



Food and Agriculture  
Organization of the  
United Nations



## Guidance on using the Framework for Ecosystem Restoration Monitoring (FERM) platform and registry

1 March 2023



FRAMEWORK FOR  
**ECOSYSTEM  
RESTORATION**  
MONITORING

### Background

There are persistent barriers in the availability of restoration-related data, information, and indicators that are required for moving ecosystem restoration to scale. Tools, platforms, and data on where and how best to restore ecosystems promise increased efficiency and impact, and governments and stakeholders need to decide where to invest and to be able to monitor progress. However, these tools and data are nascent and are not yet widely available. To overcome these barriers FAO, in consultation with the [Task Force on Monitoring](#), which brings together experts from over 100 organizations, have developed the [Framework for Ecosystem Restoration Monitoring \(FERM\)](#), the official monitoring platform of the United Nations Decade on Ecosystem Restoration to improve data access, transparency, and ensure actions to meet restoration commitments are guided by the best available science.

### Overview

The FERM platform is built on FAO's corporate [Hand-In-Hand geospatial architecture](#). FERM's foundational, and restoration-relevant, geospatial data is sourced from FAO technical divisions responsible for Soil, Land, Water, Climate, Fisheries, Crops, and Forestry and public catalogues. Additionally, in collaboration with the Task Force for Monitoring, and with ecosystem and domain oversight from Terrestrial and Aquatic Sub-Task Forces, and the Socio-Economic Sub-Task Force, restoration-relevant geospatial data will be sourced and added over the coming months and years. Continuous improvement will support a science-based restoration movement through transparent and fit-for-purpose monitoring in support to the United Nations Decade on Ecosystem Restoration.

The FERM geospatial platform provides accessible and transparent information for restoration practitioners across all UN Decade's types of ecosystem restoration: grasslands, shrub lands and savannahs, peatlands, mountains, farmlands, oceans and coasts, freshwaters, forests, drylands, and urban areas, in an easy-to-use interface. The UN Decade's Global Flagships are hosted on the FERM platform and users can find more information of the restoration activities and actions in the Flagships Initiatives.

Users can interrogate and interact with key geospatial information related to the biophysical, and the socio-economic dimension for their ecosystem of interest. The FERM platform also has functionality for uploading national and sub-national data, enabling integration of geospatial data locally, nationally, regionally, and globally.

The platform includes functionality for creating compelling restoration impact stories, based on user specific geospatial data for a defined area of interest. For the more advanced user, it also includes an integration with FAO's geospatial processing platform, [SEPAL](#), and allows on the fly composite/mosaic creation— drawing on the historical archive of Landsat imagery, the frequency of the Sentinel-2 imagery and of the cloud-penetrating abilities of Sentinel-1.

The platform also allows restoration stakeholders and national entities to share their information on restoration progress at different scales through the FERM Registry, which will be interoperable with other restoration monitoring platforms, enabling transparency in restoration monitoring and reporting.

The FERM platform was launched on the 3 June 2021 and has been further developed, with increasing functionality built in consultation with the Task Force on Monitoring, member states and other partners, to meet the monitoring and reporting needs of the United Nations Decade on Ecosystem Restoration. An updated version was launched on the 4 May 2022. The UN Decade Global Flagships were launched and available through the FERM platform as of 13 December 2022 and future planned enhancements and functionality are described below.

Currently the FERM platform is only available in English. However, in the near future, it will be made available in multiple UN Languages, with Spanish and French added in the coming months, followed by Chinese, Russian and Arabic. Like the Hand-In-Hand, it is the vision that the platform be accessible in all UN Languages.

**To find out more about the FERM platform development visit:**

<https://data.apps.fao.org/static/sites/ferm/about.html>

**To explore the updated FERM platform visit:**

<https://data.apps.fao.org/ferm/>

**To register a restoration project on the FERM registry visit:**

<https://ferm.fao.org/>

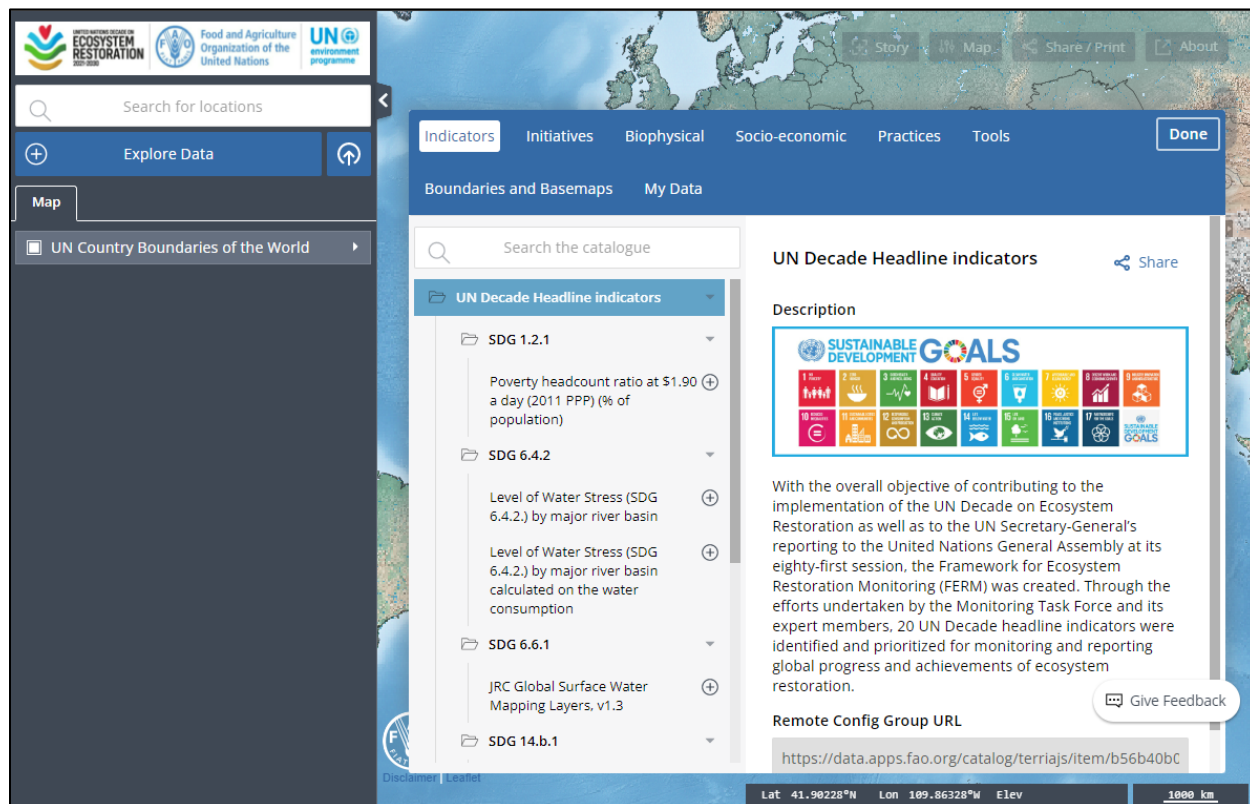
## 1. FERM platform functionalities

The FERM platform is divided into eight main categories – Indicators, Initiatives, Biophysical data, Socio-economic data, Practices, Tools, Boundaries and Basemaps and My Data. Each category has various datasets for monitoring ecosystem restoration including reported data on indicators, key geospatial datasets, links to documents and tools for monitoring and information on restoration projects worldwide. Users can upload their own data into the FERM into their private workspace through the 'My Data' category or publicly share data on their restoration project through the FERM registry.

The Monitoring Task Force has identified 20 headline indicators based on SDGs (Sustainable Development Goals) relevant to restoration as global indicators for reporting Decade's progress. The 20 headline indicators are built on existing SDG and Multilateral Environmental Agreement indicators and existing country and global data collection mechanisms. To avoid extra reporting burdens, the UN Decade is not establishing formal country monitoring and reporting. Instead, it builds on existing data reporting systems

within relevant international commitments, conventions, and plans. A key component of the Decades reporting structure will be the restoration-relevant indicators under discussion as part of the CBD (Convention on Biological Diversity) post-2020 global biodiversity framework and will be integrated into the FERM when made available.

Additional frameworks, such as the GRO (Global Restoration Observatory) network’s Restoration Project Information Sharing Framework, are linked in the FERM to include data related to the project level indicators.



The FERM geospatial platform hosts the UN Decade Global Flagships, which are accessible through the Initiatives tab. Geospatial data for each of the 10 flagships can be visualized and analyzed against other relevant geospatial data on restoration. The FERM geospatial platform is interactive and can be used to produce data maps and create compelling restoration impact stories. From remotely sensed geospatial data to statistical time series, the FERM platform enables the analysis of public and private restoration-related data at global, regional, national, and subnational levels.

The platform enables restoration stakeholders to compare key data layers and visualize changes in ecosystem components over time. This can be done using temporal datasets and by selecting the date range, clicking ‘play.’ Data layers can be compared side-by-side using the slider function to split your screen and visualize and compare data layers of interest. These functionalities allow the user to examine how a defined Area of Interest (AOI) changes over time.

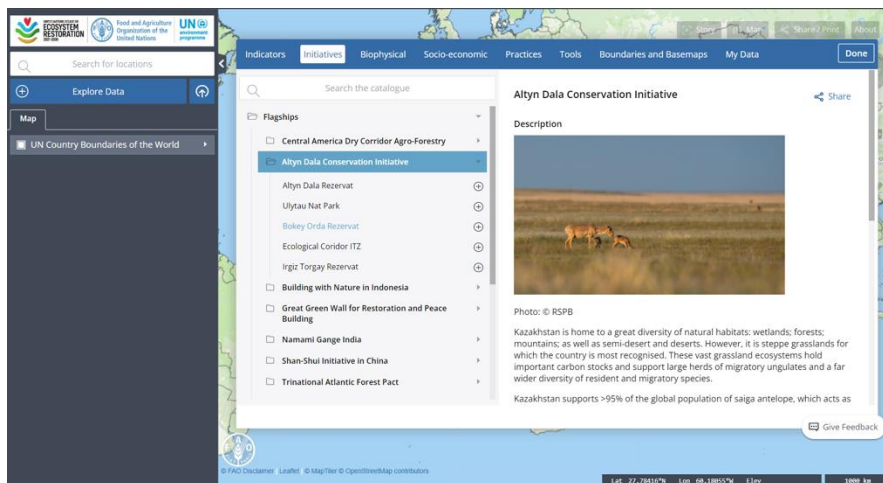
At any point during the analysis, the user can save or print their geospatial analysis, or preferably, use the “share” function to generate a unique URL to save and share your restoration story with the restoration community. The ability to create impact stories around restoration actions provides a powerful

communication tool for practitioners to demonstrate results on the ground, highlight best practices and attract further investment and political will.

A key FERM functionality is for users to add their own custom data set, while working in private FERM workspaces, particularly governments and sub-national entities are encouraged to include and analyze national and sub-national geospatial data for increased accuracy and enhanced spatial resolution as well as interoperability between monitoring and reporting.

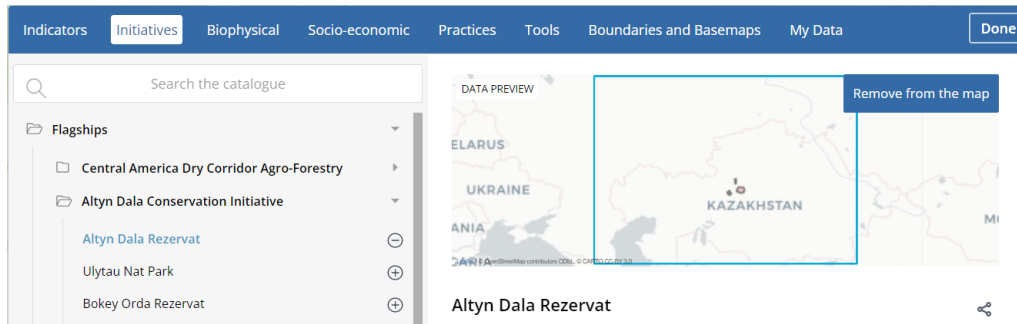
## 2. Exploring FERM geospatial data

Click on “Explore Data” to access geospatial data. The geospatial layers are organized under seven tabs at the top of the popped-up window. In addition to these data layers, users can upload and visualize their own data in My Data tab. Explore each tab to read the description of each geospatial data layer and select those of interest to be added to the background.



### **APPLYING DATASET**

If you wish to visualize your selected dataset on the map, you will need to click on the plus sign or the **Add to the Map** button on the top right corner of the preview.

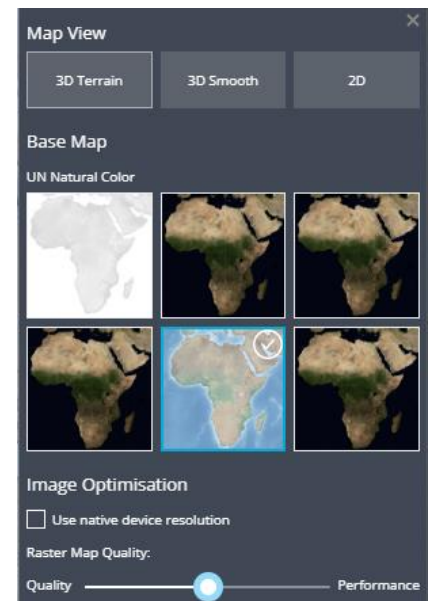


In the Initiatives tab, select geospatial information from any of the 10 Global Flagships

## VIEWING DATASET

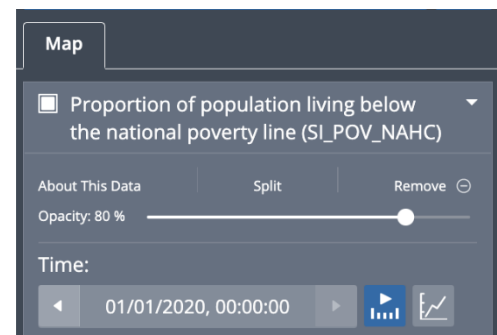
Once your added **data** is reflected on the map, you can easily customize your search by applying different parameters to suit your needs, such as:

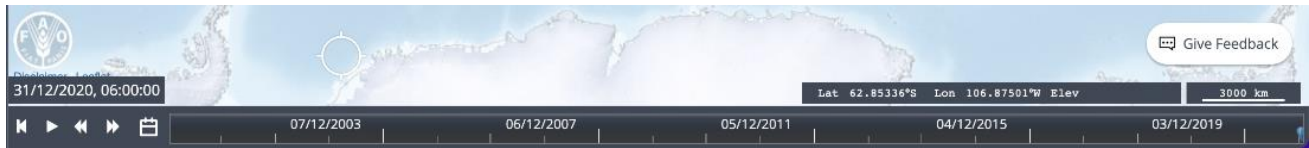
1. **Map View** - change from 2D to 3D Terrain, modify the type of overlay, apply image optimization, and regulate Raster Map Quality.
2. **Workbench with Legends** – helps you refine your search criteria for the added datasets by adjusting the **opacity of the colors**, **selecting the timeframe**, **changing the variables**, among others.



## FEATURE ADJUSTMENT

The slider allows you to see the changing dynamics over time for the selected data set. It can be displayed either by clicking the **Play** button at the bottom of the map – to see the chronological change, moving the **slider** manually, or by setting a fixed timeframe on the left panel.



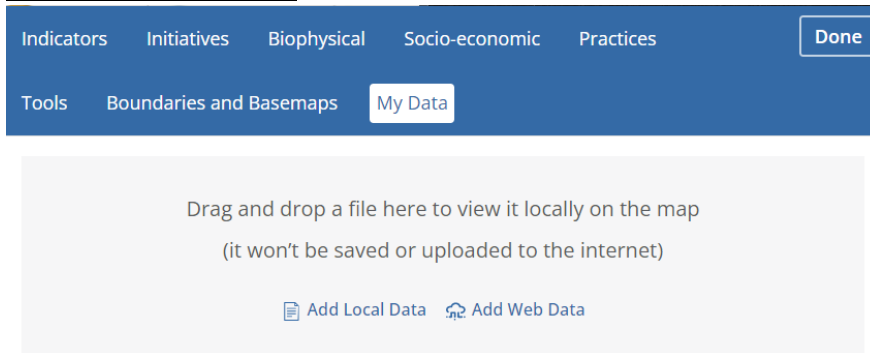


## **COMPARING DATASETS**

Users can use the 'Split' function to compare datasets. After adding two or more datasets to the map, you will be able to see a comparison between the datasets visualized in the map:

1. **Split** - click on this button after adding your to-be compared datasets
2. Click on a data set to select **right or left**, to set the comparison
3. **Cursor** - move the cursor to the right and left to visualize the comparison.

## **ADDING CUSTOM DATA**



With the use of Database of Global Administrative Areas (GADM) for sub-national boundaries, FERM integrates publicly available national data. To add data privately, click:

**1) Explore Data > 2) My Data > 3) Upload** your data using preferred method and format:

## **CUSTOM DATA**

Adding custom data, such as national and sub-national datasets at different admin levels helps you view more localized information. This will ensure the accuracy of information and help generate solid national and sub-national reports.

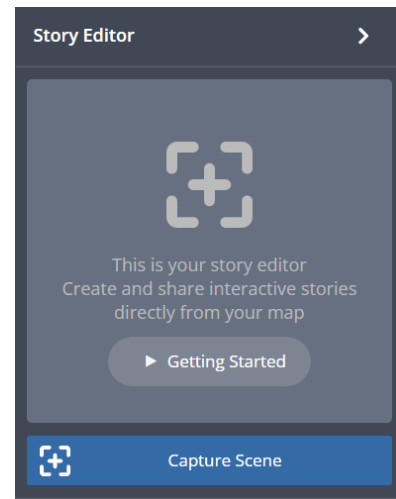
## **VIEWING CUSTOM DATA**

Adding the **Custom Data set to the Map (1)** will **Feature Information (2)** and provide comprehensive data for analysis both on national and sub-national levels. Only the user will be able to view and analyze their own uploaded data in completely private workspaces.

## ADD IMPACT STORY

The 'Story' functionality allows you to create interactive stories within the map, and then create and share:

1. Select **Story** once the data set is reflected into the Map
2. Click **Capture Scene** on a selected area of interest
3. Type in the corresponding **Title** and **Description** to your story, and then click on the **Save** button
4. After saving the **Story**, click on the **Play Story** button
5. You should then be able to see your **created data-map story** and **share it online or print it**.



### 3. Foundational geospatial data

The “**Indicators**” tab includes information on indicators at two scales:

1. **UN Decade Headline Indicators.** These are global indicators for reporting Decade progress. Information on the FERM reporting structure for the UN Decade on Ecosystem Restoration, identifying how ecosystem restoration is contributing to achieving the Sustainable Development Goals. The 20 headline indicators are built on existing SDG and Multilateral Environmental Agreement indicators and existing country and global data collection mechanisms. To support global reporting on restoration progress, the FERM platform provides data on these indicators, pulling the latest reported statistics from the [SDG API](#) and underlying datasets (found in the Biophysical and Socio-Economics tabs), such as the World Database on Protected Areas, used for reporting on SDG indicators 14.5.1 and 15.1.2. Additionally, linkages to tools to define custom analyses to monitor ecosystem restoration progress (found in the Tools tab), such as the SDG 15.4.2 application in SEPAL to monitor the Mountain Green Cover Index, help better track and report on restoration. The platform provides the time series of the headline indicators for all countries that officially report data.
2. **GRO Indicators.** These are project indicators for monitoring restoration interventions. Indicators for monitoring project level restoration activities are being discussed among key members of the Task Force for Monitoring, through a process initiated by Climate Focus, the Society for Ecological Restoration (SER), in partnership with the Global Restoration Observatory (GRO) network and the Task Force on Monitoring. The aim is to formalize a standard set of sector-wide project indicators for tracking progress and trends in ecosystem restoration actions. A set of common indicators can enable communication among disparate databases, meta-analyses, and feed into tracking of the progress of the UN Decade.

The “**Initiatives**” tab shares data on where restoration is happening through regional initiatives taking part in the UN Decade Flagships, project level data reporting through the FERM registry and linkages to other restoration platforms such as Restor and IUCN’s Restoration Barometer. The 10 Global Flagships of the UN Decade span 23 countries and include the following initiatives:

- Central America Dry Corridor Agro-Forestry
- Altyn Dala Conservation Initiative
- Building with Nature in Indonesia
- Great Green Wall for Restoration and Peace Building
- Namami Gange India
- Shan-Shui Initiative in China
- Tri-national Atlantic Forest Pact
- SIDS (Small Island Developing States) Ecosystem Restoration Flagship
- Restoration of Coastal and Marine Ecosystems Abu Dhabi
- Multi-country Flagship on Ecosystem Restoration in Mountain Regions

**The “Biophysical” tab** hosts an array of geospatial data, sourced from FAO technical divisions responsible for Soil, Land, Water, Climate, Fisheries, Crops, and Forestry, as well as from available public catalogues. Full details of any layer on the FERM can be found on the platform. Some highlights of geospatial data available on the platform is described below (more data are being added to the platform progressively):

- Global land cover information at 10-meter resolution (*Vegetation*).
- Geospatial data on hydrological basins, rivers, irrigation, and dams (*Water*)
- FAO’s Global Soil Organic Carbon Map (GSOC) the first global soil organic carbon map ever produced through a consultative and participatory process involving member countries (*Soils*).
- Global Ecological Zones (second edition) used for The Global Forest Resources Assessment (FRA) reporting (*Climate*)
- Elevation Models (*Terrain*)

**The “Socio-economic” tab** identifies data and publications that represent the crucial intersection of people and nature in restoration monitoring. This tab will continue to be populated in consultation with the sub-task force on Socioeconomics

**The “Practices” tab** highlights geospatial information relevant to good and promising ecosystem restoration practices from the Task Force for Best Practices.

**The “Tools” tab** shared tools that can be used for customs analyses for monitoring ecosystem restoration. Key tools have been identified and the list of tools is growing as technology evolves and momentum in the restoration community amasses. Tools presently included in the FERM include:

- SEPAL
- Earth Map
- Climate Crop and Water Requirements Tool
- se.plan
- Peatland restoration monitoring
- Collect Earth and Collect Earth Online
- Satellite time series
- AURORA (Assessment, Understanding and Reporting Of Restoration Actions)
- FL-WES
- ABC-Map



The “**Boundaries and Basemaps**” tab includes background geospatial data, such as country boundaries and satellite data. High resolution monthly cloud free image mosaics from Planet Labs covering 64 tropical countries are available thanks to Norway's International Climate & Forests Initiative.

#### 4. Advanced functionality

The FERM platform is also integrated with FAO’s geospatial processing platform, [SEPAL](#), and allows on the fly composite/mosaic creation for more advanced users – drawing on the historical archive of Landsat imagery, the frequency of the Sentinel-2 imagery and of the cloud-penetrating abilities of Sentinel-1. SEPAL provides data visualization and analytical possibilities within the FERM. For any area of interest on the planet’s surface and for any time-period of interest, users can create customized, best-pixel, Landsat or Sentinel image composites, on-the-fly. Satellite imagery from 40 years ago can be viewed alongside the latest acquisitions to visualize the impacts of restorative actions. This can be combined with ecosystem-specific geospatial data available in the FERM such as for terrain, climate, soil, water, vegetation, socioeconomics, and management.

1. Select or create an Area of Interest (AOI)
2. Click on ‘Explore Data’
3. Click on ‘Tools’
4. Click on ‘SEPAL’ and ‘Add to the Map’
5. A SEPAL theme will appear in the map layers
6. Click on the area of interest (AOI) in the map
7. Click on the SEPAL label in the pop-up box
8. You will be presented with options to create an optical or radar mosaic/composite
9. Select the AOI from the dropdown menu
10. Select the date (or date range) for which you want to make an image
11. Select the sources of imagery (Landsat or Sentinel-2 for Optical, Sentinel-1 for radar)
12. Select composite options (or just take the default)
13. Select color bands (or just take the default)
14. Click ‘GO’

To explore the full functionality of SEPAL join the 10,000 users already using the platform and [sign up!](#)

#### 5. FERM Registry

##### ***FERM registry description***

The FERM registry is designed to support UN restoration monitoring and stakeholders to monitor their progress using geospatial information on restoration projects for different ecosystems. The FERM registry offers a harmonized and consistent approach and will build on the process underway to align project-level indicators. The FERM registry is designed based on international standards to integrate and be interoperable with other restoration platforms and will enable designated national entities to track and monitor restoration actions for reporting against restoration commitments. The FERM registry uses the

IATI standard (International Aid Transparency Initiative; now more than 1M records available) and ISO:19139 standard to ensure that as many possible initiatives can be included.

To access the FERM registry, visit <https://ferm.fao.org> and click the Register button.



You will be asked to sign in. If you do not have an account, request one by filling in the online form. You will receive an email notification with your credential. To sign in, enter your email and click the Login button. When you receive an email from [fao-data@fao.org](mailto:fao-data@fao.org), open it and click “Sign in to FERM Registry” to complete the login. The FERM main page will open on the browser, where you can add a new initiative to the Registry or view other initiatives of the organization that you belong to.

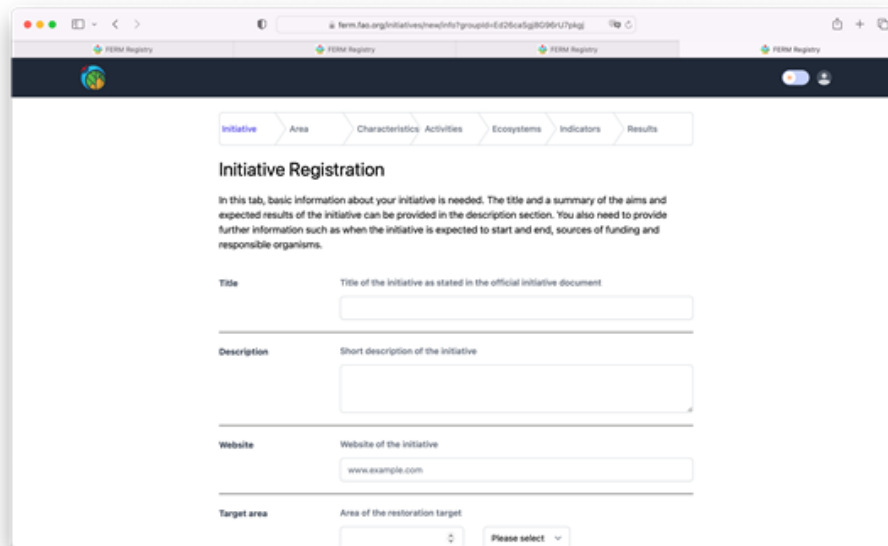
To add a new initiative, you will need to click the Add new initiative button and select your organization.

## Initiatives

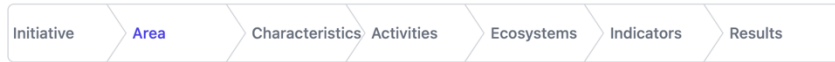
Restoration projects, programs and initiatives at all spatial scales, from individual sites to large landscapes and seascapes, play a vital role in achieving ambitious global goals for sustaining life on Earth. The FERM registry allows you to consistently and transparently monitor, report, and share information on restoration initiatives good practices. The information published in the FERM Registry will be used to officially report on hectares under restoration during the United Nations Decade on Ecosystem Restoration and for the Convention on Biological Diversity Post-2020 Global Biodiversity Framework Target 2.



In the FERM registry, initiatives/projects are described in seven sections: Initiative, Area, Characteristics, Activities, Ecosystems, Indicators and Results.

A screenshot of the FERM Registry 'Initiative Registration' form. The form is displayed in a browser window with the URL 'ferm.fao.org/initiatives/new/info?groupid=E126ca5g8C99U7ykg'. The form has a navigation bar with tabs for 'Initiative', 'Area', 'Characteristics', 'Activities', 'Ecosystems', 'Indicators', and 'Results'. The 'Initiative' tab is selected. The form title is 'Initiative Registration'. Below the title, there is a paragraph of instructions: 'In this tab, basic information about your initiative is needed. The title and a summary of the aims and expected results of the initiative can be provided in the description section. You also need to provide further information such as when the initiative is expected to start and end, sources of funding and responsible organisms.' The form contains four main sections: 'Title' with a text input field and a label 'Title of the initiative as stated in the official initiative document'; 'Description' with a text area and a label 'Short description of the initiative'; 'Website' with a text input field and a label 'Website of the initiative', with 'www.example.com' entered; and 'Target area' with a dropdown menu and a label 'Area of the restoration target', with 'Please select' shown.

1. Initiative: In this tab, basic information about your restoration initiative is needed. The title and a summary of the aims and expected results of the initiative can be provided in the description section. You also need to provide further information such as when the initiative is expected to start and end, and organizations that implement the initiative.
2. Area: The user can identify the geographic areas where the restoration initiative is located based on three options: a) Selecting the administrative area, b) uploading a polygon ShapeFile, or c) directly drawing a geometry on the platform. The below figure shows an example of drawing an area using the “Draw polygon” functionality.



## Area

Identification of geographic areas of ecosystem restoration is key for geospatial applications. One initiative implements ecosystem restoration in one or more geographic areas. Initiatives can identify one or more initiative areas. Identification of activities, indicators, characterization and results will be provided for each area. Geographic areas can be identified based on different options:

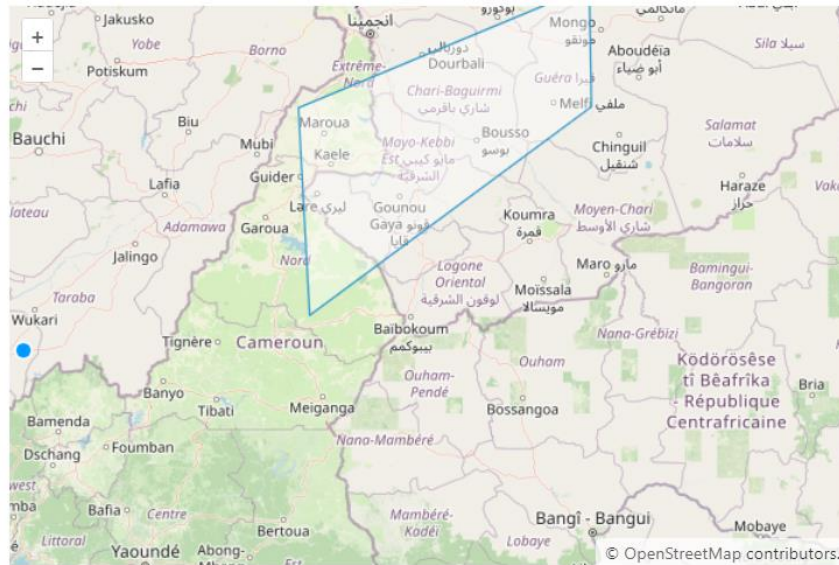
- Select administrative areas
- Upload polygons/vector
- Draw directly on the platform

Total area under restoration (ha)

After clicking the “Draw polygon” button a map window will pop up and you are able to delineate a polygon where your project is located. Once the area is drawn click on the “Upload” button that is displayed below. A message will appear asking you to agree to create a new area with a unique identifier, click the button “OK.” By uploading the polygon area, this is added to the restoration initiative record and used to do calculations in the following steps. You can enter a site name for each area identified in this step.

## Area #2

Site name



Upload



Remember to save the changes using the “Save” button at the bottom of the webpage before the end of the session or the creation of the area will be lost.

3. Characteristics: Default parameters are automatically calculated for each area identified in the previous section, based on selected global data covering elevation, temperature, rainfall, land cover and more biophysical data useful to provide a context of the conditions where the initiative is located. We are currently improving this functionality and it will become available again soon.

Project    AOI    **Characteristics**    Activities    Indicators    Information    Results

## Characteristics

The project area is characterized by a number of default parameters. They are automatically generated for each aoi based on global data sources. More information about the data source will be soon made available.

1

**Drawn area**

Calculate values

Elevation [m]	86.83	39.00	131.00
	Mean	Min	Max
Temperature [°C]	26.82	26.70	26.85
	Mean	Min	Max
Rainfall [mm/pentad]	33.65	29.89	38.18
	Mean	Min	Max

Land cover class area [ha]

Closed forest, evergreen broad leaf. Tree canopy >70 %, almost all broadleaf trees remain green year round. Canopy is never without green foliage.	11842.21 Area
Name	

The same information can be retrieved for the other options: administrative area and an uploaded shapefile.

4. **Activities:** Restoration activity describes what is being implemented on the ground in order to achieve restoration objectives. The activities in the list are adapted from the IPBES report (IPBES, 2019). They are divided into two main categories (biophysical and enabling). Select all the activities that are applied to the area identified in the previous section.
5. **Ecosystems:** It is crucial to identify the ecosystems that your initiative is restoring. If spatially explicit information of an area is provided and represents the entirety of the area under restoration (i.e. polygons of the areas are provided), the ecosystems can be calculated based on a map overlay. If only tabular data of an area is provided, we kindly ask you to select the corresponding ecosystems using biomes of the IUCN Global Ecosystem Typology 2.0 (Keith et al., 2022).
6. **Indicators:** Depending on the reporting process of your initiative, different indicators are provided. The 82 SDG indicators (including the UN Decade headline indicators) is the result of extensive consultations and review processes conducted through the Task Force on Monitoring

(see [Briefing Note](#)). Further information of the consultative and analytical processes that identified these 82 indicators can be found in the report: "Global Indicators for Monitoring Ecosystem Restoration: A contribution to the UN Decade on Ecosystem Restoration" ([link](#)). For GEF projects, select corresponding GEF indicators. You will also be able to enter customized indicators for monitoring your initiatives (functionality coming soon).

7. Results: For each combination of selected indicator and area of interest, results will be provided based on global data, by using cloud-computing environment such as Google Earth Engine.

Note: The FERM Registry intends to use a flexible data-sharing license. All users will be given the option of limiting and explicitly outlining the data sharing requirements of their choice when uploading data to the FERM Registry. Under no circumstances will data be stored, used, or shared without explicit consent of the user. The current data sharing and licensing options in the FERM Registry are:

- Keep data saved in a private workspace and do not share it publicly
- Select a creative commons license (*coming soon*)
- Create a new custom license (*coming soon*)
- Use a custom license that you have already created (*coming soon*)

### ***Supporting national restoration monitoring and reporting***

At the national level, state-of-the-art tools and data will be curated and deployed to countries through the FERM platform, building on and respecting national systems, capacity, and institutional arrangements. The FERM builds on, and complements, existing international, regional, and national reporting processes, their goals, targets, criteria, and indicators.

The FERM registry also offers an official entry point for those countries that do not have their own system to monitor and report on the Kunming-Montreal GBF target 2 - Area under restoration - indicator. This functionality is currently under development.

### ***Integration and interoperability with other monitoring tools and platforms***

Integration and interoperability of monitoring tools and platforms can enhance and simplify the user experience of restoration practitioners. For example, FERM integrates the [Dryland Restoration Initiatives Platform \(DRIP\)](#), which is designed to enable practitioners to compile and analyze data related to their dryland restoration work, as well as data from Trends.Earth for SDG 15.3.1. Presenting a single technical solution to both needs reduces duplication of effort and ensures that geospatial data is interoperable between platforms.

Through the Monitoring Task Force, a survey on monitoring tools and platforms revealed an ecosystem of over 150 tools, useful for restoration monitoring practitioners at various scales. In the future, under

the mandate of the Task Force, discussions with tool and platform developers will explore integration and/or linkages to the FERM platform. The vision of the Task Force and of the FERM is to support a data ecosystem founded on data integration and interoperability, with linkages/integration with other tools and platforms. This shared vision for restoration monitoring is critical to a coherent UN Decade to capitalize on increased public and private restoration commitments, and to capitalize on advances in global monitoring solutions and transformational technologies to enhance delivery of restoration action on the ground.

### ***Next steps***

The Monitoring Task Force is calling for special attention to further develop monitoring approaches to ecosystems, which currently lack or require enhanced monitoring approaches for their large-scale monitoring. These include marine and freshwater ecosystems. From a socio-economic perspective, there is still important work to be done and incorporated into restoration monitoring approaches. The Task Force encourages further development of crowd-sourced monitoring approaches that could also be integrated into the FERM platform. The Task Force also recognizes the importance of geospatial information for restoration planning as a complement to monitoring efforts. Selected countries are piloting the use of the [se.plan restoration planning tool](#) for this purpose.