



openforis



Food and Agriculture
Organization of the
United Nations

Innovation journey for the forest monitoring tools developed in FAO

Yelena Finegold
FAO Forestry Officer
BIOSpace Conference
11 February 2025

15+ years work on Solutions – Open Foris

Digital innovation has transformed how we monitor the world's forests

Field Data Collection



Ground

Simple, intuitive, and versatile map-first data collection mobile application



Arena Mobile

The fast, new generation data collection tool works with Arena and runs on Android and iOS devices



Collect Earth

Augmented visual interpretation tool for land monitoring



Collect Earth Online

Custom built, open-source, high resolution satellite image viewing and interpretation system

Data management



Collect

Easy and flexible survey design and data management



Arena

Online platform for survey design, data management, utilization and processing



SEPAL

System for earth observation data access, processing, analysis for land monitoring



Earth Map

The power of Google Earth Engine without coding. A user friendly tool for complex land monitoring

Integrated Solutions



Whisp

What is in that plot?
Supporting Deforestation Compliance with Whisp

250,000

Users

196

Countries and Territories

89%

UNFCCC FREL

25+

Developers

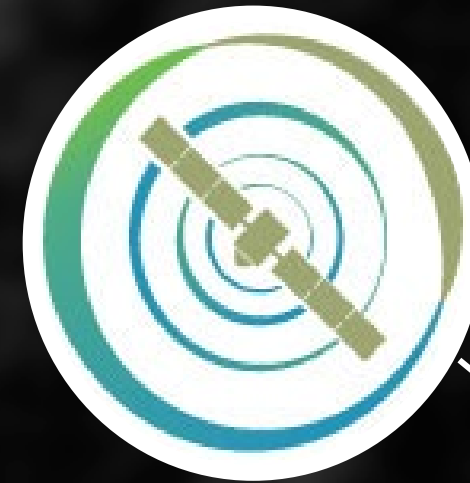
1150

Questions on Forum

Open Foris Timeline

From a script to a galaxy of solutions

2009



Geospatial Toolkit
development starts

2010



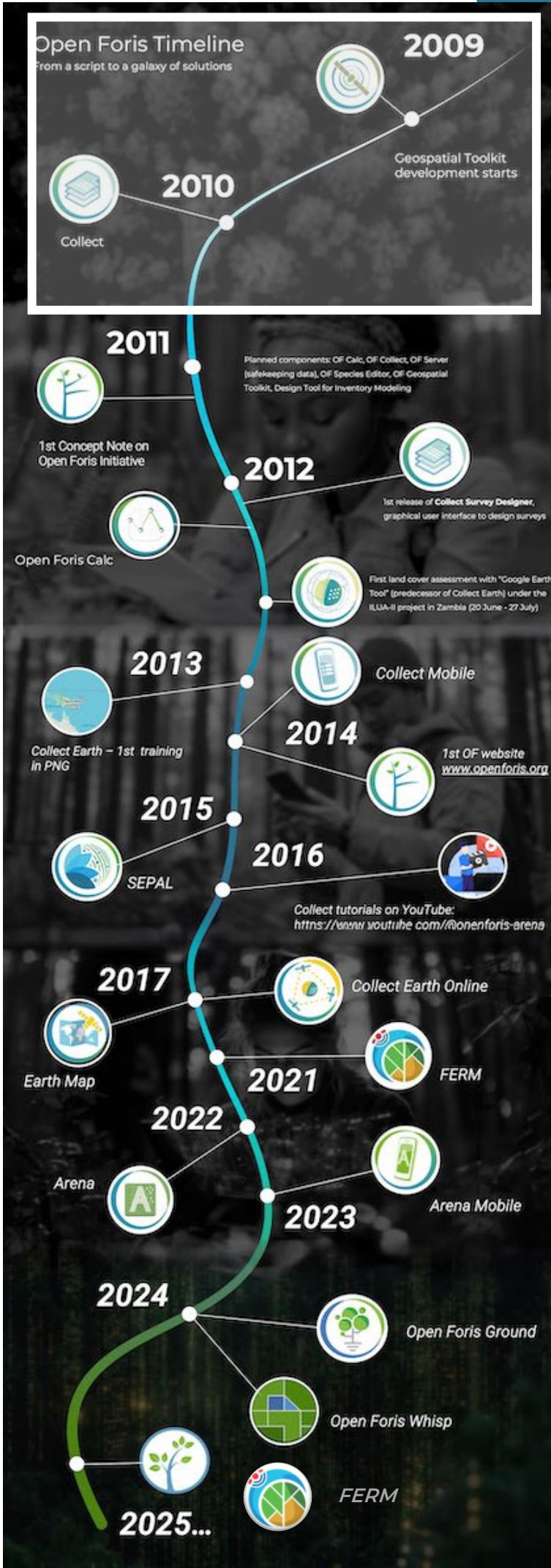
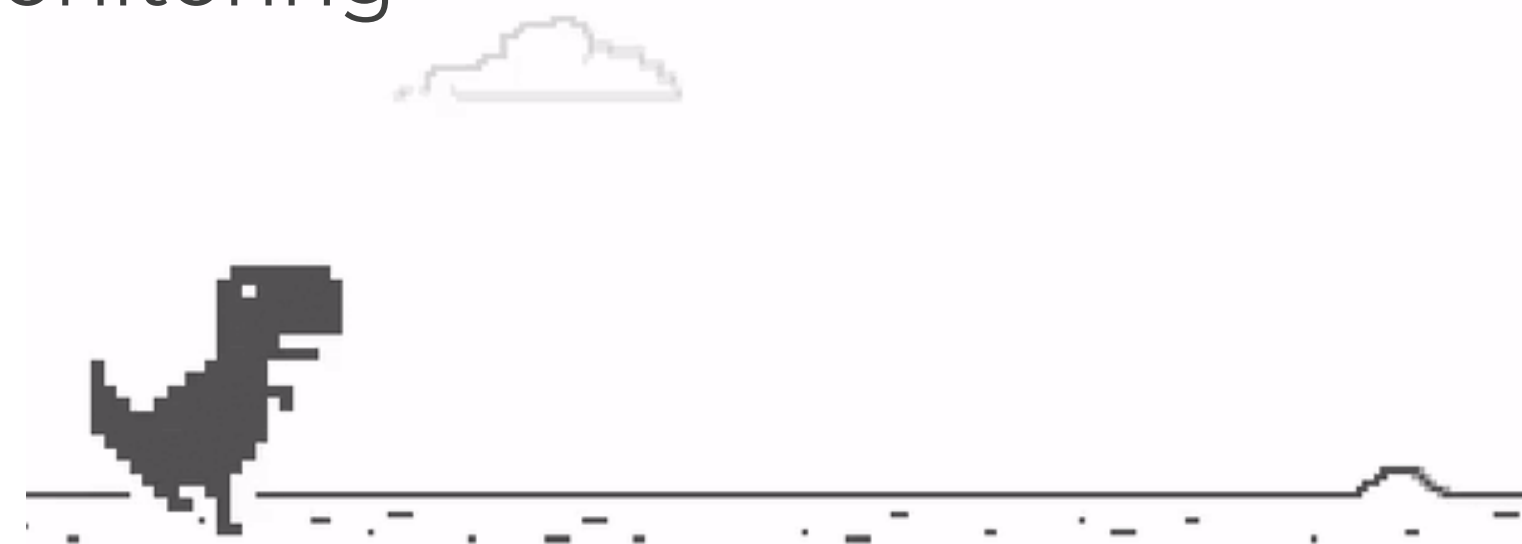
Collect

Open Foris

2009

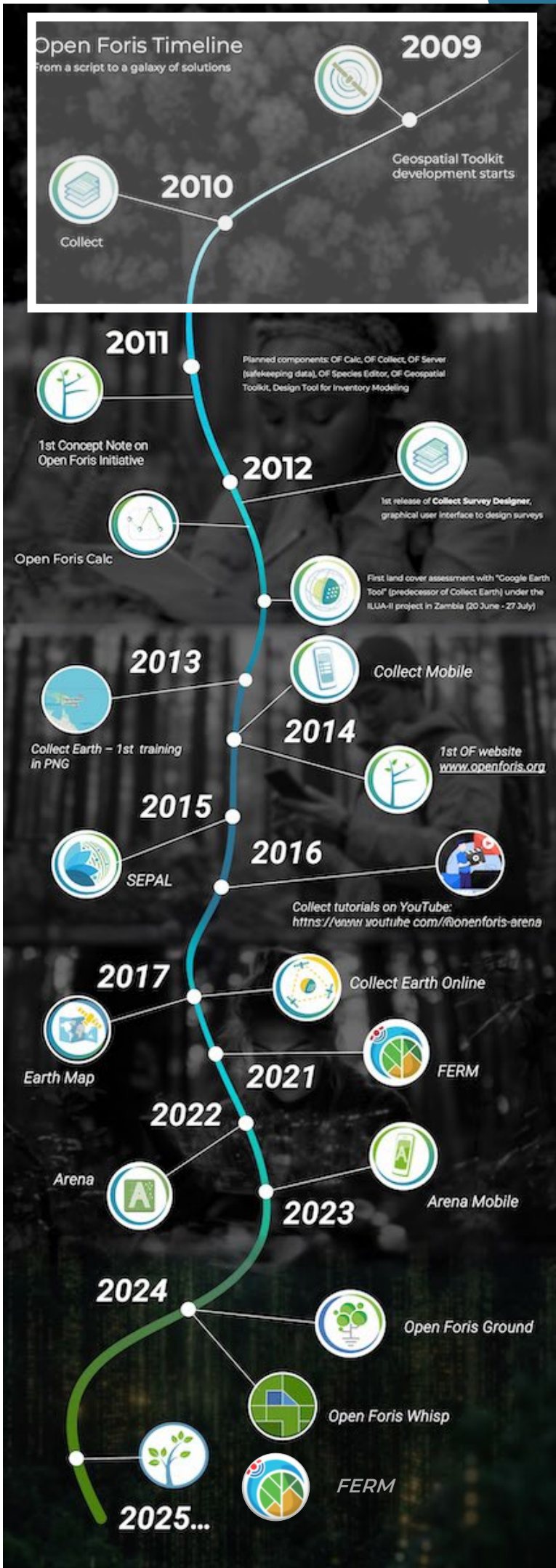
The Beginning

- Initial development: desktop programs for download
- Transitioned to mobile tools for field data collection
- Shift towards web-based platforms for broader accessibility
- Now focusing on innovative monitoring



Collect

2010



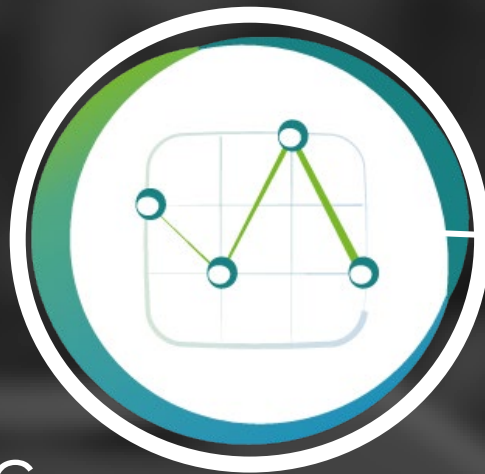
2011



1st Concept Note on Open Foris Initiative

Planned components: OF Calc, OF Collect, OF Server (safekeeping data), OF Species Editor, OF Geospatial Toolkit, Design Tool for Inventory Modeling

2012



Open Foris Calc

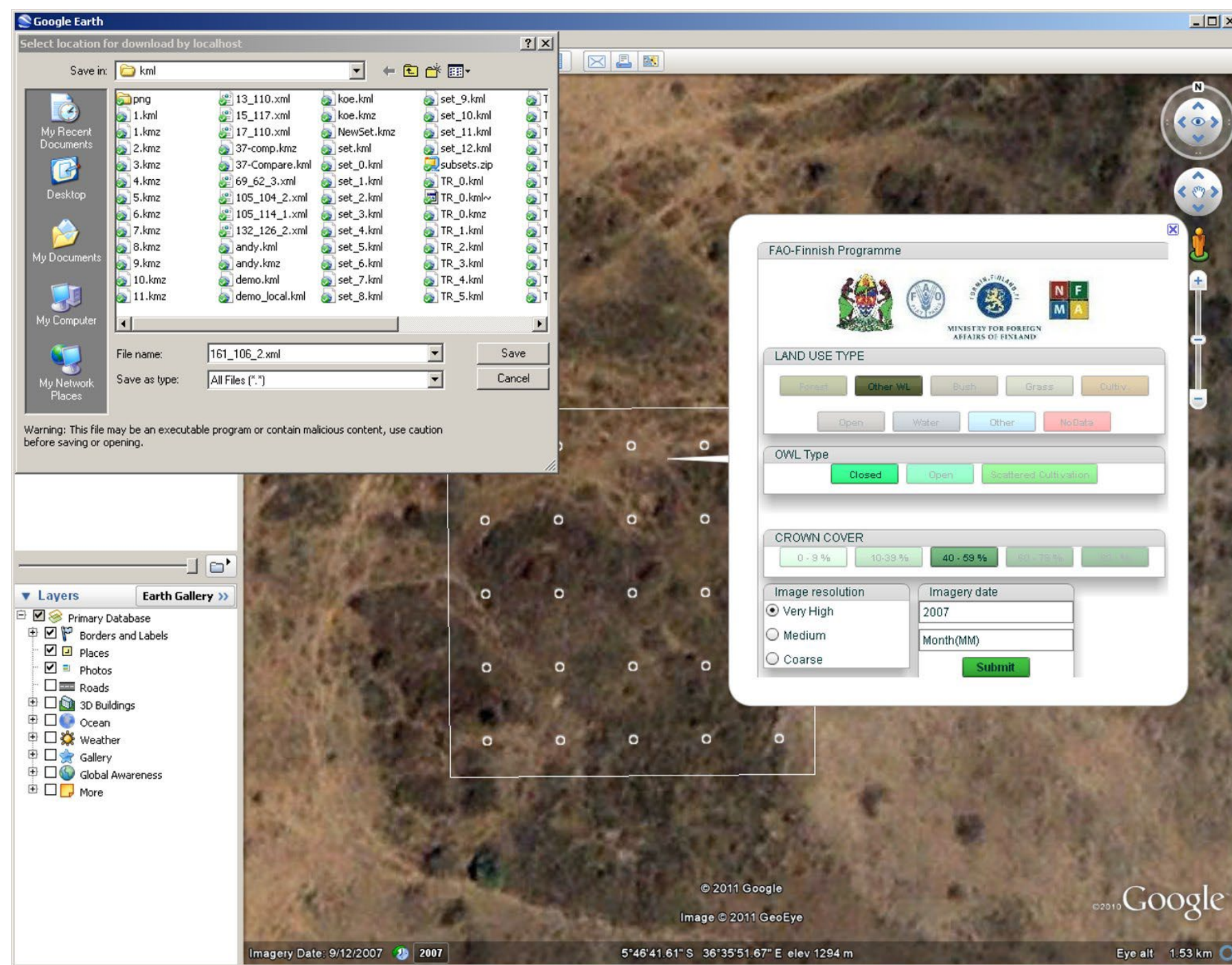
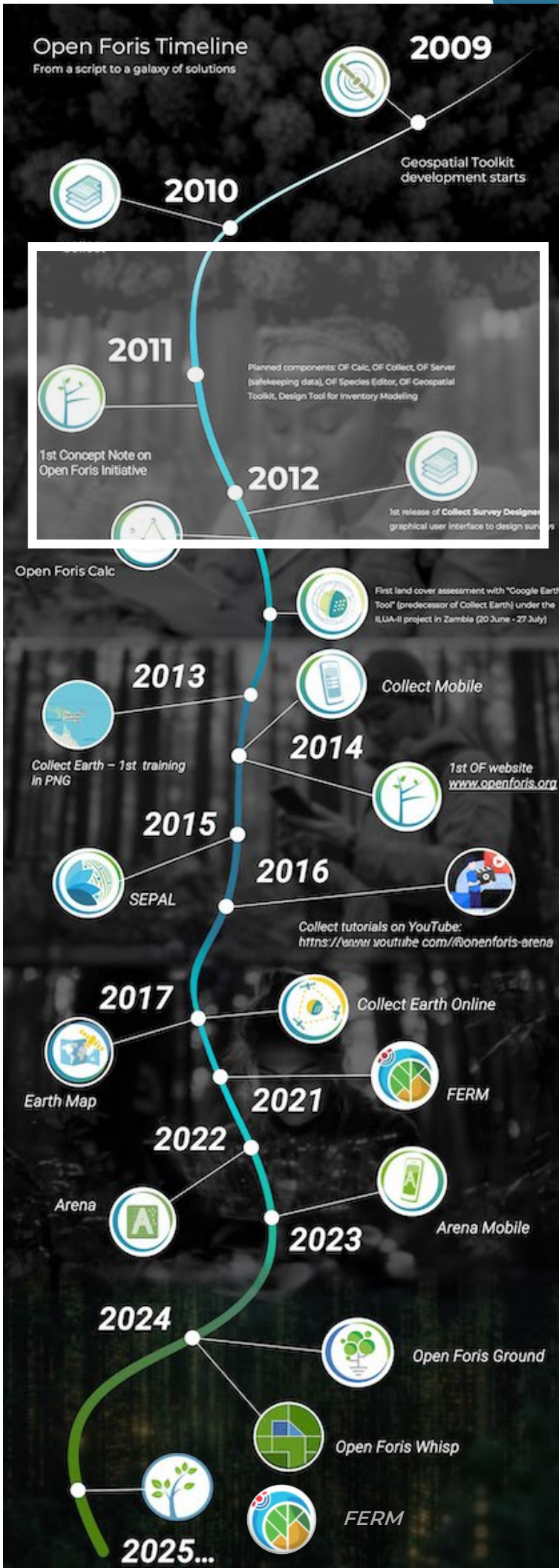


1st release of **Collect Survey Designer**, graphical user interface to design surveys



First land cover assessment with "Google Earth Tool" (predecessor of Collect Earth) under the ILUA-II project in Zambia (20 June - 27 July)

Google Earth Data Collector 2010



Open Foris Collect Earth

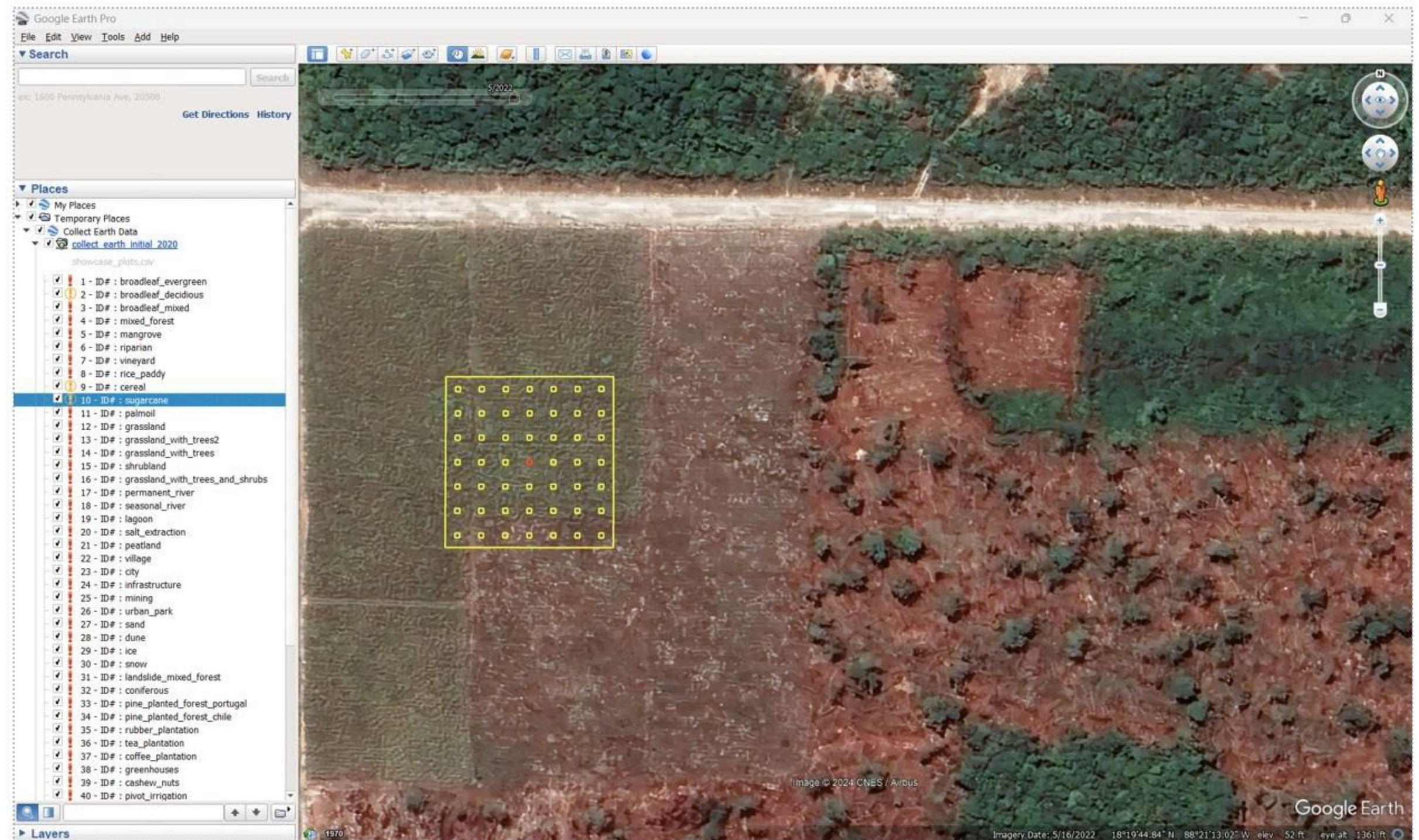
2011

2024

UX is Key!

Improved UI with simple design > complex development:

- 1000s of users
- Mio of plots



2013



Collect Earth – 1st training in PNG



Collect Mobile

2014

**1st OF website
www.openforis.org**



2015

SEPAL



FAO-Google MoU



2016



**Collect tutorials on YouTube:
<https://www.youtube.com/@openforis-arena>**

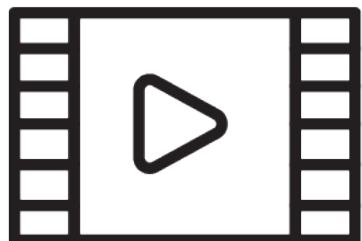
Open Foris SEPAL

2015

2024

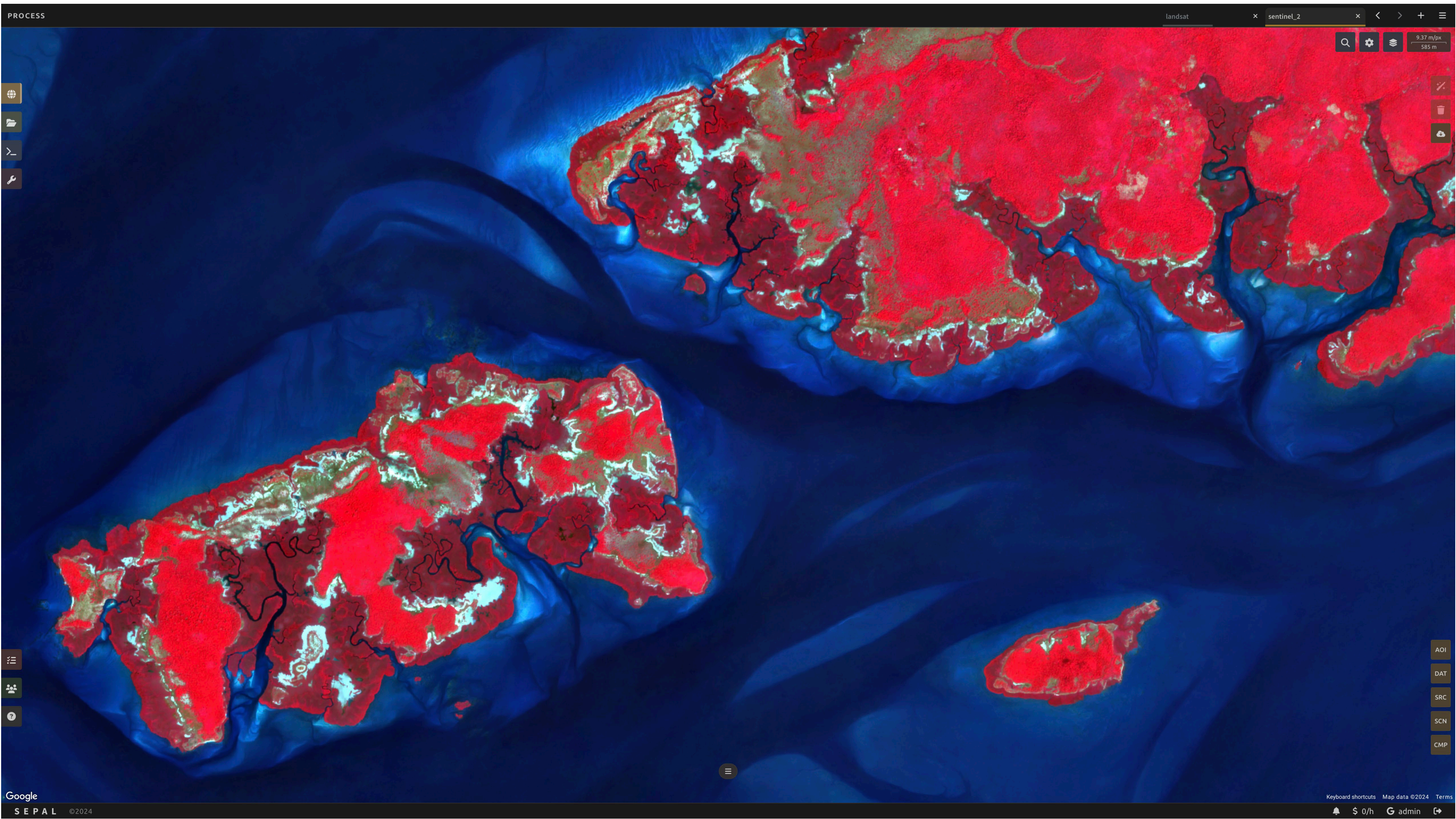


[Video](#)



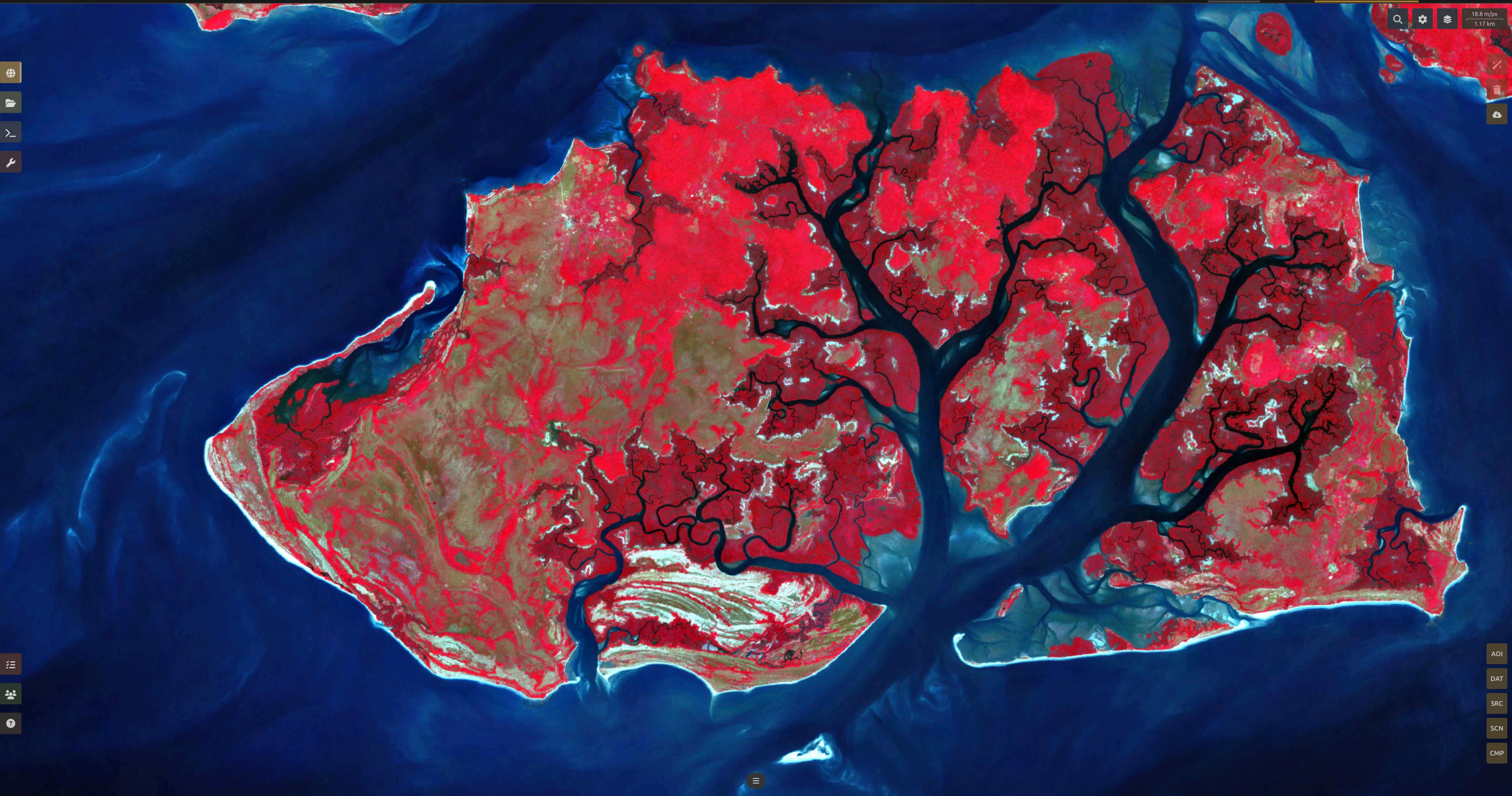
```
SDMS: Terminal

Erik.Lindquist@ip-172-31-35-235:~$ ls
sdmsrepository
Erik.Lindquist@ip-172-31-35-235:~$ cd sdmsrepository/
Erik.Lindquist@ip-172-31-35-235:~/sdmsrepository$ ls
LT51770611986004XXX01
Erik.Lindquist@ip-172-31-35-235:~/sdmsrepository$ cd LT51770611986004XXX01/
Erik.Lindquist@ip-172-31-35-235:~/sdmsrepository/LT51770611986004XXX01$ ls -lrt
total 366676
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 53476198 Jan 14 13:17 LT51770611986004XXX01_B1.TIF
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 53476198 Jan 14 13:17 LT51770611986004XXX01_B2.TIF
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 53476198 Jan 14 13:17 LT51770611986004XXX01_B3.TIF
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 53476198 Jan 14 13:17 LT51770611986004XXX01_B4.TIF
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 53476198 Jan 14 13:17 LT51770611986004XXX01_B5.TIF
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 53476198 Jan 14 13:17 LT51770611986004XXX01_B6.TIF
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 53476198 Jan 14 13:17 LT51770611986004XXX01_B7.TIF
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 19533 Jan 14 13:17 LT51770611986004XXX01_GCP.txt
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 65535 Jan 14 13:17 LT51770611986004XXX01_MTL.txt
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 365653 Jan 14 13:17 LT51770611986004XXX01_VER.jpg
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 253574 Jan 14 13:17 LT51770611986004XXX01_VER.txt
-rw-r--r-- 1 Erik.Lindquist Erik.Lindquist 9201 Jan 14 13:17 README.GTF
Erik.Lindquist@ip-172-31-35-235:~/sdmsrepository/LT51770611986004XXX01$
```

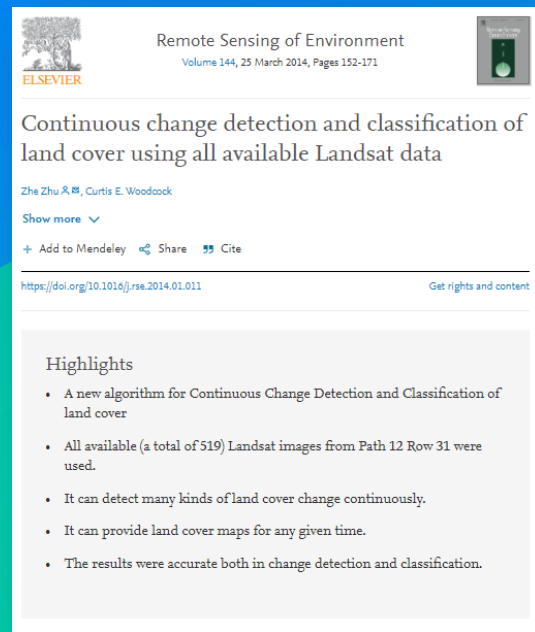




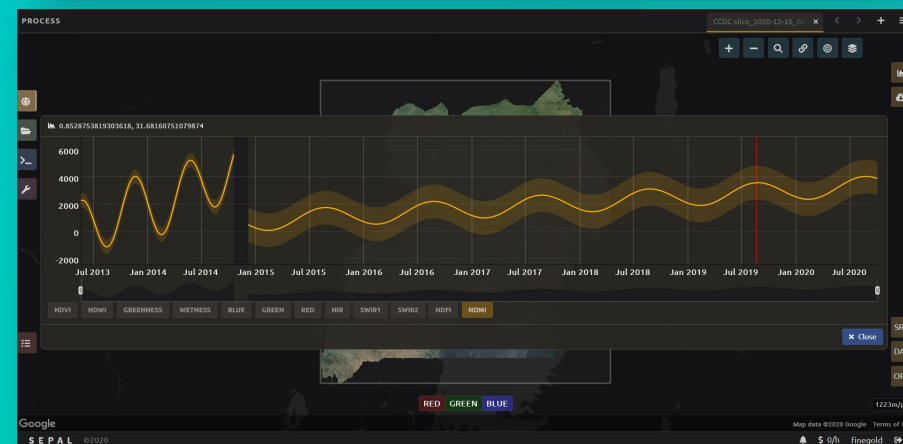
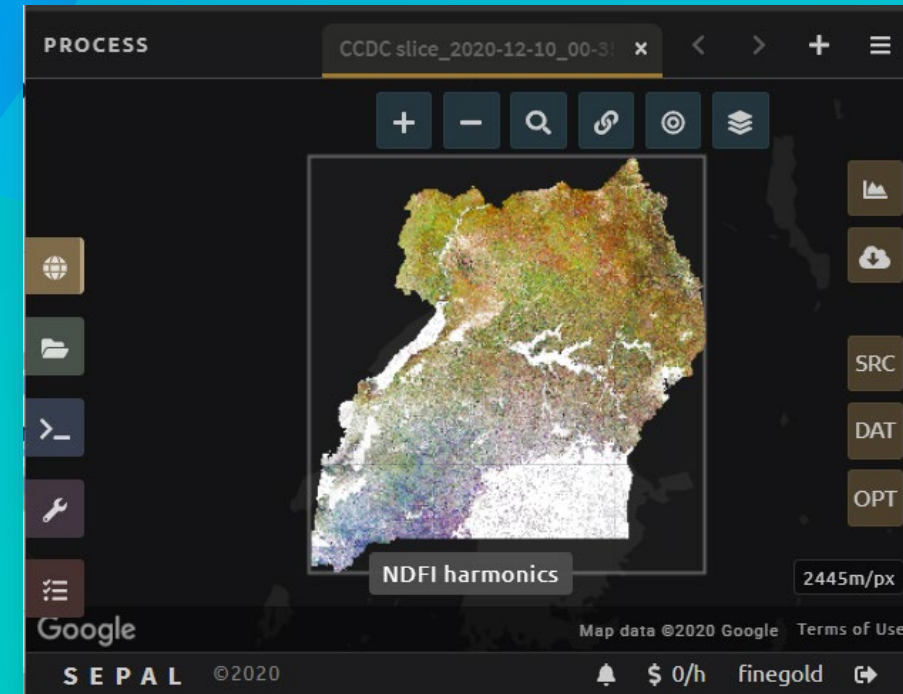
- AOI
- DAT
- SRC
- SCN
- CMP



Bridging science and practice, democratizing data



```
1 import os
2 import time
3 from datetime import timedelta
4 from pathlib import Path
5 import concurrent.futures
6
7 from osgeo import gdal
8 import pandas as pd
9 import numpy as np
10 import rasterio as rio
11
12 import tensorflow as tf
13 import tensorflow_probability as tfp
14
15 from component import parameter as cp
16 from component.message import ca
17
18
19 def cumsum(residuals, threshold=None):
20
21     # do cumsum calculation
22     cumsum = tf.math.cumsum(residuals, axis=0)
23     s_max = tf.math.reduce_max(cumsum, axis=0)
24     s_min = tf.math.reduce_min(cumsum, axis=0)
25     s_diff = tf.subtract(s_max, s_min)
26
27     # get position of max value
28     argmax = tf.math.argmax(cumsum, axis=0)
29
30     # filter out based on expected change
31     if threshold:
32
33         # we might have all zeros within s_diff file, the booleanmask is empty and throws an error
34         # therefore we simply set the full output to zeros in that case
35         try:
36             n = tf.cast(
37                 tf.stats.percentile(
38                     tf.boolean_mask(s_diff, tf.math.not_equal(s_diff, 0)), 95
39                 ),
40                 "float32",
41             )
42             argmax = tf.where(tf.greater(n, s_diff), tf.zeros_like(argmax), argmax)
43             s_diff = tf.where(tf.greater(n, s_diff), tf.zeros_like(s_diff), s_diff)
44         except:
45             argmax = tf.zeros_like(argmax)
46             s_diff = tf.zeros_like(s_diff)
47
48     return s_diff, argmax
```



- Consistently apply best practices and advanced methods
- Allow large scale implementation
- Allow trial and error – fail faster

Big data processing - Time series analysis in Uganda

Why SEPAL?



Without SEPAL



With SEPAL

- . User friendly
- . Efficient
- . Transparent
- . No need of programming skills
- . Access anytime anywhere
- . Continuously developing tool

2017



Earth Map



Collect Earth Online

2021



FERM

2022

Arena



2023



Arena Mobile

2024



Open Foris Ground



Open Foris Whisp



FAO-Google MoU



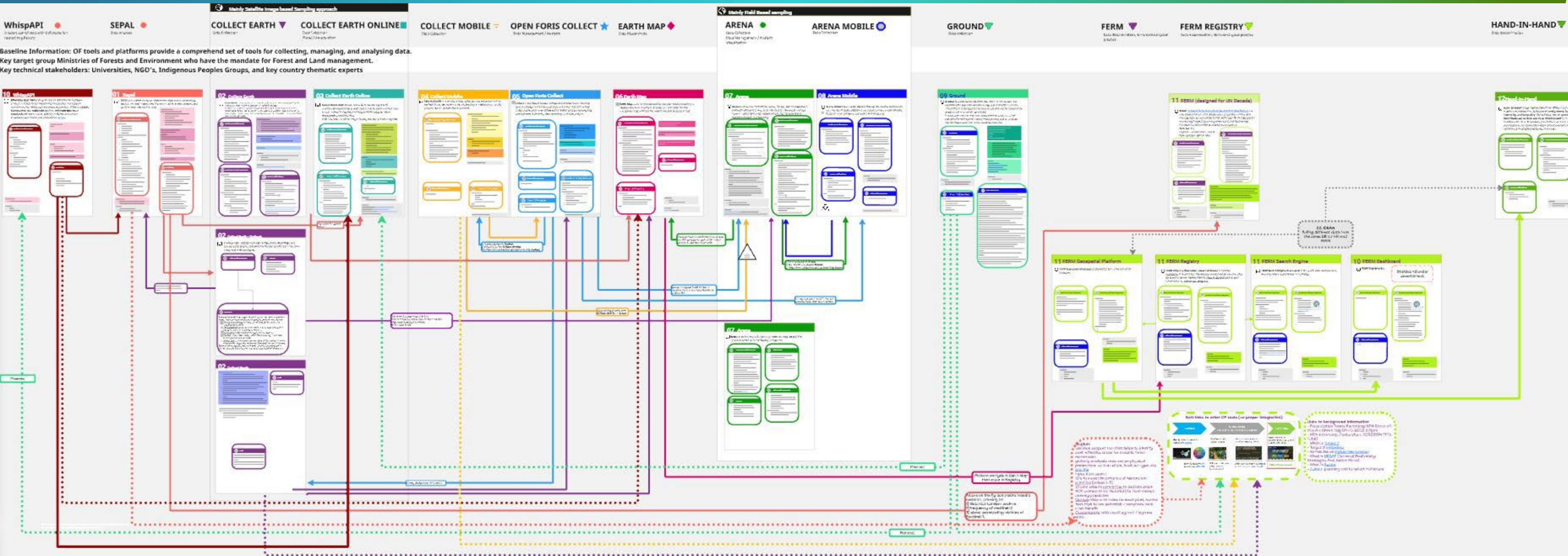
2025...



**The Framework for Ecosystem
Restoration Monitoring (FERM)**

Open Foris Ecoystem

2024

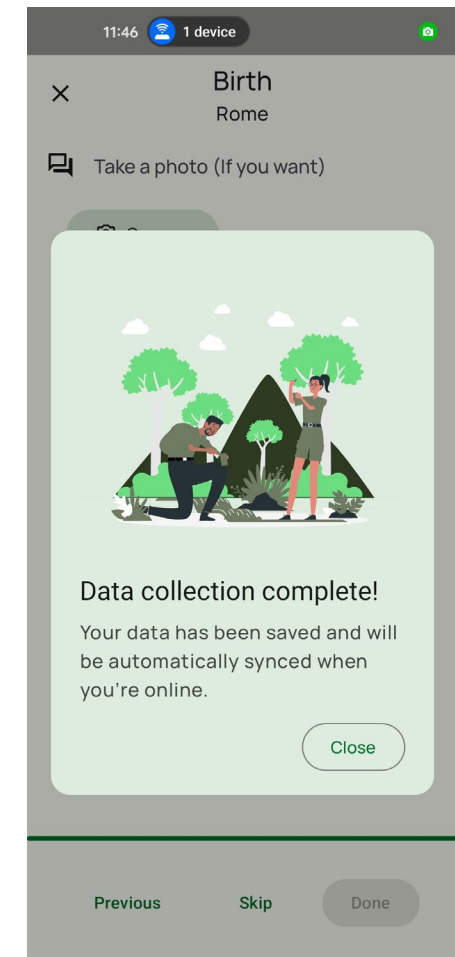
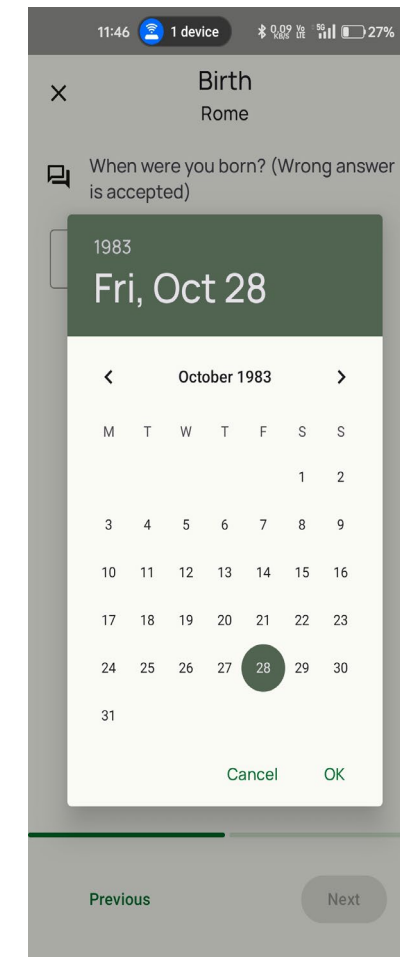
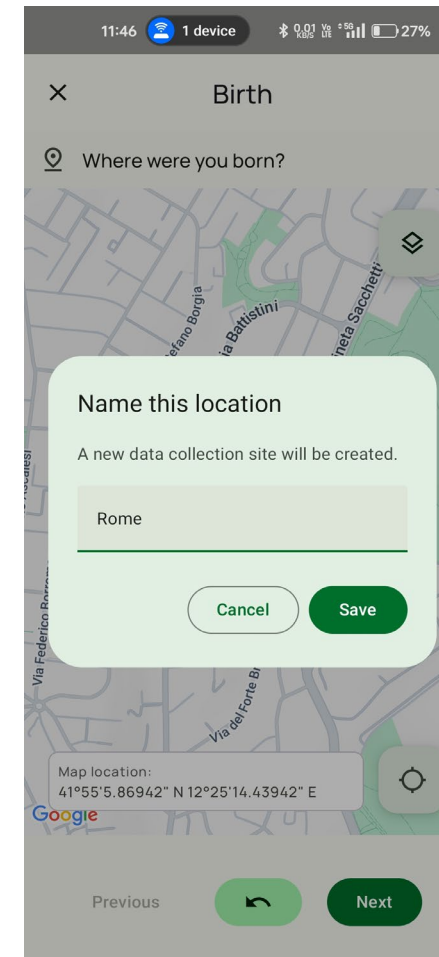
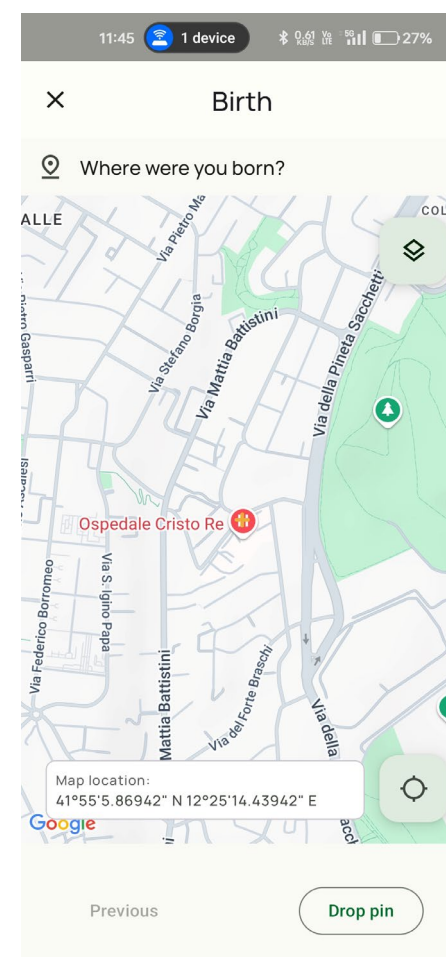
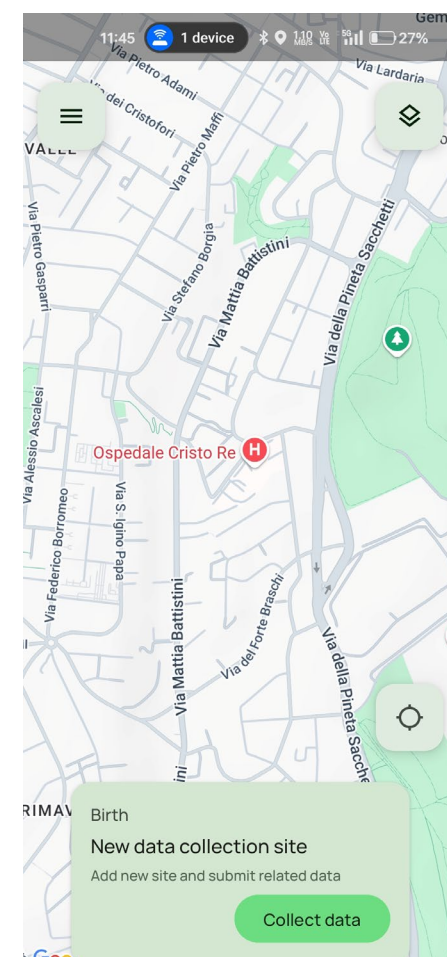
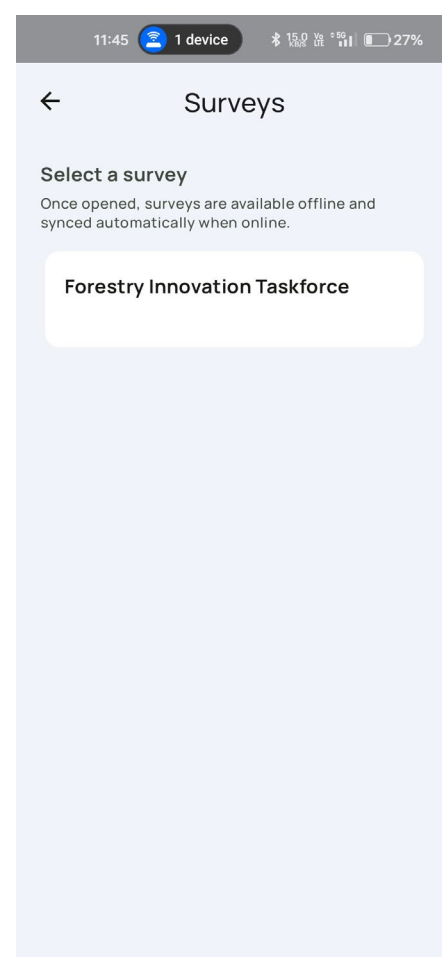
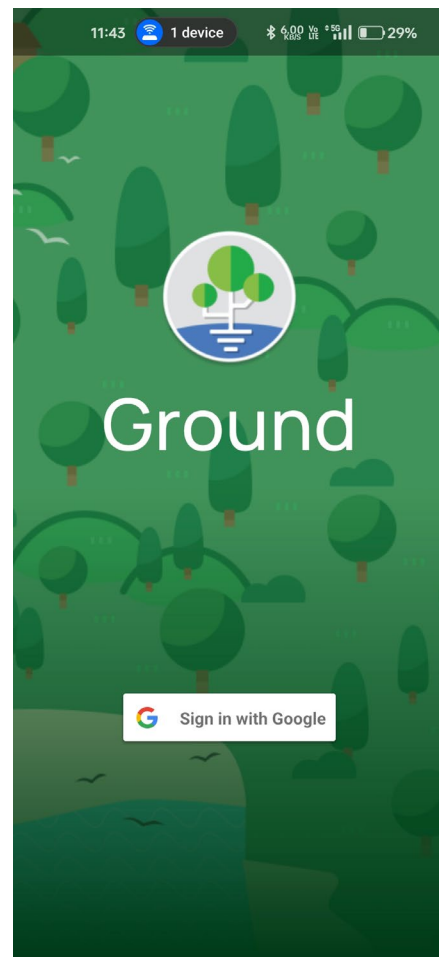


Open Foris Ground

2023


2024

Data collection steps




Open Foris Whisp in EarthMap

2024



whisp.earthmap.org/login


EN-GB


 Whisp


**Deforestation analysis
made easy**

**A convergence of evidence tool
for deforestation-related
regulations compliance**

Access here

 Sign-in with Google

 Sign-in with email

 Access anonymously

By continuing, you are indicating that you accept our [Terms of Service](#) and [Privacy Policy](#).

User adoption - Whisp

2024



Whisp (What is in that plot) is an open-source solution which helps to produce relevant forest monitoring information and support compliance with deforestation-related regulations.

- The deforestation risk analysis presented below uses information generated by Whisp to classify plots of land into three risk levels:
- **Low Risk:** Any plot outside of mapped forest, overlapping with an available commodity map or with any observed disturbance map before 2020.
 - **High Risk:** Plot is within mapped forest, not within any mapped commodity, and only disturbances detected after 2020.
 - **More information needed:** Plots that have not been disturbed or lack other evidence to determine their risk level. This classification highlights areas that require further investigation.

You can read more about the Convergence of Evidence approach and risk assessment methodology at the [Open Foris Whisp](#). For each of the plots, you can also access more detailed, visual analysis tools through the embedded WhispMap.

Land plot	Tree cover ↑↓	Commodities ↑↓	Disturbance before 2020 ↑↓	Disturbance after 2020 ↑↓
1	yes	no	yes	yes
2	yes	no	yes	yes
3	yes	no	yes	yes

Category	Item	Percentage
Forest Types	GLAD Prim. Humid Tropical Forest - Tree Cover	57.7%
	JAXA - Tree Cover	55.4%
	GLAD - Tree Cover	62.8%
	ESA - Tree Cover	91.8%
	JRC Tropical Moist Forest Disturbed - Cover	5%
Agriculture Land Cover 2020	JRC Tropical Moist Forest - Plantations	0%
	Oil Palm BIOPAMA 2020	0%
	Oil Palm FDaP 2020	0%
	Cocoa Cover 2020	0%
Disturbances	Plot inside a Key Biodiversity Area (BirdLife Int.)	
	GLAD tree cover loss after 2020	
	GLAD tree cover loss 2000-2020	
	RADD Deforestation Alert Present in the Plot!	

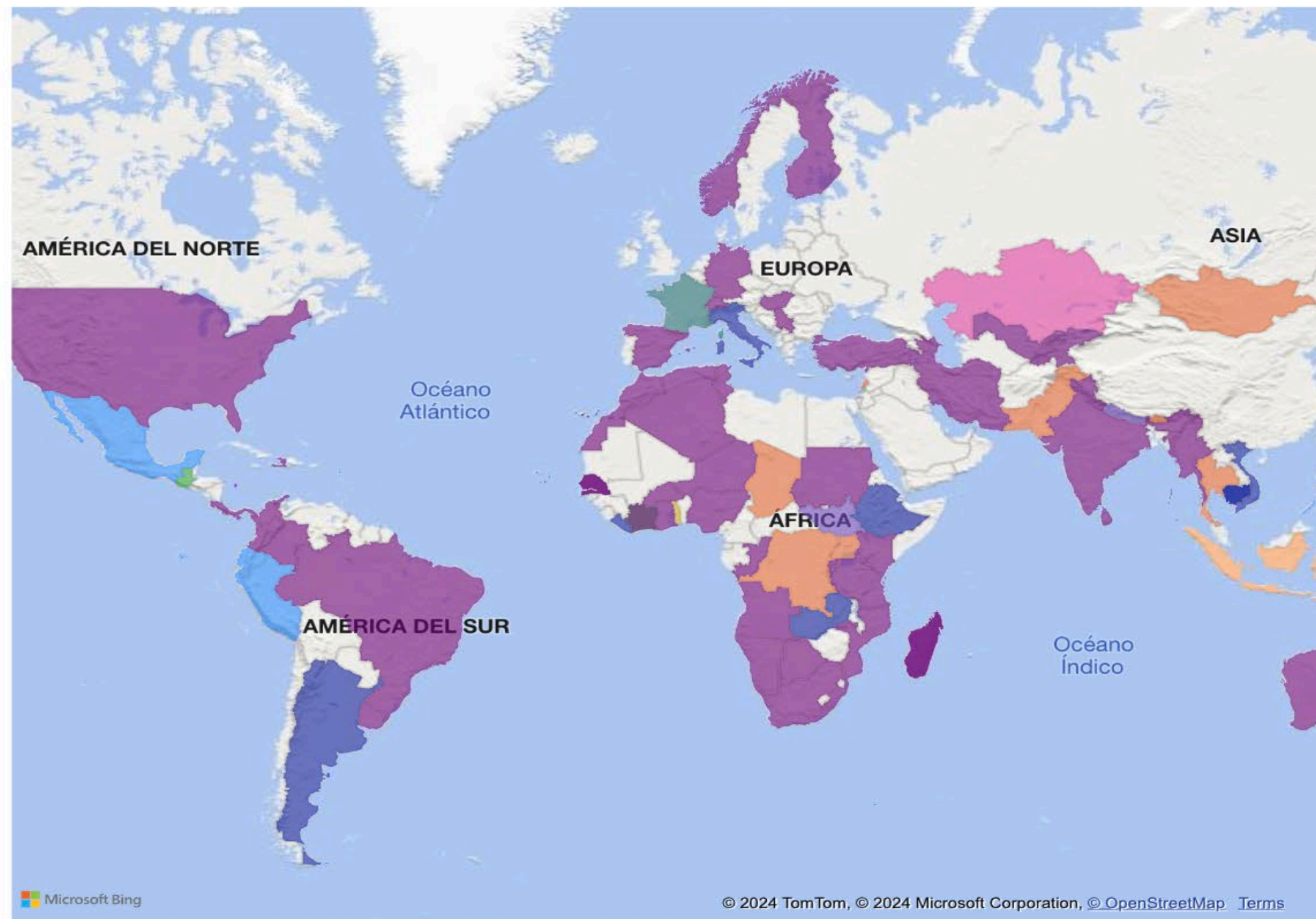


<https://bit.ly/WhispOverview>

Open Foris Capacity Building

2014 - 2024

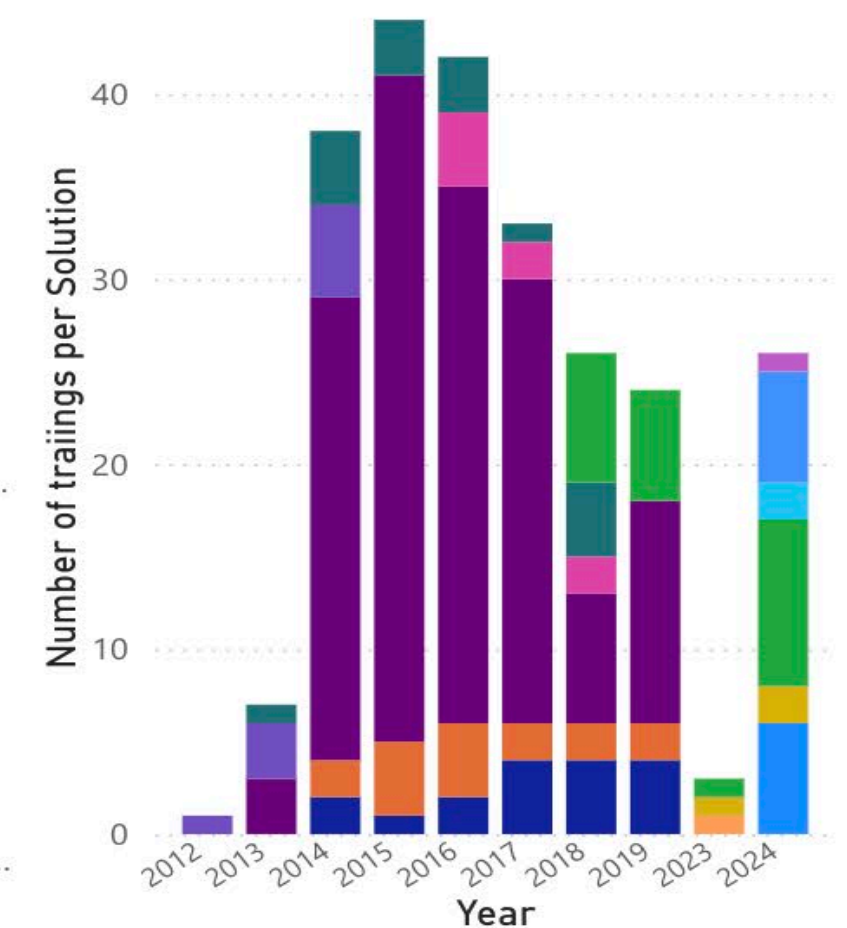
- Solution**
- Arena
 - Calc
 - CEO
 - Collect
 - Collect Earth
 - Collect Mobile
 - Geospatial Toolkit
 - Ground
 - Open Foris
 - SEPAL
 - Whisp
 - Whisp, Ground
 - Whisp, Ground, SEPAL

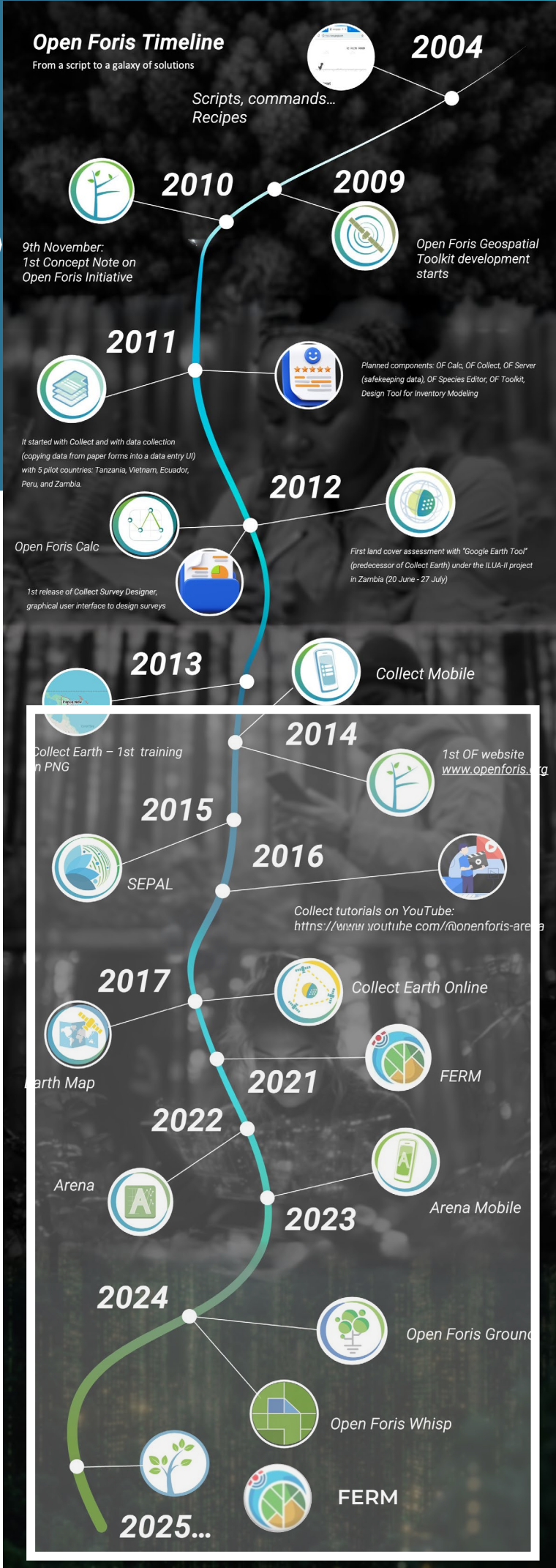


244
Trainings

92
Countries

- Solution**
- Arena
 - Calc
 - CEO
 - Collect
 - Collect Earth
 - Collect Mobile
 - Geospatial Too...
 - Ground
 - Open Foris
 - SEPAL
 - Whisp
 - Whisp, Ground
 - Whisp, Ground...





Open Foris

2014 - 2024

Forest Monitoring

[Home](#)
[Our work](#)
[Forest Monitoring](#)
[Data platforms](#)
[News and Events](#)
[Resources](#)
[Dashboard](#)

Reference Levels Submitted to the UNFCCC

Forests play a key role in the fight against climate change. To measure impact, unlock results-based finance, and support decision making, countries need transparent and reliable forest data for assessment of forest carbon fluxes. A forest reference emission level and/or forest reference level (hereafter reference level) serves as a benchmark for evaluating a country's progress in implementing activities to reduce deforestation and degradation and enhance forest carbon stocks (referred to as REDD+).

Developing countries can voluntarily submit a reference level to the UNFCCC (United Nations Framework Convention on Climate Change), which is a requirement for accessing results-based payments.

Countries can submit multiple reference levels for reasons such as expanding the area covered, including more activities, updating data, or improving methods.

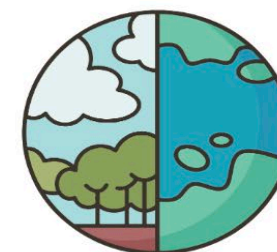
This section offers an overview of the choices countries have made in their submitted reference levels and how they assess their emission reductions against these benchmarks.

For more details, click [here](#).

UNFCCC Reference Levels Dashboards



Submissions and forest area



Reference levels elements

E-Learning



Measurement, reporting and verification for environmental integrity: Introduction

15/11/2024

This course highlights the importance of forests in climate change mitigation and how quality measurement, verification and reporting (MRV) is needed...

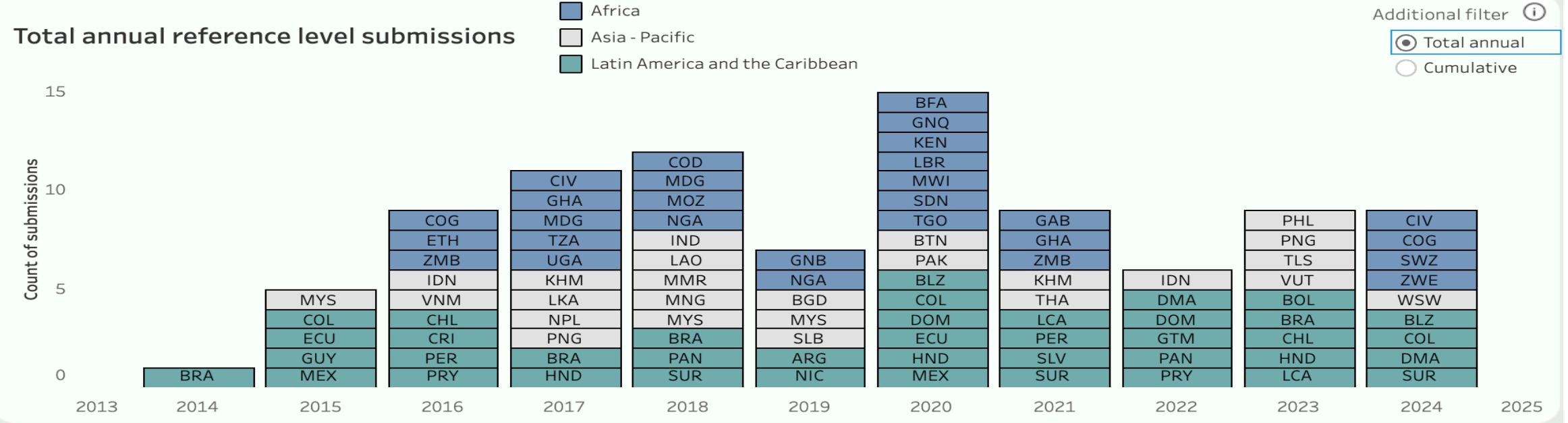
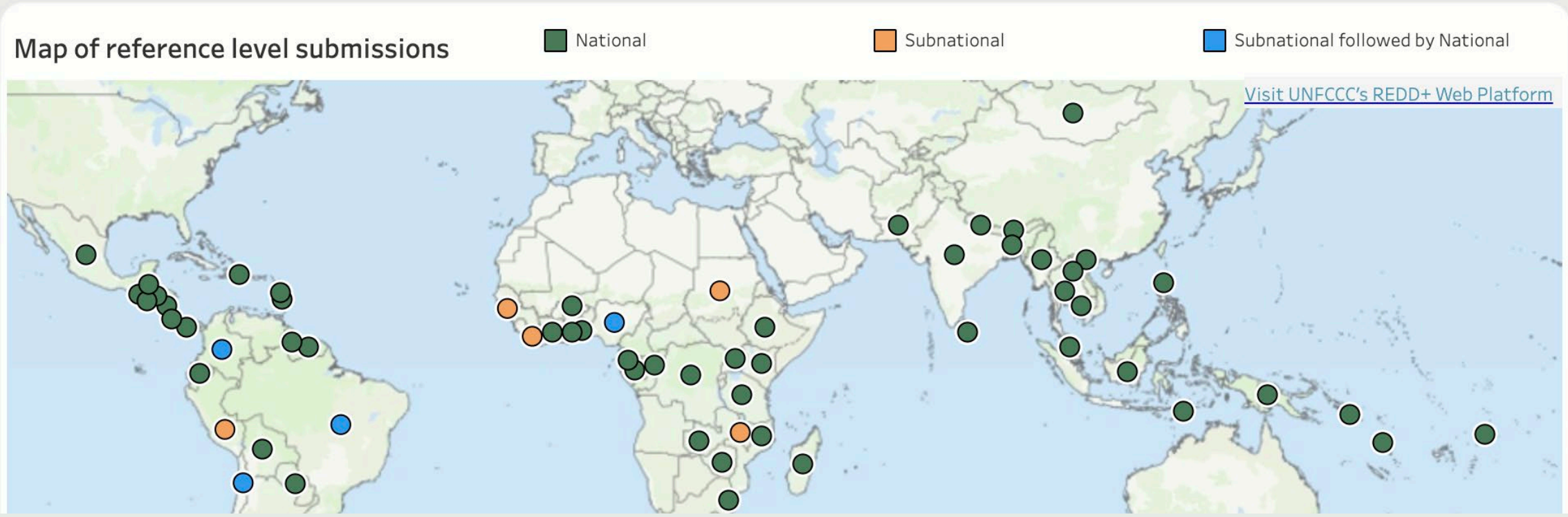
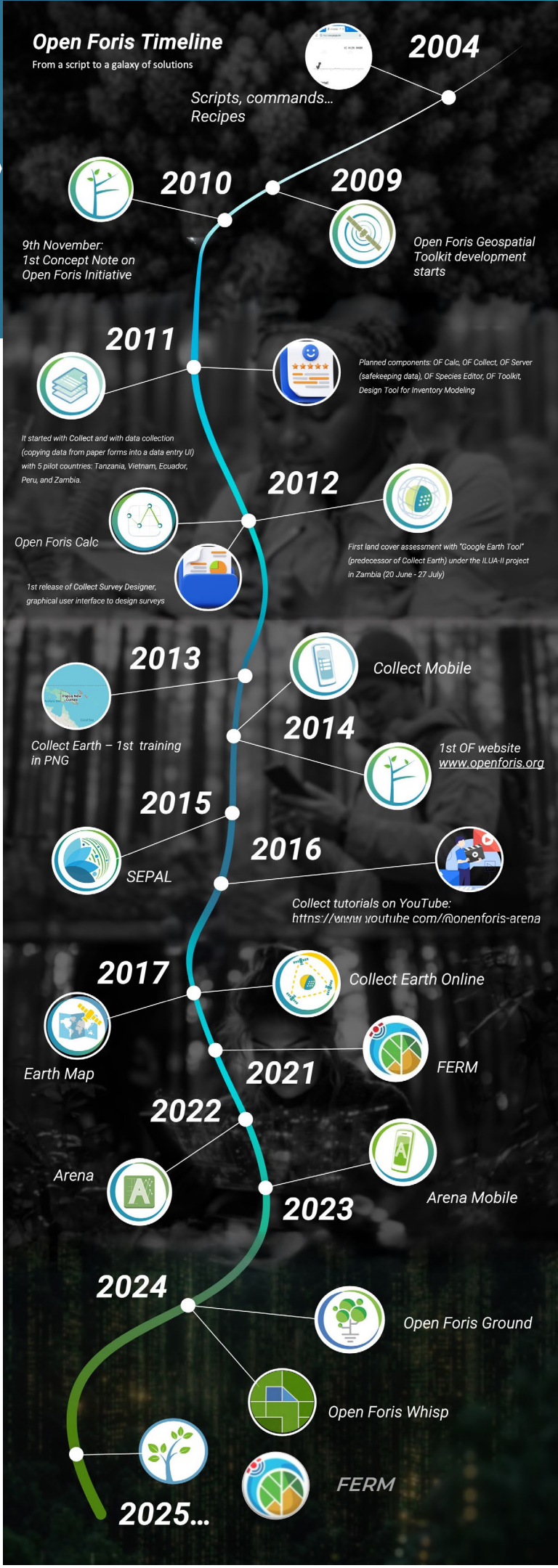
Events

[Enhancing Forest Monitoring and Collaboration: a South-South Knowledge Exchange](#)

HYBRID EVENT, 25/11/2024

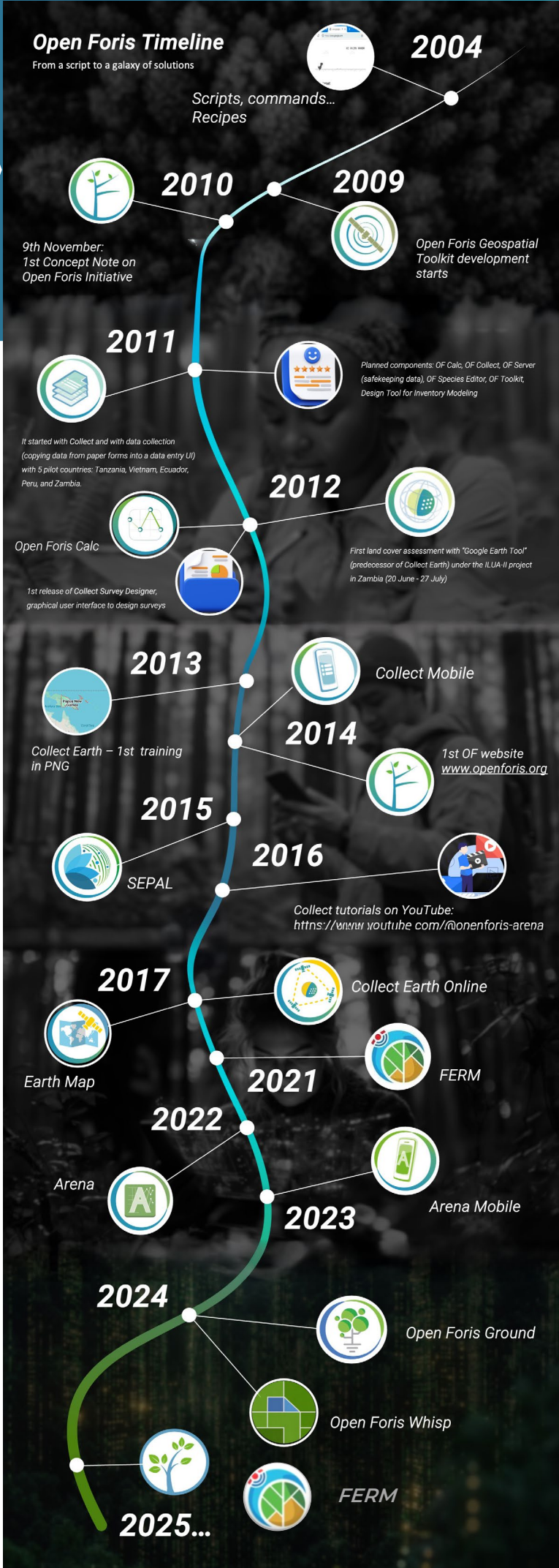
Open Foris MRV Dashboard

2024



Integrating the FERM

2025



FRAMEWORK FOR ECOSYSTEM RESTORATION MONITORING

- REGISTER**: Your restoration initiative and good practices
- VISUALIZE**: The latest geospatial data on restoration
- USER GUIDE**: Download the FERM user guide
- SEARCH**: For good practices on ecosystem restoration

The **official framework** for operational monitoring of global restoration progress and disseminating good practices for the **UN Decade** and reporting areas under restoration towards **Target 2** of the **KM-GBF**

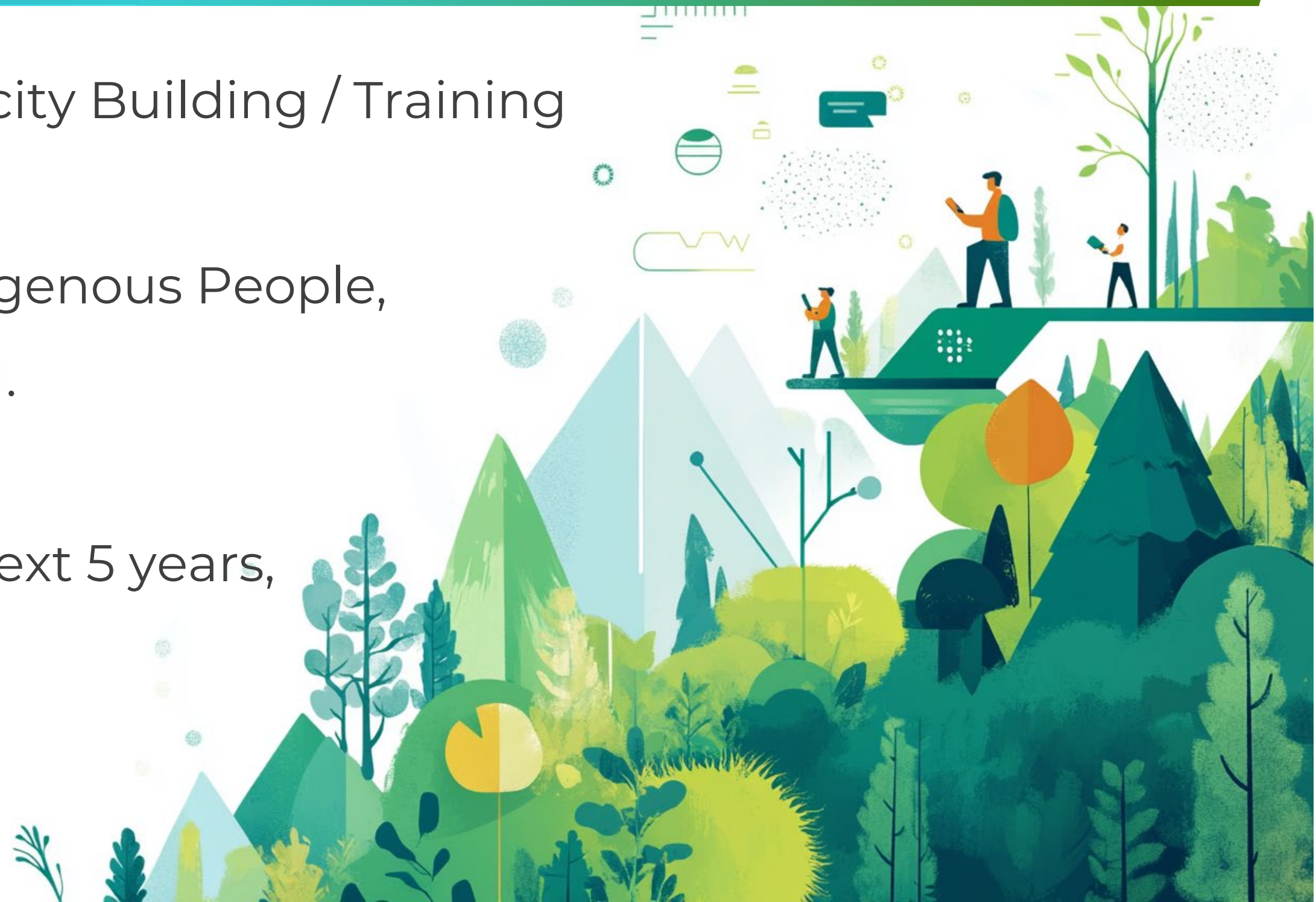
<https://ferm.fao.org>



Open Foris Heading towards

2025 & beyond...

- Request from Countries + Capacity Building / Training + technical advances
- Commodities, Restoration, Indigenous People, potential collaboration with OIN.
- Digital Public Infrastructure
- Potential data available in the next 5 years, "conversational maps"



Key Takeaways from the Open Foris Journey

2011 - 2025
& beyond...

Lessons Learned:

- Openness: Building trust through transparency.
- Interoperability: Seamless integration across systems.
- User-Centric Design: Meeting diverse user needs effectively,
e.g. simplified solutions

Key Takeaways from the Open Foris Journey

2011 - 2025
& beyond...

Ongoing Challenges:

- Expanding reach to diverse user groups: While innovative tech-wise, we need to improve outreach
- Managing redundancy and data overlap.
- Ensuring long-term sustainability (funding).



open**foris**



Food and Agriculture
Organization of the
United Nations

Thank you!

yelena.finegold@fao.org

Openforis.org