management of forest with an ecosystem-based approach at Mediterranean level;

- the integration of conservation objectives in the design of spatial products to help comply not only with reporting obligations at various levels, but also to international targets of conservation and restoration at regional level;
- Collaboration efforts to produce the most useful type of data needed to assist governments, stakeholders, and societies to conserve biological diversity in forests, both inside and outside protected areas, in the Mediterranean region is of utmost importance. It relies on identifying the priority areas to focus conservation efforts, particularly through re-naturalization and restoration actions.
- Capacity building, within public administrations and stakeholders engaged in supporting their work/ forest inventories, on new data technologies linked to ongoing research, and better communication to the public at large via visual dashboards are advisable to engage as many stakeholders as possible in data collection, processing, reporting and communication;
- Empowering and training young professionals, especially in the South realm, can support ministries and co-design approaches complementing traditional ways to develop inventories and the use of technologies to fill data gaps through science and evidence-based approaches.

The workshop concluded with the assertion that this **multidisciplinary Mediterranean Forest coordination group could give continuity to this innovative work** across the region. However, **funding** opportunities in the frame of the ongoing and future projects and/or international mechanisms **need to be secured** to engage the necessary human and financial resources, and agreed workflow mechanisms across institutions and countries.



## KEY MESSAGES



### SESSION I: Visions for Mediterranean forests: the policy scenario

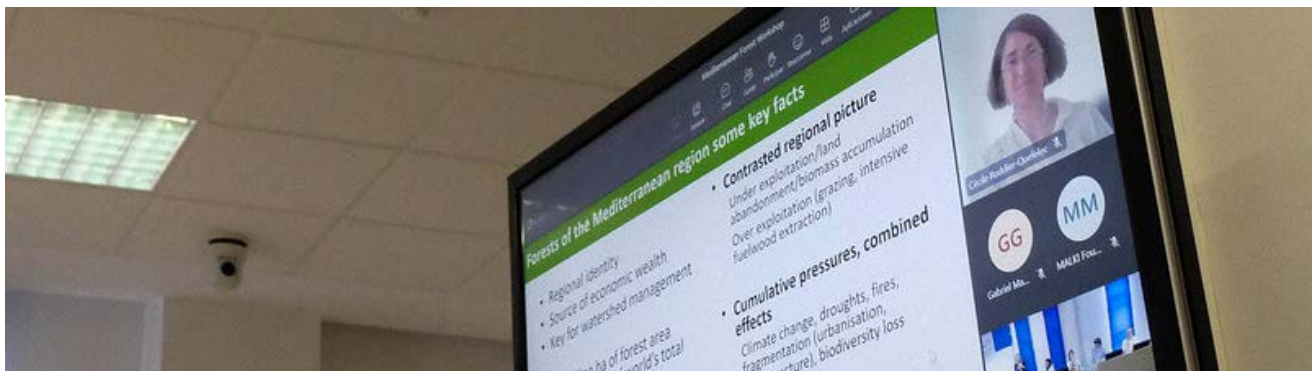
- At the European policy level, current forest linked strategies seem to be better aligned in Europe under the **Green Deal**. When it comes to data / data platforms: FISE in Europe and some national structures (EIKOS for Spain for example) are relevant **platforms for forest linked data to answer policy questions at European/ national scales**, but challenges remain. Accessibility to relevant supporting data is very much needed.
- In the Mediterranean, no common forest strategy implemented among countries is yet established. Reasons include the **reliance on project-based developments rather than a systemic approach** with clear funding and regulation among countries. Other issues remain linked to the localisation of issues (**public versus privately owned land**).
- **Solutions to map forests** more holistically in the Mediterranean region include **enhancing the coordination and targeted research**, and the ways to **collect data** and statistics; ensuring capacity building and **empowering young experts** to complement NFI with quality checked EO outcomes. Instruments include closer and more effective **cooperation** with and within **countries** and **connecting better research with ministries/agencies**.
- **Governance** is also important and needs to be strengthened, through better **coordination** between the **Barcelona Convention** and relevant institutions, on terrestrial aspects (namely forests) at **Mediterranean level**.

## SESSION II: New approaches to map forests - advantages, limitations, and complementarities

- **Traditional forest mapping** and **national inventories** record very important information. However, the process is costly, **time-consuming** and uses different sources of data and sometimes, even **different methods**. Therefore, it is difficult to obtain frequent maps and inventories and the data is **not comparable**. Also, they do **not respond to urgent forest matters** nor small scale changes.
- **New technologies and methods** are being developed mostly in **the frame of research institutions / universities**. Only in certain cases there is coordination between the latter and **governments** and implementing institutions to **transfer** this knowledge and do a transition to **hybrid traditional-technological** approaches.
- **Innovative forest mapping**, supported by technologies namely remote sensing, artificial Intelligence, cannot substitute traditional methods. However, they can **complement traditional ways**. For instance, by **screening priority** areas for action or early **warning of risks**. For this, it is important to create **multi-disciplinary groups** and build **capacities** in all departments of knowledge.
- To make appropriate use of forest mapping results, it is critical to understand **and know how to interpret each forest-related map and data product**, their **accuracy, as well as** their limitations.

## SESSION III: Technologies to support forest monitoring

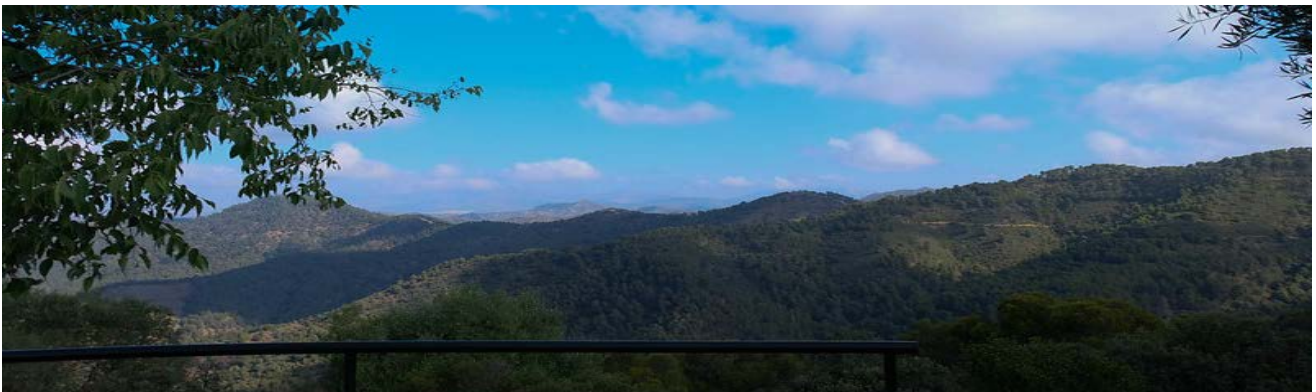
- There are many **technologies and geospatial data available** to support forest mapping, although some are still underexplored, such as LiDAR.
- Progressive **implementation and** use of new technologies for regional (supra-national) forest mapping is crucial and can be done **step by step** if necessary, for instance, start doing maps of forest productivity using LiDAR airborne data, **a country at a time**. Later, try to do a coordinated effort on a supra-national level.
- There are many **products** at the **European** level oriented to forest monitoring, for instance, the **high-resolution** layers, which can be used to develop spatial **forest indicators**.
- **Automated techniques** can help in the coordination of forest mapping at regional/national scales, as different countries and regions **may have different methodologies**, forest **definitions**, etc. However, there must be an effort to **standardize methods before producing products and maps**.





## SESSION IV: The way forward for Mediterranean forest protection - a conversation between managers and scientists

- **Forest maps are important to study forest dynamics and do predictions** of species migrations, in a scenario of changing climate, to prevent risks and soil erosion, such as flooding, when the forests are gone and do not hold the ground, fires, etc.
- The generation of a reliable / high accuracy forest map is only the beginning of the process of an improved supporting system to forest monitoring and management. Following steps include a wide list of possible **forest by-products to support forest action and decisions** from different angles.
- The development of the first ever Mediterranean wide **forest types map was a complex and long process** that included several steps including the identification the need of what kind of map in agreement with EEA and Silva Mediterranea, the funding, the skills to implement it and the regional network of validation groups from across the region.
- The Mediterranean wide forest typology map is a very relevant and useful Mediterranean wide baseline to support forest **management and decisions in a more informed manner. Nevertheless, there is still room for improvement** of the product and further developments. What is clear is that such a forest Mediterranean baseline is now available and accessible to stakeholders, but this process needs to be repeated in time with a regular frequency to support spatial and temporal assessments in the region.
- This innovative Mediterranean forest **mapping approach can be repeated** to focus on mapping other ecosystems in the region such as shrubland, which are after all intrinsically related to forests, and where data is lacking.
- It is important to **develop tools such as dashboards or viewers** to make the maps and products available to a larger audience, especially for non-experts in remote sensing. These tools can extract stats, plots and maps of specific areas on the go, implementing basis **analyses by combining several layers**.
- **Tools that provide quick alerts on forest fires are needed.** Some initiatives like AFES or Copernicus fires observatory, are reporting fires at a temporal scale of every 3 days. especially to alert fires brigades and municipalities.
- This event focused on forest mapping helps connecting different events and works to **foster multidisciplinary conversations**: i.e., the State of the Mediterranean Forests report (FAO), Mediterranean Forest Week, work with national focal points through Eionet, etc.



## THE WAY FORWARD



Participants agreed that **a multidisciplinary approach to forest information and data is needed to reach a Mediterranean knowledge base that could support monitoring, management, restoration and conservation policies and measures** at regional level. Socio-economic information should be collected and made available to adapt to different situations and guarantee stakeholder involvement where needed.

The compilation of national and in-situ data among different Mediterranean countries, in addition to national responsibilities for reporting at EU and Mediterranean level to EU institutions and international conventions such as the Barcelona Convention, is heterogeneous across countries and usually only project-based. To counteract the unbalanced access to project funds, flexible funding mechanisms should be enhanced, particularly those engaging countries from non-EU countries in the Mediterranean like Horizon Europe, the EFI grants, the ENI CBC MED and the Interreg programmes.

The process to develop **a Mediterranean Forest typology map** led by ETC-UMA has proven to be an effective way to **combine** public, open access **data** by countries with volunteer **scientific research** results. This approach **will continue**, subject to funding available, to complete the information gaps identified and to **sustain this multidisciplinary partnership network** to foster and develop future project proposals to enhance the capacity of the different stakeholders involved. The data and the preliminary data assessment will be made available through an interactive dashboard on Mediterranean forests, and regularly updated with the feedback from the parties involved.

The completion of the Mediterranean typologies map will be **accompanied by capacity building activities** and will combine traditional and innovative data collection and processing tools and methodologies, to answer the needs for more regular up-to-date information. This new approach aims to help establish warning and risk assessment systems almost on real time, pinpoint priority areas for conservation and restoration, and support a **collaborative working environment** for EU and non-EU countries to tackle the challenges of climate change and urban development faced by Mediterranean forests.

Current calls for proposals will be screened and new formal/informal partnerships will be encouraged to give continuity and enough financial and human resources support for the implementation of a multidisciplinary ecosystem-based approach.

## CONTRIBUTIONS PER SESSION

### *01. Visions for Mediterranean forests: the policy scenario*



Next to the welcoming words by the Enbic2Lab and University of Malaga representatives, the first session informed about the vision and political mechanisms to ensure healthy and resilient Mediterranean forest ecosystems in the next decade at Global, EU, Mediterranean, and national level. Political instruments and governance tools at hand were highlighted along the data gaps to strengthen a fully Mediterranean-wide political agenda for forests. Cross cutting success factors, barriers, and key actions for healthy and resilient Mediterranean forests were reviewed from a policy perspective. Below a summary of key topics highlighted and discussed:

- 91% of Mediterranean forests reported are degraded or fragmented due to cumulative pressures and provide a contrasting overall picture with under exploitation/land abandonment/biomass accumulation versus Over exploitation (grazing, intensive fuelwood extraction).
- At global level, the UN Strategic Plan for Forests 2017-30 (Global Forest Goals 2017-2030 and Global Core Sets of forest-related indicators) builds on efforts started in 1990 with Agenda 21. International forest processes include national and regional reporting.
- There is **no common forest strategy for the whole Mediterranean** region, though a **new systemic approach** has been set with the EU Forest Strategy 2023, the EU Green Deal and New Restoration Law whereby other EU policies need and can benefit from forest related information from different sources.
- Criteria and indicators for Sustainable Forest Management tackle **different types of data**, ranging from the extent of forest habitats, biological diversity, health and vitality, and the linked ecosystem services to the legal and institutional frameworks set and the socio-economic purposes it ensures.
- Ongoing efforts at EU level are aiming to use integrated / holistic approaches to **bring knowledge on forests together** placing this in cross-cutting platforms i.e. Forest Information System for Europe (FISE); Biodiversity Information System for Europe (BISE); European climate and health observatory.
- There are remaining gaps to ensure a better policy implementation which relate to **ensuring data quality, consistency, availability and accessibility**; the integration of diverse data sources; the enhancement of stakeholder **engagement and coordination, capacity building** and technical expertise; monitoring and evaluation systems, and **financial resources**.

Territorial actors advised on What is the challenge faced when it comes to availability of data for reporting on the forest condition and on its trends, and for advising your target stakeholders on action prioritisation at various geographical scales, as follows:

At EU level, from EEA's perspective, there is a need for coherence and consistency, and harmonisation, bridging science, monitoring and policy and to capture transversal aspects that reflect the cross-cutting nature of forest ecosystem to support overall resilience and multifunctionality of forest/ex forest together with the economical part (bioeconomy) and socio-eco aspects. Climate change trade-off (carbon storage versus renewable energy, fires/storms, etc) LULUCF law and strategies for climate change adaptation.

- Covering 38 countries, EEA instruments and tools linked to evidence and underlying data still missing and needed to ensure an effective monitoring system of Pan European forests rely on national monitoring as this is the country's responsibility, not EEA, which gathers this information and knowledge at pan-European level using several platforms (FISE – FMPL).
- There is a need for more data harmonisation and to make it open access to reach country comparability. Capacity building can be reached through exchanges of experience.
- The current forest monitoring scheme is very resource demanding (5 years reporting), technologically and financially dependent on the capacity of each country. Consistency with other monitoring systems (Forest Europe, ESTAT, Forest Resources Assessment).
- At EU policy level, the new EU Horizon Europe for Research and Innovation is undergoing a systemic change in the way it tackles information and insights to create forest knowledge for action, with fundamental changes in knowledge and governance. These changes would include:
  - Systems literacy: from certainty, prediction, and control to uncertainty, complexity, foresight, and anticipatory thinking;
  - Systemic policies: a systemic approach to policy coherence that looks across domains and scales;
  - Participatory and deliberative: better harnessing of ambition, creativity and power of citizens, businesses, and communities, through enhanced participation and public engagement;
  - Polycentric: enabling local action by empowering communities, in recognition of the many legitimate perspectives on desirable futures; and a
  - Networked knowledge system/architecture.

At Mediterranean level, from FAO's perspective, a coordinated approach still needs to be included throughout the Mediterranean basin to obtain reliable information and tools based on sound science, as in the case of forest genetic resources.

Prioritising target areas can increase the efficiency of forest and landscape restoration, while cost-effectiveness can be used to identify priority areas or hotspots for restoration. Most prioritisation analyses are based on one or a few criteria – commonly identified by researchers – with few contributions from other stakeholders. Although some studies and management tools have succeeded in integrating a variety of criteria identified and weighed according to participative processes, priority criteria may not be restricted to particular aspects of ecosystem structure, function and services but may include other features, such as distance to the nearest populated area, accessibility, or the local unemployment rate. **Priority maps**, based on criteria identified through **participative processes** and cost-effectiveness analysis, can facilitate the identification of **high-priority areas** with the highest levels of biodiversity and services for a given investment. This can also be a step towards increasing the efficiency and support for restoration programmes.

A similar approach could be taken to answer the lack of harmonized monitoring mechanisms, lack of access to data and data standardisation. The most critical FLR monitoring challenges include the improvement of **stakeholder coordination and participation**; meeting the needs of different audiences at different levels; implementing sustainable assessment processes; including socioeconomic aspects; and **linking monitoring across all levels** (local, national and global).

The FAO “Global guidelines for the restoration of degraded forests and landscapes in drylands: building resilience and benefitting livelihoods”, the UN Decade Task Force on Best Practices led by FAO, and the Standards of Practice of Mediterranean forest restoration by SER and WWF are paving the way in this direction. In fact, knowledge-sharing requires the establishment of common platforms for data and information-sharing across the region, including encouraging the use of global platforms, where to share and disseminate data that can help in exchange with other Mediterranean countries and worldwide.

**Improving dialogue and collaboration at the regional level** is one of the mandates of Silva Mediterranea and the publication of the State of Mediterranean Forests every 5 years is helping to facilitate this dialogue that aims at supporting policymaking and forest management in the face of rapidly changing climatic and land-use conditions in the Mediterranean area.

Main challenges faced by Mediterranean countries to bridge common forest policies and communications on the status and progress of Mediterranean forests are the **limited funding sources for the region**. Whereas EU funding sources allow sometimes limited participation of North African and Near East countries, this is **in contrast to the need for coordinated activities**, which is essential to have effective results of the policies in the forest sector at the Mediterranean scale, especially under the common challenges deriving from climate change.

There is however an evident need to **improve the dialogue between the academic world and policymakers** to make policymaking more research and science-based. In many cases, national focal points to organizations like FAO do not have good connections with research institutions. The situation is however improving thanks to the work of national counterparts and partners such as EFIMED, and to events like this workshop in Malaga, the Mediterranean Forest Week or the EFI Mediterranean network Forum having as objective connecting forest researchers, policymakers, and practitioners across the Mediterranean. Recently, Silva Mediterranea has been promoting the activities of its Med Youth Task Force, with the long-term objective of creating a dialogue among the young generations and the “higher” levels dealing with the forest issues in the region resulting in greater involvement and participation.

At **national level, in the case of Spain**, the main **challenge** when it comes to availability of **data for reporting** on and for advising Spanish regions on **the prioritisation of action** concerning forest ecosystems refers to the needed knowledge to ensuring healthy, biodiverse and resilient forests across the Mediterranean to meet the growing demand for its many and diverse ecosystem services, such as biomaterial supply, carbon sequestration, erosion control or water regulation as they are under increasing pressures, climate change and risks like forest fires and exacerbating human-induced pressures.



**Effective coordination of many forest-related policies, plans, targets and monitoring systems is the main challenge.** There is a risk of setting policy targets and taking action on one goal without considering other objectives that forests will have to meet. This could lead to unwanted concessions and inconsistent measures in policy formulation and implementation. An integrated needs assessment in different sectors is needed to balance overall ambitions with the potential of forest multifunctionality. **Integrated forest planning** based on clearly defined long and medium-term national **strategic objectives** is key to enabling efficient monitoring and forecasting, which in turn will allow planning performance to be assessed and adapted if necessary. In this context, the Spanish Ministry has tried to identify key needs, coordination mechanisms, opportunities and challenges for developing and improving planning for forests, as well as good practices in place, giving as a result the so-called **Spanish Forestry Programme**, which comprised 3 instruments: the Spanish Forest Strategy, Forest Plan and Sustainable Forest Management Basic Guidelines. The new Spanish Forest Strategy aims to become the reference instrument that establishes the long-term general strategic framework for Spanish forest policy (EFE 2050) in a coherent, consensual, and participatory manner and provides guidelines that enable its articulation and governance, respecting the distribution of powers between the central government and Autonomous Administrations, as well as the forestry planning by the Autonomous Communities in their territories. The Spanish Forest Plan is a long-term planning instrument for Spanish forest policy that defines the measures and means necessary to develop the strategic lines established by the EFE 2050. The Plan must be in accordance with the General State Administration own competences with respect to forests, both those exclusive to it and other competences shared with the Autonomous Communities. It determines the initiatives, measures and actions or activities for the next decade (2022-2032).

Concerning how is **Spain using technologies and collaborating** with Spanish regional authorities to support forest mapping at national level in line with the Forest Plan, and how are those efforts responding to the new EU Forest Strategy for 2030, in compliance with the international obligations and commitments acquired by Spain, it is necessary to maintain all available information instruments (inventories, mapping, monitoring networks, statistics, etc.), incorporating data related to new demands or opportunities of the sector and those arising from new challenges and threats affecting mountains. The measures to develop this line of action will take into account the following strategic orientations set out in the Spanish Forest Strategy:

- Develop an agile Spanish Forest Information System, accessible and integrated in the Nature Data Bank, at the service of the needs of the sector, that incorporates new technologies, such as those related to land observation systems, land analysis with technologies based on the management of large volumes of data and artificial intelligence, linked open data, etc.
- Advance the digitalization and accessibility by the public to forest information and the National Archives, strengthening its connection with the existing archives to ensure its conservation and use.
- Promote coordination and integration with other European, state and regional (sub-national) bodies that generate territorial information of forest interest.

This is planned to be achieved through two kinds of measures:

A) **Administrative coordination procedures**; mechanisms for **institutional collaboration**, cooperation and **sectoral participation**. This will be achieved by strengthening the Forest Information and Forest Mapping Working Groups and evaluation of the forest statistics system to foster communication and joint actions between **National and regional** governments merged in one working group addressing new international initiatives such as the negotiation of the EU Forest monitoring Regulation, the integration of the Knowledge Platform developed by MITECO, the status of the National Forest Inventory and the integration of the forest sector in the System for Fire Extinction. Additionally, **coordination with the industrial sector** associated with the forestry sector is encouraged to improve the availability of information on the production and consumption of forest products, promoting the structuring of the sector and improving its composition.

B) Development of **measures and actions on the territory**, analysis and studies like integration of new technologies in the National Forestry Inventory, improving their quality and maintaining the historical series of relevant variables to increase knowledge of forest ecosystem services; the implementation of a methodological review and a five-year National Forestry Inventory of Productive Species of the Peninsular North taking into account its integration with

regional inventories; the development of the Poplars Inventory of Spain and potential cultivation area (continuation of the Cartographic Series Map of Poplars of Spain, and updating and maintenance of the Poplar Directory of Spain).

Other measures and actions are the Improvement of the Forest Map of Spain and its associated products and its coordination with agricultural mapping (LPIS); Preparation of a study to improve the identification and quantification of forest areas available for timber supply (FAWS) considering the physical, environmental, legal and socio-economic constraints that hinder or impede timber harvesting; Design of methodologies to incorporate forest management into the calculation of carbon uptake by forests; Improvement and continuous updating of Spanish Forest Information and statement of the Spanish Forest Report provided for in Article 28.5 of the Forestry Law, based on available forest information tools; Preparation of the Spanish Accounts for Forestry, within the framework of the European Forest Accounts, following the methodology of EUROSTAT and the United Nations.; Standardization of the variables that make up the Spanish forest information (IEPNB and Spanish Forest Statistics) to be estimated with comparable criteria in all regional inventories; Development and dissemination of forest indicators created in the field of international forums; Maintenance and continuous improvement of forest damage monitoring networks, promoting their integration with the IFN and data from regional networks, as well as methodological improvements in the collection and exploitation of information (carbon, affected areas...); Organisation, inventory and digitisation of forest documentary funds - making them available through tools that facilitate access to entities and the general public and keeping the consultation service and promotion of the fund through dissemination activities; and the Creation of linked, open, accessible and integrated forest information systems in the Nature Data Bank by means of the new knowledge platform.

From a **conservationist** point of view such as IUCN's, the type of data needed and available to assist governments, stakeholders, and societies to conserve biological diversity in forests in the Mediterranean region is of utmost importance. Their approach to forest conservation in the area focuses on increasing conservation efforts, particularly through re-naturalization and restoration actions. In this context, the applicability of the **ROAM methodology**, which is a framework developed for countries **to assess forest and landscape restoration** opportunities and identify priority areas at the national or sub-national level, is being explored. The ROAM assessment can be conducted by a small team in collaboration with stakeholders, and it can provide the following outcomes:

- Identification of priority areas for restoration.
- Creation of a shortlist of the most relevant and feasible intervention types for restoration within the assessment area.
- Quantification of the costs and benefits associated with each intervention type.
- Estimation of the additional carbon sequestration potential resulting from these intervention types.
- Analysis of finance and investment options for restoration in the assessment area.
- Evaluation of the readiness for restoration and development of strategies to address major policy and institutional challenges.

The effectiveness of the ROAM assessment relies on the availability of spatial datasets, **so the more information available, the better**. Additionally, to complement the qualitative assessment of forest status, valuable data for prioritizing intervention areas can be obtained from instruments such as the **IUCN Red List of Ecosystems**, the KBAs database and the forest status update of the FAO.

The NBS (**Nature-based Solutions**) standard of IUCN can then be applied to the identified restoration opportunities, to ensure that restoration actions undertaken in a particular territory align with the needs of society and conservation. By adhering to these principles, a proposal with the Tunisian Ministry of Environment for a GEF (Global Environment Facility) project is under preparation.

Other tools at hand used by IUCN that can ensure a more effective implementation and monitoring of conservation measures in forest ecosystems in the next decade and that may allow comparability of results among countries, are the **OECMs**. These refer to areas that effectively conserve biodiversity **outside of designated protected areas**, and that can

be governed and managed under various regimes involving a diverse range of actors, including Indigenous peoples and local communities, the private sector, and government agencies.

The recognition and support of OECMs present an opportunity to acknowledge the de facto conservation efforts that are taking place outside protected areas. This is particularly important considering that protected areas alone may not be sufficient to conserve all biodiversity values or address specific conservation challenges. In the post-2020 Global Biodiversity Framework, OECMs are referenced as a key approach alongside protected areas for biodiversity conservation. This recognition highlights the potential effectiveness of OECMs in contributing to conservation goals.

However, the challenge lies in monitoring and ensuring conservation outcomes are achieved within OECMs. **Monitoring** efforts, such as assessing the status of biodiversity and ecosystem health, can be more **complex** in OECMs compared to protected areas due to the **diverse governance and management regimes** involved. Establishing clear criteria, indicators, and monitoring protocols specific to OECMs can help address these challenges and ensure effective conservation outcomes.

Another important tool for monitoring the conservation performance of forests is the IUCN **Green List of Protected and Conserved Areas**. The Green List is a standard for assessing the management effectiveness of protected areas, specifically measuring their performance in achieving conservation objectives. It directly addresses Target 3 of the new Global Biodiversity Framework (GBF). This assessment can be applied to all forests that are part of protected areas.

For forests outside of protected areas, another system that effectively monitors biodiversity is the **Forest Stewardship Council (FSC) certification**. The FSC certification is a globally recognized certification scheme that promotes responsible forest management practices, ensuring that forests are managed in an environmentally, socially, and economically sustainable manner. The Green List standard is partly based on the FSC certification.

By incorporating the Green List assessment and FSC certification, comprehensive monitoring systems that cover both protected areas and forests outside of protected areas can be established. These tools play a vital role in evaluating the conservation performance of forests and promoting sustainable management practices.

The initiative to bring new technologies and innovation research into a **dialogue** with public authorities, managers and conservation actors was praised **to complement the knowledge base needs** and uses Mediterranean forest ecosystems **across the region** and different sectors, users and scales.





## *02. New approaches to map forests - advantages, limitations and complementarities*



Session II showcased latest developments in knowledge, tools, and information systems at different scales in the Mediterranean to support a more effective forest monitoring, a **forest typology map** and the online data platform by ETC-UMA in collaboration with LifeWatch ERIC Enbic2Lab project. Initial regional results building on Earth Observation and technological tools on the extent and distribution of major forest types in the Mediterranean were debated with the audience.

The first ever Mediterranean forest typology map was presented by ETC-UMA, developed in the frame of the Enbic2Lab project in collaboration with volunteer experts from across the Mediterranean through the organization of an open Hackathon and the joint validation of a working methodology and standardization of results, followed by a 4-day hybrid course on remote sensing hosted by the University of Malaga. The hackathon winners, beneficiaries of the course, contributed with their experience and knowledge to the discussions on the key challenges.

The production of this forest types map based on dominant species has used artificial intelligence / machine learning tools for environmental applications to support traditional forest monitoring with the objective of improving the spatial and thematic resolutions of the existing forest cartography in the Mediterranean, produce a map that is harmonized across countries and contribute to the definition of forest types with a bottom-up approach for the Mediterranean eco-region. A scientific paper for an “Scalable approach for high-resolution land cover: a case study in the Mediterranean Basin” has just been published describing the full methodology. For this, three main map products are now available, namely:

- Land cover map (similar categories to Copernicus Global Land cover)
- Forest typologies map: coniferous, broadleaved, mixed forests in open and dense forests
- Forest types based on dominant species

For land cover ground data, 42,099 samples have been processed coming from National Forest maps (31,954 samples) and the Hackathon (10,145) whereas for Forest ground data a total of 32,907 samples were collected. Main results of this collaborative data collection and processing include an improved Land Cover Map for the Mediterranean with circa 90% accuracy, a new Mediterranean Forest Types Map, based on dominant species, a working model that can be transferred to other world regions, an harmonized and consolidated Forest Database, for cartography purposes together with a spectral library of Mediterranean forests, for Sentinel-2 and ASTER data. This collaborative work has helped set up a solid network in 16 Mediterranean countries including Ministries, universities, research institutions, National Parks and NGOs. The Mediterranean Forest typology map has a 10m spatial resolution, with an accuracy for dense forests of 97.2% and for open forests of 98.3%, each differentiating between needle-leaved, broad-leaved and mixed forests.

Zooming into the Iberian Peninsula map, it was highlighted that the Forest types map per dominant species in Spain contains up to 86 different forest classes, which was reduced for the Mediterranean map. The resulting maps for Morocco, Italy, Lebanon and Turkey were also exposed.

The advantages of applying this methodology assisted by remote sensing technology is higher resolution maps with 86 types of forests per dominant species (in the case of Spain); the potential production of yearly maps with similar accuracy and a methodology repeatable to other ecosystems/regions. In brief, traditional and innovative methodologies can complement each other, with RS/AI methods that could cover inter-periods of NFI and photointerpretation mapping; field surveys could be adapted to tackle selected variables and be implemented more periodically and simultaneously across countries and RS/AI maps used as base for digital photointerpretation to update existing maps.

The presentation was followed by a series of exchanges by country experts highlighting the limitations and challenges faced by each in the use of traditional mapping and forest inventory methods, the level of incorporation or planning of innovative methods like automatic mapping, and their perspective over the implementation of more innovative methods in their current mapping / National Forest Inventory workflows, which can be summarized by country below.



In the case of Italy, the first national forest inventory was implemented in 1985 and the last one in 2015. The process is very robust divided in three phases and based on plot work. Main limitations refer to the lack of spatial specific products, but rather statistical information. Alike, the study of disturbance needs more precise data. Other limitations refer to the timeframes, as the frequency of forest maps does not respond to the needs of forest managers and do not include local level info to be able to reach on time.

In the case of Morocco, two mapping cycles were carried out; the first one between 1994-2005 and the second between 2005 and 2018. The information carries used are aerial photographs and satellite images as well as open-source images. The adopted classification is consistent with the land cover categories of the IPCC. Two types of limitations were observed: organizational (cycle duration, divergence in the temporal extent of the data used, and significant mobilization of resources) and technical (heterogeneity of the carries used, problem of comparability of the results of the two cycles).

At present, reflections on the realization of the 3rd cycle have been launched by capitalizing on the achievements obtained and on successful experiences in countries similar to the context of Morocco for drawing a roadmap for the realization of the 3rd cycle. Similarly, a project aimed at sampling mapping was initiated in 2014, based on the use of FAO's Open Foris products (particularly Collect Earth) for the development of national land cover maps and for monitoring changes. Also, several innovative methods and tracks are currently in the test phase, some of which are at advanced stages: Test for the use of AI for the detection of forest offences, testing the use of terrestrial Lidar data, the

use of drones for mapping forest areas, and for monitoring the performance of the Agency's activities (monitoring and control of the spread of forest fires, counting the success rate of plantations ...).

In Tunisia, limitations refer to the lack of comparability among inventories which points to the need to work on the harmonization of classification systems by FAO and other institutions, trying to integrate new innovative methods in the future.

As for Lebanon, a certain level of innovation has been applied for forest fires and land degradation initiatives, with good cooperation examples between public institutions and research centres. The adoption of research applied science (research with a practical use) is a good example of the cooperation with the Ministry of Environment for the finalization of the National Forest Fire Strategy. Moreover, the National Biodiversity Action Plan linked to the Convention on Biological Diversity incorporates information about protected ecosystems, particularly forests in Himas (a Lebanese protection denomination) and other natural sites, with an information-based approach for protected areas in the country. Concerning innovation, satellite images have been used to monitor conversion of land (object-based analysis approach, not at pixel level) as related to carbon emissions and removal, Also, under the UNFCCC work on the forest cover with high resolution images compared with global datasets and national data has incorporated the use of AI to identify the loss of land due to urbanization funded by UNDP.

Exchanges among panellists and the audience led to the following recommendations:

- Technologies available need to be better understood, together with the cost involved for interested countries.
- The workflow and the development of data processing and analysis protocols need to be widely known and be time efficient.
- The technical capacity and human resources to interpret data need to be secured to obtain comparable results, which would be achieved through partnerships with data provided.
- Forest mapping models need to be correctly interpreted and standardized across the region to be comparable.
- Forest disturbance identification (fires, illegal logging) needs to be faster in order to react to it quickly, as the current 5/10 mapping lapse is not sufficient, particularly in the face of climate change and increasing human pressures.
- AI and technologies alone are not enough, and data needs to be validated on the ground – the human capacity to interpret data is crucial.
- Different scales can be used for different purposes (local, national, regional) with training and capacity building as a requisite to obtain the best combination of traditional and innovative (aerial, RS) tools available.
- A Mediterranean global approach is very important to overcome the current discrepancies in forest classification systems and terminology, in and should be cost-efficient and based on new common indicators identified.
- Spatial accuracy could be sacrificed for the benefit of more updated information, particularly to help ecology and conservation and address forest related crises,
- Multistakeholder dialogues are needed across geographical scales (world, Mediterranean, EU, national, regional) and sectors (policy makers, researchers, conservationists, forestry sector) to consider multiple variables and map users' needs.

### 03. Technologies to support forest monitoring



Session III focused on collaborative actions developed to build capacities on the use of new technologies, tools, and open-source data for improving and validating the knowledge on forests at different scales in the Mediterranean region as well as experiences from outside the Mediterranean. The session highlighted the role that collaborative work and the transfer of skills and experience among relevant institutions and individuals can play to keep a Mediterranean major forest type map up to date.

Selected technologies and tools available to support Mediterranean region's forest data and mapping were presented by ETC-UMA, highlighting the relevance of questioning who is the audience, the necessary steps to collect and process data, and how to engage the various stakeholders affected. Among the various data products available, interactive data viewers and statistical dashboards were discussed. As a practical example, a Mediterranean forest dashboard was explained, with the different functionalities available. The benefits of using such tools is that it allows the user to extract statistical information without needing particular software or training, providing at the same time an overview at regional level and offering the option to personalize the information and enrich it with biodiversity images, stories and access to scientific data for further research. The content in the sample dashboard can also be filtered by country or by type of forest, with the possibility of personalizing filters for different purposes.

Another example of an online database developed in collaboration with the Carpathian convention on virgin forests showed that transnational work with agreed standards can be successfully implemented. These dashboards however need to be curated and do not offer instant/real time information but can help raise awareness among the general public.

Beyond this type of data products, the EEA reminded participants of the spatial data infrastructure at EU level and the different eionet interest groups, which can make use of all the maps therein stored and downloadable for different purposes, but also the need to provide capacity building opportunities like the Hackathon across countries so that data management is spread, and technologies transferred.

At national level, the case of Italy was exposed, underlying the fact that Mediterranean forests have a number of species higher than many other countries and therefore different and Mediterranean adapted algorithms need to be used. In this case, the new national forest strategy includes RS and mapping information that is made available to managers and policy makers, using drones and other technologies, through decision-support systems, co-designed with policy makers and managers to answer their real needs. The vision is that maps need to provide estimations and work variables, and disturbance indicators for sustainable development should use up-to-date data tools for queries. Data collection is implemented for reporting at different levels (national, EU, international), with the inconvenience that each region uses different classification systems.

The AGRIDIGIT project in Italy was mentioned as national initiative making use of remote sensing and new technologies to help monitor wood and agricultural resources, producing forest models and feeding into further analyses on

disturbance algorithms and carbon pools among other. The GOSURF platform offers access to data as Decision Support System, as forest management needs of several scales, like monitoring multi-taxon biodiversity with satellite images.

Biodiversity monitoring can also benefit from the provision of open access data. Indeed, in addition to AI, data provided by citizens through smart phones and specific apps in standardized formats can support live monitoring and assist with in-situ information, engaging citizen science in the process.

The role of collaborative research work, transfer of skills and experience among relevant institutions and individuals is key in obtaining and processing forest related data. However, considering the particularities of Mediterranean forest ecosystems, to keep a Mediterranean major forest-type map updated and improved the European Forest Types Classification schemes should be updated/modified for the MED bio-region, not just EUNIS classes

Forest remote sensing in Sweden was presented among other ongoing initiatives. The fact that models can provide estimates and that variances in classes should be considered in particular for the Mediterranean region, where the eco-region includes different types of habitats. **To keep a Mediterranean major forest-type map updated and improved**, it was recommended to **incorporate LIDAR** data to help in the discrimination of difficult typologies and enhance the estimates, **and RADAR**, which provides full contiguous coverages. On the other hand, **NISAR** can provide the highest temporal frequency for timely updates.

From ongoing experience at international level, FAO has applied RS for forest mapping in Ghana from field plots to satellite LIDAR for the whole Western African, where it provided good results using GEDI, with its pros (almost global, optimized for tropical ecosystems) and cons (discrete non-continuous samples and temporal discontinuation), with several scientific articles recently published on the topic.

However, what is **most needed is the harmonization of definitions** applicable to forest ecosystems, independently of the platform or sensors used, combining the different methods available (RS, airborne, drone-LIDAR, in-situ...), as in the AMAZECO project and in the forest attribute map of Sweden using airborne laser scanning and field data from the national forest inventory. It is therefore evident that different methods could be used for different purposes i.e. estimation and disturbance detection and mapping.

The role of collaborative research work, transfer of skills and experience among relevant institutions and individuals in the case of Sweden was deemed necessary and inter-disciplinary engaging for forest monitoring ground data, forest inventories, and remote sensing on one hand, and on the other, forest management and stakeholder involvement. Such a national example could be replicated in other countries, step by step. In this regard, EFINET can be a good forum to exchange on different and novel methods for different purposes, with societal aspects and information that should also be considered. In fact, societal attitudes for forest management across Europe can have a strong significance. In this frame, ongoing Horizon Europe projects and those from coming calls for proposals can offer opportunities to strengthen innovative partnerships and collaboration for the Mediterranean.

The ForestWard project for an Observatory to Secure the Resilience of European Forests was presented as an innovative example combining existing EU data sources for environmental forest monitoring through a network of super sites and novel models for forest disturbance characterization together with guidance to forest management to test climate-smart, restoration and preservation alternatives for forests, and considerations from a social perspective, encouraging co-design processes. Participants were invited to explore The ForestWard framework which offers 150.000 euro grants to third parties to implement innovative practices for better forest monitoring and management, including conservation and restoration actions.

From the EEA perspective, the ideas to interact with stakeholders for research and monitoring to support better policies, including people to support the final products was very much welcome, inviting the audience to make use of the already available data and tools, as depending on the objective, different tools could be used. In particular, the Copernicus Land Monitoring System, an open access pan-European tool, has a high potential for forest monitoring. Copernicus has three main products in high resolution:

- Tree cover/forests with tree cover density (> 90% accuracy), dominant leaf type (coniferous/broad leaf) and forest type (similar to FAO's definition) from 2012 to 2018.
- Phenology and productivity with daily vegetation indices, seasonal trajectories every 10 days and phenology and production every 2 seasons yearly, and
- Small woody features, linked to forest connectivity indicators.

Some examples with temporal animation series were shown, as in the case of recent forest fires in Portugal, and further explanation on the data infrastructure was provided, with the JRC and EEA hosting global and pan-European spatial data, the first with a higher level of automatization and the EEA with in-situ, higher degree of manual calibration with collaborations and regional level.

Copernicus services are only for general purpose data though. Other European spatial data structures, networks and organizations were mentioned, in particular the European Environment Information and Observation Network (EIONET) with their working groups, among which the Land Systems Group to support CLMS from the EU Member States perspective and the European Topic Centres (ETCs) in charge of validation / verification, product evolution and downstream user applications. Alike, the European Commission through the Joint Research Centre (JRC) and the concerned policy Directorate Generals (ENV, CLIMA, AGRI, etc.), the European Space Agency and other users from the industry and research communities.

Overall, the need to have local, regional, national and stock data before starting continental mapping is strongly recommended to reach consistent datasets. In the future, disturbance monitoring will be further addressed, with a new system to be launched in the coming years to have more magnitude, duration and recovery information. CLMS evolution will involve the use of Artificial Intelligence, Biomass Mapping, Novel EO Data, IT and In-situ, continuous monitoring and data fusion for policy support, where the next generation of satellites and complex data fusion processes will hopefully meet their demands.

Though AI and algorithms can help building estimates, a combination of new technologies with traditional mapping in situ is needed. On top of this, having a visible knowledge base and knowing your audience and their needs are required to fill the gaps, with actions like the data hackathon serving at the same time for capacity building and setting collaborative networks to talk to each other and find common solutions, including to the terminology and harmonization processes. Moreover, forest and biodiversity mapping need to be linked, with issues like plantations and species richness considered while integrating data for forests.



## *04. The way forward for Mediterranean forest protection - a conversation between managers and scientists*

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The session looked at ensuring regular forest mapping actions at various scales, supporting national forest inventories and integrating them into Mediterranean wide monitoring and assessment approaches to inform forest action... from conservation and restoration to their sustainable use in a climate changing environment. The session highlighted regional work to inform Mediterranean wide actions on forest in the next years.

The Mediterranean Forest Research Agenda 2010-2020 by EFI provides a series of recommendations, also discussed during the Mediterranean Forest Week in Turkey in 2022, on why we need a high-resolution map for the region and most of all, we need to know what is happening. In Lebanon for instance, there are ecological features that are not included in EUNIS, that would need to be tackled, where many ecosystems serve as a refuge for species, at the same time as depopulation and rural abandonment are taking place, affecting erosion processes and forest diebacks.

For the new 2020-2030 MFRA, four topics were identified through a consultative procedure via online webinars, referring to forest resilience towards global change and related disturbances; conservation and management of genetic resources; management trade-offs and synergies between ecosystem services; and social and business innovations and policy instruments for a forest-based bioeconomy.

In order to understand forests and their ecology, it is fundamental to be aware of their evolution over time and space, as they have and will continue to evolve along anthropogenic, geological and climate changes. Thus, diverse and resilient forests can only be maintained if we understand their sensitivity to past climate change and are able to predict future changes in different scenarios. The cultural landscape, human-made with pastures, plantations and agriculture, and species migration over time have an important impact and will continue in the coming years, with different effects on the north and south of the region.

Achieving a common map need collaboration and the same goals. There are loads of data, with genetic monitoring following their own protocols, and the choice of a common platform should be discussed, from FAO's perspective. To this end, ETC-UMA started a consultative process with EEA in 2018 to understand which kind of product could be useful, choose the appropriate EU standards to optimize quality and data sharing and though only a proxy for 2021, the model is now available for future updates, ideally in partnership with relevant organizations. In brief, the following recommendations raised from the audience:

- Work could be implemented with the focal points or directors of forest ministries at country level, considering the participation of other ministries/departments too.
- The momentum of preparation of the coming State of Forests report can be an opportunity to make visible the need to combine innovative and traditional mapping methods

- Collaboration with certain eionet groups with national contacts should be sought
- Links with international organizations like the Union for the Mediterranean and the Convention of Biological Diversity should be ensured to align efforts.
- The political willingness is key at various geographical scales.
- Forests fragility needs to be identified in order to increase their resilience, as related to genetics.
- The social part is a gap in management: forests need to be managed by people; the impact on the soil of livestock and other land uses needs to be understood by all sectors.
- A good set of data needs to be characterized to get to know forests' biodiversity status: general indicators to really know what is happening, including flammability of forest species and dryness/drought.
- A dialogue with the main data collectors and users is needed to push for more real time information, particularly concerning forest fire risks and measures.
- Technical training and software demands for high level data processing and assessments should be accompanied by non-expert tools, such as interactive statistical dashboards to help communicate forest information to a wider public.
- The co-design of maps and open access data repositories for analysis should be implemented together with the user.
- Tourism and recreational uses of forest maps, even in collaboration with mobile apps to collect georeferenced data among citizens, can also help forest fire risk assessments.
- Genetic information is related to resilience and climate change, and should therefore be reflected in maps.
- Rural people should also be considered as map users in the region, placing traditional management practices like grazing and husbandry and crop management as part of the agro sylvopastoral commonly found in the region. Shrublands should also be visible in forest maps.
- Forecast functionalities and models, particularly Sentinel for fires and biodiversity hotspots, should be improved at national level to feed into a updated forest covers, so fragile to climate change impacts.
- Maps combined with other tools can serve also as mitigation tools.
- At EU level, more work is needed for forest classes, types and its harmonization. Main aspects to advance are open and mixed forests, and their classes, and the results to be applied in the Southern Mediterranean.
- Remote sensing technologies are not enough and need to be complemented with in-situ information.
- A coordination mechanism for the Mediterranean is needed including building on the ground capacities and training on the use of innovative data tools.





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## WORKSHOP MATERIALS

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- a. [Agenda](#)
- b. [Workshop presentations](#)
- c. [Workshop speakers booklet](#)
- d. [About Montes de Malaga – site visit \(Spanish\)](#)
- e. **Visuals and photo gallery**
  - 2 June 2023: [International workshop](#)
  - 3 June 2023: [Visit to Montes de Málaga](#)
  - Video: [Spatial data dashboards](#)
  - [Mediterranean Ecosystem Restoration - poster exhibition](#)

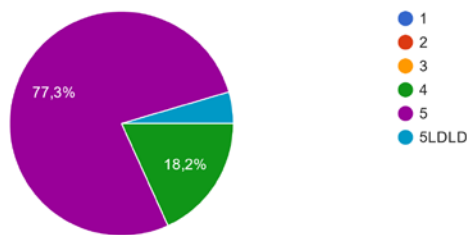


## SATISFACTION SURVEY

### *About the workshop - 2 June 2023*

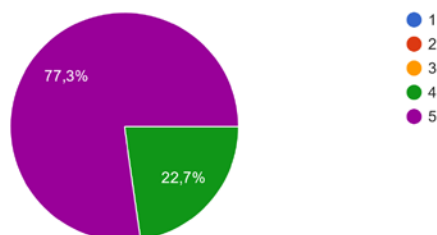
It was a great opportunity for me to meet people and learn a lot about forests, remote sensing and forest data and indicators used - Very interesting and necessary - Overall, fantastic idea, preparation and running - Very informative and contributive - All good - Muy interesante - A successful event - Everything was perfectly organised.

CONTENT - VERY BAD (1) to VERY GOOD (5)  
22 respuestas



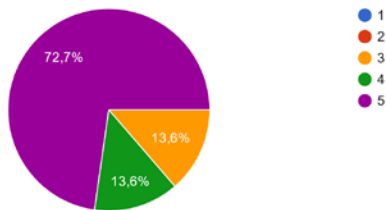
I think it was a very good experience sharing exercise with alternating session components - It might be interesting to have the texts of the presentations during the presentations - The workshop was very well organized and thought in detail. - Interesting content and discussions - Las mesas redondas eran interesantes, pero un poco pesadas y muy ambiguas en algunos casos - Appropriate choice of the thematics of the sessions. - Contenido muy bien estructurado, bloques centrados, concisos y una representación variada de cada tema con distintas perspectivas. - The content was very wisely set up including a diverse range of topics. The time allocated to each panel member was satisfactory. The field excursion facilitated interaction. A strong point of the field visit was that the trip was rather short (and thus not tiring). - Speakers were substantial and contributed much with their reports. - Make it more interactive. At in person events, participants should have the opportunity to interact more.

SPEAKERS - VERY BAD (1) TO VERY GOOD (5)  
22 respuestas



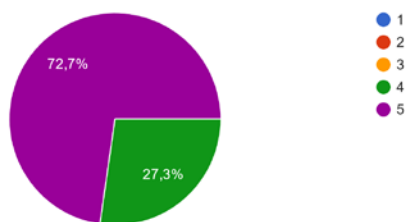
Too diversified - More emphasis on practical conservationist application of tools - The speakers were well prepared in their topics - Very good speakers. Great expertise. - La representación fue muy variada y me parece muy positivo para conocer las perspectivas y realidades de cada ámbito. A veces me resultaba algo más tedioso de seguir el no tener un soporte visual - One strange thing was that some of speakers (i.e. panel sessions) haven't prepare any multimedia material (i.e. presentations). Would originally seemed awkward, I think that at the end was beneficiary for the workshop. Sometime presentations could be boring, while talks might facilitate interaction. So, I would suggest that next time a similar set up could be deliberately adopted. It was perfectly balanced.

FORMAT - VERY BAD (1) to VERY GOOD (5)  
22 respuestas



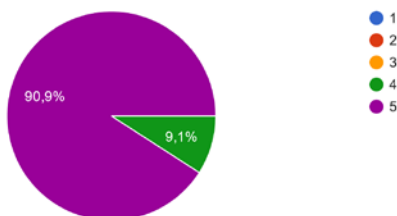
The duration should be longer - The topic and their timing were well fixing the content of the workshop. - Good balance in panels, presentations, pauses. - Me parece enriquecedor plantear preguntas concretas y contestadas con distintos puntos de vista, a veces al no ser el propio idioma un soporte visual ayuda, pero me gustó la forma de generar coloquio.-  
- Make it more interactive. At in person events, participants should have the opportunity to interact more.

METHODOLOGY - VERY BAD (1) to VERY GOOD (5)  
22 respuestas



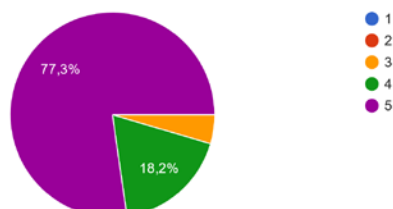
Good alternance with different session topics - Greather interdisciplinary interaction - The moderators were so professional, the questions were well thought and the results of discussions were satisfactory in accordance with the goals.- Ambitious and serious work. - I really liked the methodology and arrangements of the programme (duration of each session, panels, moderator etc) - It was the first time I took part in such event and I found it interesting.

ORGANIZATION - VERY BAD (1) to VERY GOOD (5)  
22 respuestas



Very Good organization - It was the one of best the organizations i joined. - Fantastic food, dinners excursion thanks - Simply perfect. The audience was neither small or large. - Well organised, also before the meeting!

CATERING - VERY BAD (1) to VERY GOOD (5)  
22 respuestas

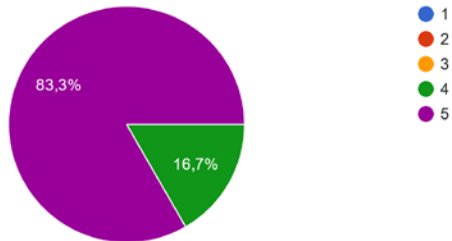


All were well thought in detail. - As said above excellent - It cannot be improved.

## About the site visit to Montes de Málaga - 3 June 2023

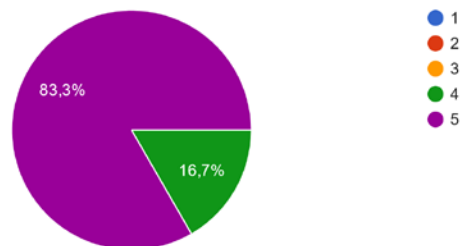
CONTENT - VERY BAD (1) to VERY GOOD (5)

18 respuestas



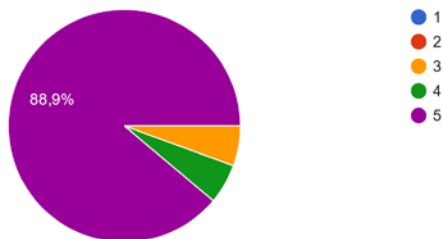
SPEAKERS - VERY BAD (1) TO VERY GOOD (5)

18 respuestas



FORMAT / DURATION - VERY BAD (1) to VERY GOOD (5)

18 respuestas



The duration should be longer. Other sessions of realization of the approvals will have to be organized for the concretization of cooperation. - I really thank to local organizers and of course University of Malaga and its all kind members organizing the meeting and field trip.- Everything was really very nice. I wouldn't change anything. Keep up the great work. Thank you - Fantastic day - Short and rich event. Very well organised. - I have really appreciated how the organizers have combined in two days, very rich work sessions and a field trip. Congratulations. - Thank you for two nice days in Malaga!



## REFERENCES

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- [Scalable approach for high-resolution land cover: a case study in the Mediterranean Basin](#) – Journal of Big Data, vol. 10, no. 91, 2023
- [Supporting forest conservation and restoration policies – A Mediterranean forest types map](#) – Living Planet Symposium 2022
- [A Mediterranean forest types' map – based on dominant species](#) – ForestSat Conference 2022
- [Global Guidelines for the Restoration of Degraded Forests and Landscapes in Drylands. Building Resilience and Benefitting Livelihoods](#). FAO Forestry Paper 175
- [Forest Information System for Europe \(FISE\)](#)
- [WWF-SER Standards for the Certification of Forest Ecosystem Restoration Projects](#)
- FAO and Plan Bleu. 2018. [State of Mediterranean Forests 2018](#). Food and Agriculture Organization of the United Nations, Rome and Plan Bleu, Marseille.
- [Satellite image-based maps: Scientific inference or pretty pictures?](#) Remote Sensing of Environment, Volume 115, Issue 2, 15 February 2011





**A knowledge baseline on Mediterranean forests supported by innovation - Enbic2Lab International Workshop report**

Prepared by ETC-UMA supported by speakers' reviews, 31 pages.

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