Forestry Thematic Exploitation Platform

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forestry
tep

European Space Agency

Forestry TEP

One-stop shop for forestry remote sensing services for the academic, public and commercial sectors

- Online service that enables quicker and smoother value adding
- Access to satellite imagery, computing power and value adding services
- Platform for developing and sharing own applications
- Worldwide marketing channel for commercial remote sensing services

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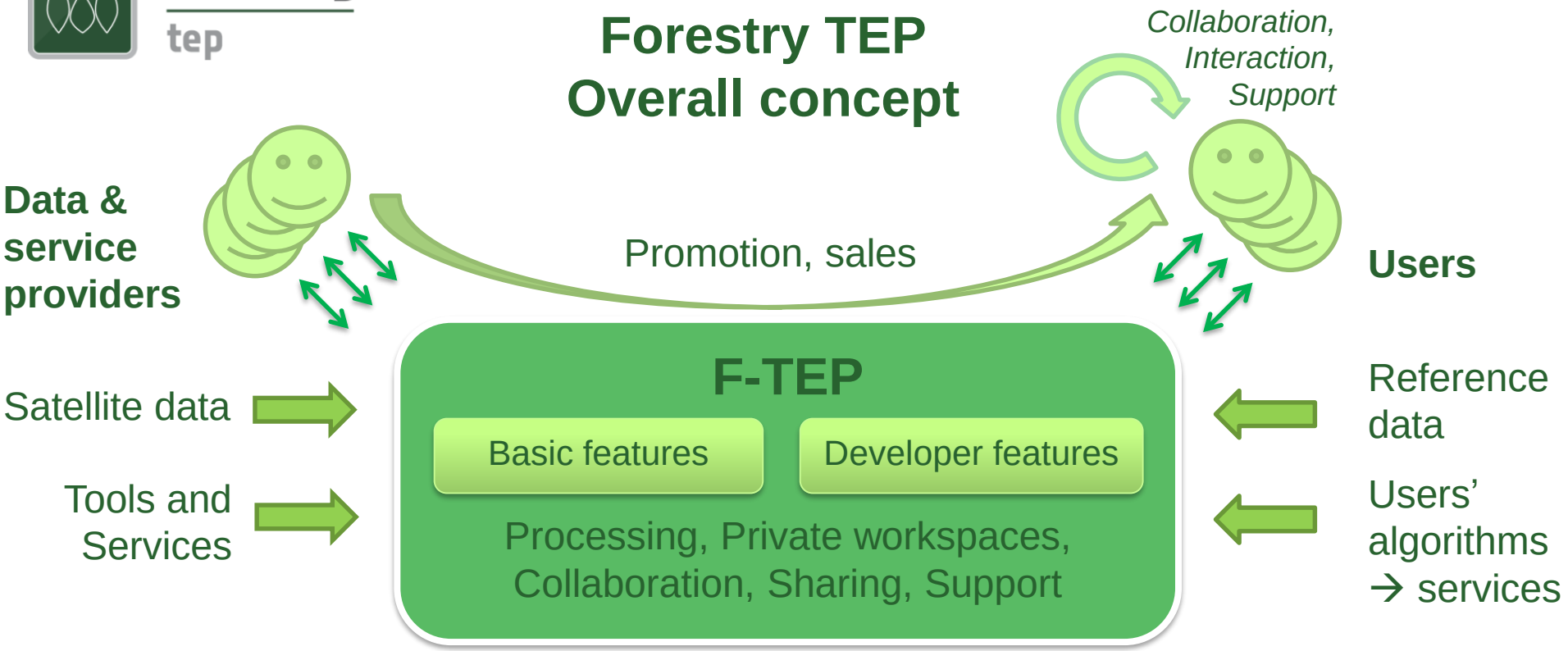
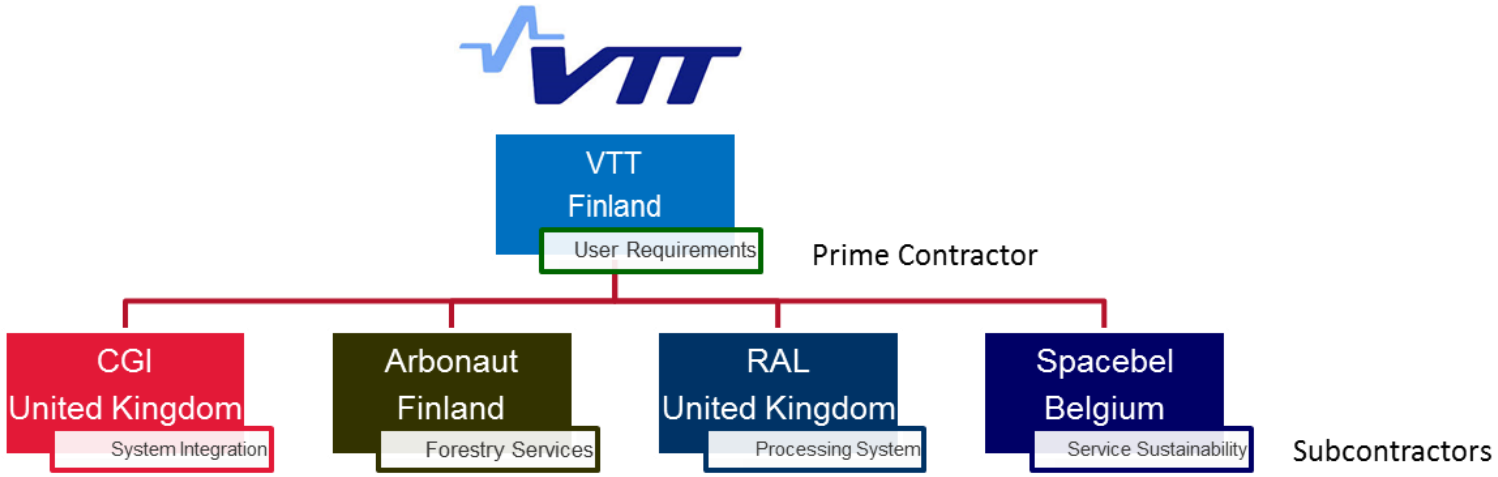
Forestry TEP Overall concept



Both free and commercial services, tools and data

Forestry TEP as a project

- Initiative by the European Space Agency
- One of the six Thematic Exploitation Platforms
- In 2018 transitioning to operational services



Infrastructure provider and data mediator until 2018:

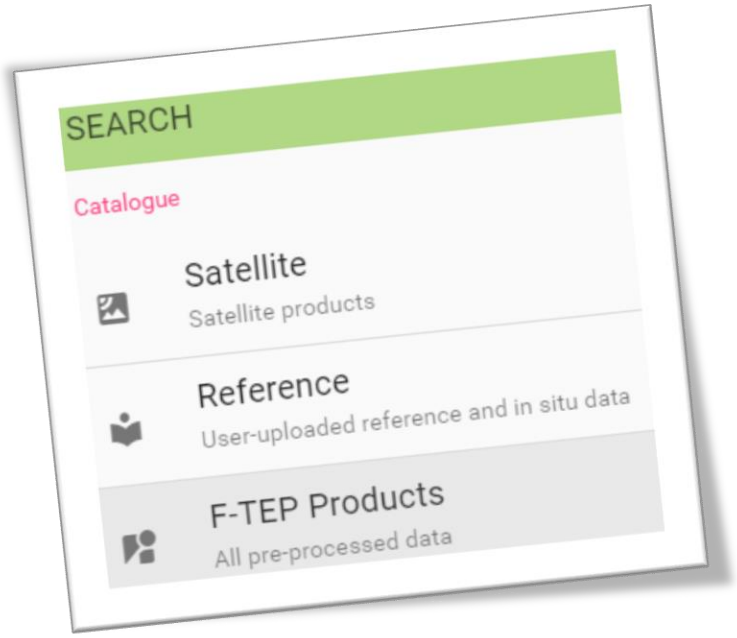
User segments

User group	Characteristics
Academia	Many and diverse users Central role in outreach Expect free or very inexpensive services
Governments	Can be massive users Ready to pay for good services
Forest industry, large forest owners	Require very specific services Potentially a major customer segment
NGO's	Important role in outreach Expect inexpensive services
Value adding service provision companies	Particularly SME's Major customer segment
Intergovernmental organizations	Potentially major customer segment via donor funding

Forestry TEP data offering

- Primary data: **Sentinel** satellites of the European Copernicus programme

- Additional satellite data sources
  - Landsat (currently limited)
  - Forthcoming: commercial satellites
- Reference data
  - As produced and shared by users
- Computed products
  - As produced and shared by users

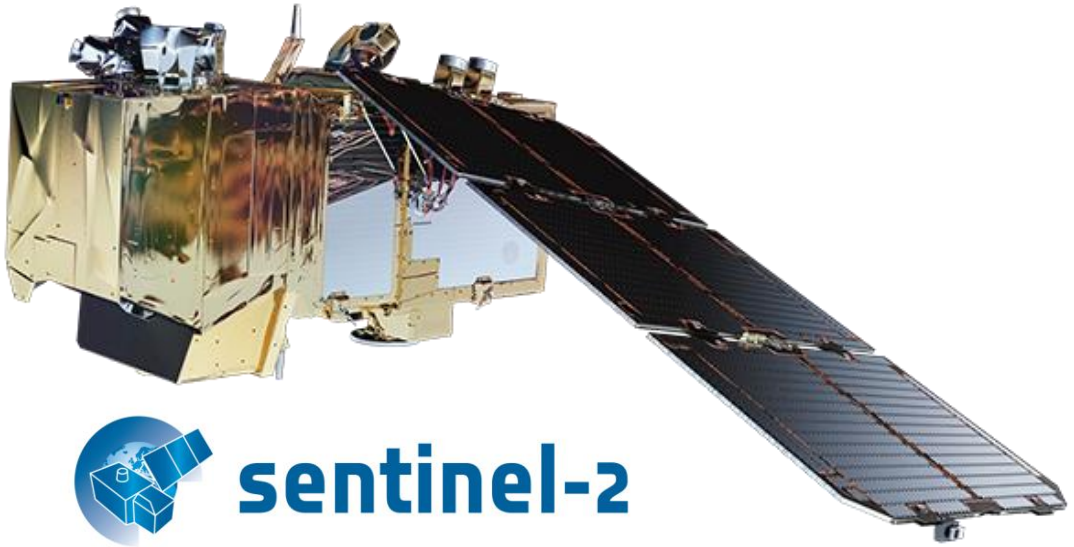


Sentinel-1

- **C-band synthetic aperture radar (SAR)**
- Two polar-orbiting satellites (1A, 1B)
- 5-day global coverage
- Benefits: operation day and night, weather-tolerant
- Main uses: sea ice, marine surveillance, ship detection, land-surface motion, forest/water/soil, humanitarian/crisis
- Modes: Interferometric Wide Swath (IW), Extra Wide Swath (EW), Wave (WV), Stripmap (SM)
- Polarisations: HH, VV, VV+VH, HH+HV
- Primary data types (Level-1):
  - Single Look Complex (SLC): 4-8 GB
  - Ground Range Detected (GRD): 1 GB

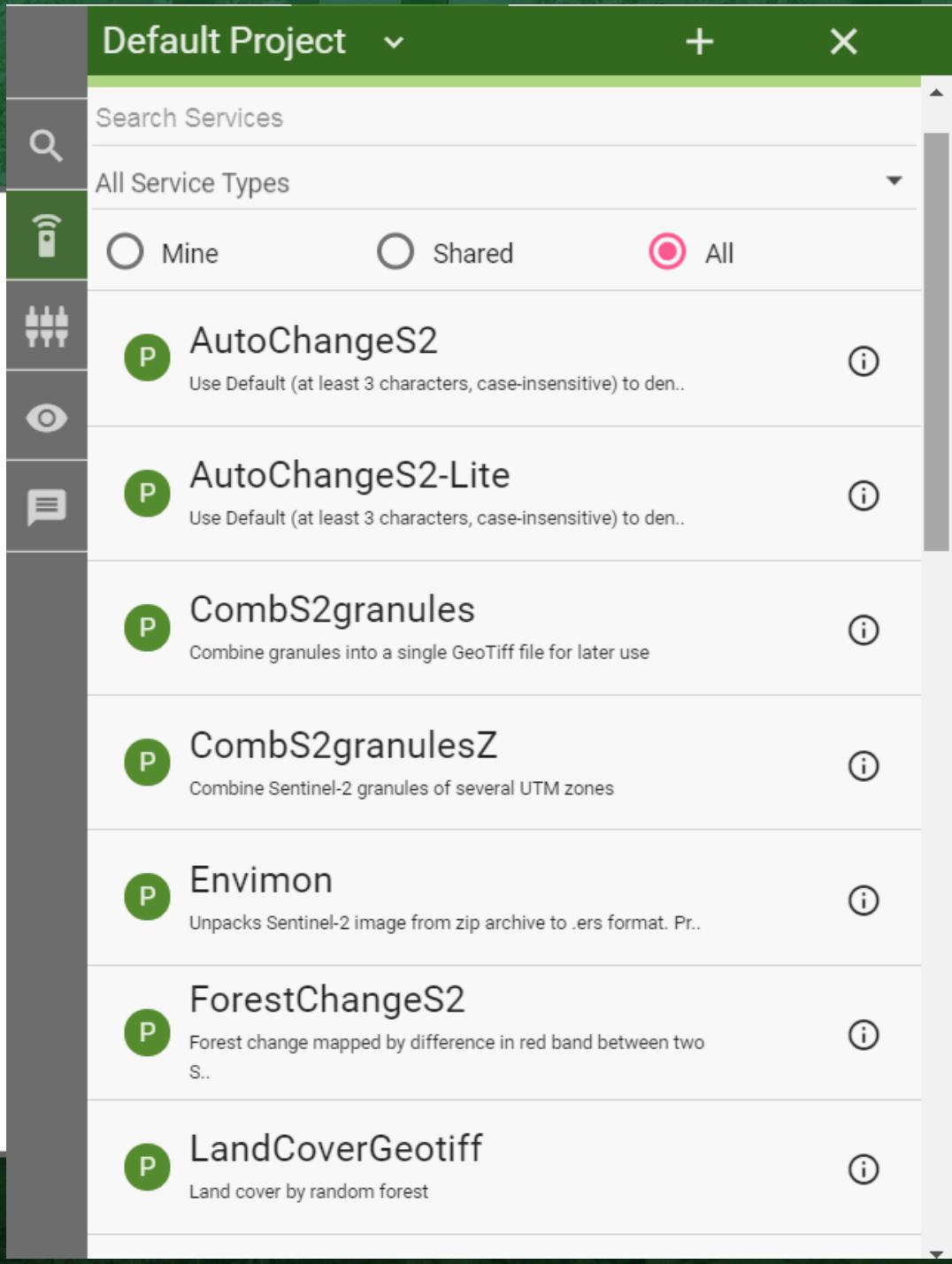
Sentinel-2

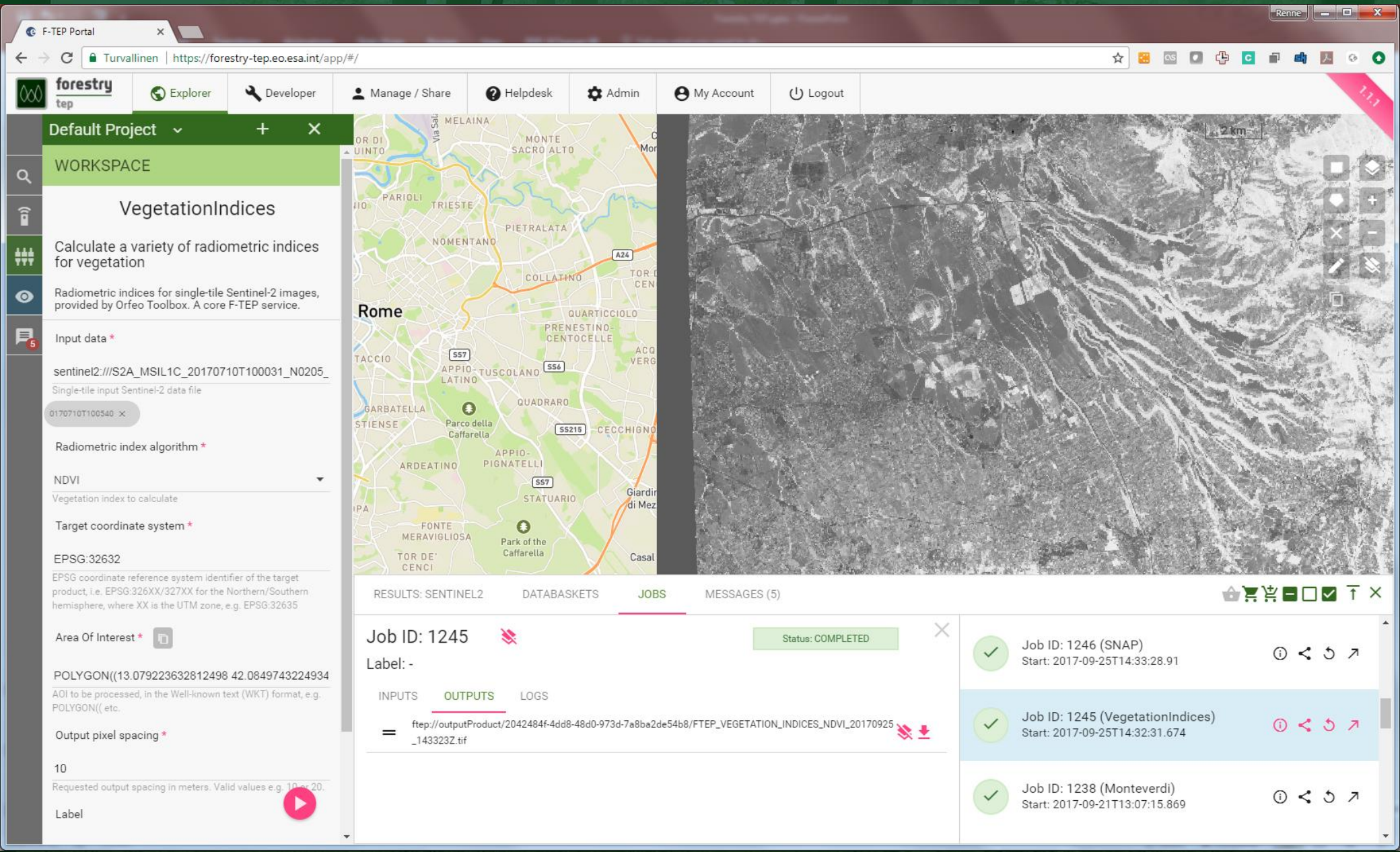
- **Optical MultiSpectral Instrument (MSI)**
- 13 spectral bands
  - 500 nm to 2200 nm
- Resolution 10 to 60 m
- Two polar-orbiting satellites (2A, 2B)
- Main uses: climate change, land monitoring, emergency management, and security.



Processing services

- Several services take user-provided reference data
- Download or share the results




F-TEP Portal
Turvallinen | https://forestry-tep.eo.esa.int/app/#/
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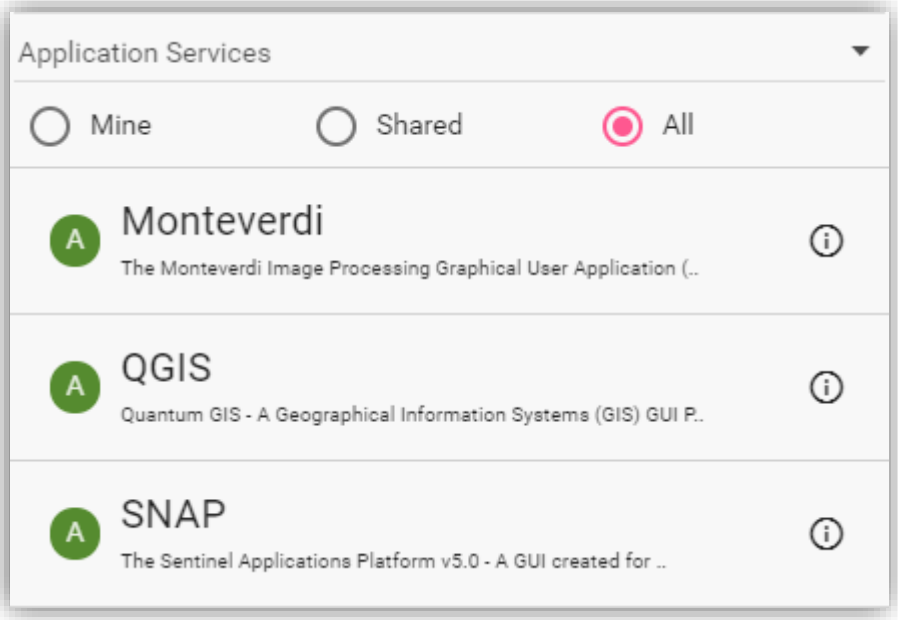
Explorer
Developer
Manage / Share
Helpdesk
Admin
My Account
Logout
Default Project
WORKSPACE
VegetationIndices
Calculate a variety of radiometric indices for vegetation
Radiometric indices for single-tile Sentinel-2 images, provided by Orfeo Toolbox. A core F-TEP service.
Input data *
sentinel2:///S2A_MSIL1C_20170710T100031_N0205_
Single-tile input Sentinel-2 data file
Radiometric index algorithm *
NDVI
Vegetation index to calculate
Target coordinate system *
EPSG:32632
EPSG coordinate reference system identifier of the target product, i.e. EPSG:326XX/327XX for the Northern/Southern hemisphere, where XX is the UTM zone, e.g. EPSG:32635
Area Of Interest *
POLYGON((13.079223632812498 42.0849743224934
AOI to be processed, in the Well-known text (WKT) format, e.g. POLYGON((etc.
Output pixel spacing *
10
Requested output spacing in meters. Valid values e.g. 10 or 20.
Label
Rome
Parco della Caffarella
Park of the Caffarella
RESULTS: SENTINEL2
DATABASKETS
JOBS
MESSAGES (5)
Job ID: 1245
Status: COMPLETED
Label: -
INPUTS
OUTPUTS
LOGS
ftep://outputProduct/2042484f-4dd8-48d0-973d-7a8ba2de54b8/FTEP_VEGETATION_INDICES_NDVI_20170925_143323Z.tif
Job ID: 1246 (SNAP)
Start: 2017-09-25T14:33:28.91
Job ID: 1245 (VegetationIndices)
Start: 2017-09-25T14:32:31.674
Job ID: 1238 (Monteverdi)
Start: 2017-09-21T13:07:15.869

Applications with their own user interface



ORFEO ToolBox

cnes

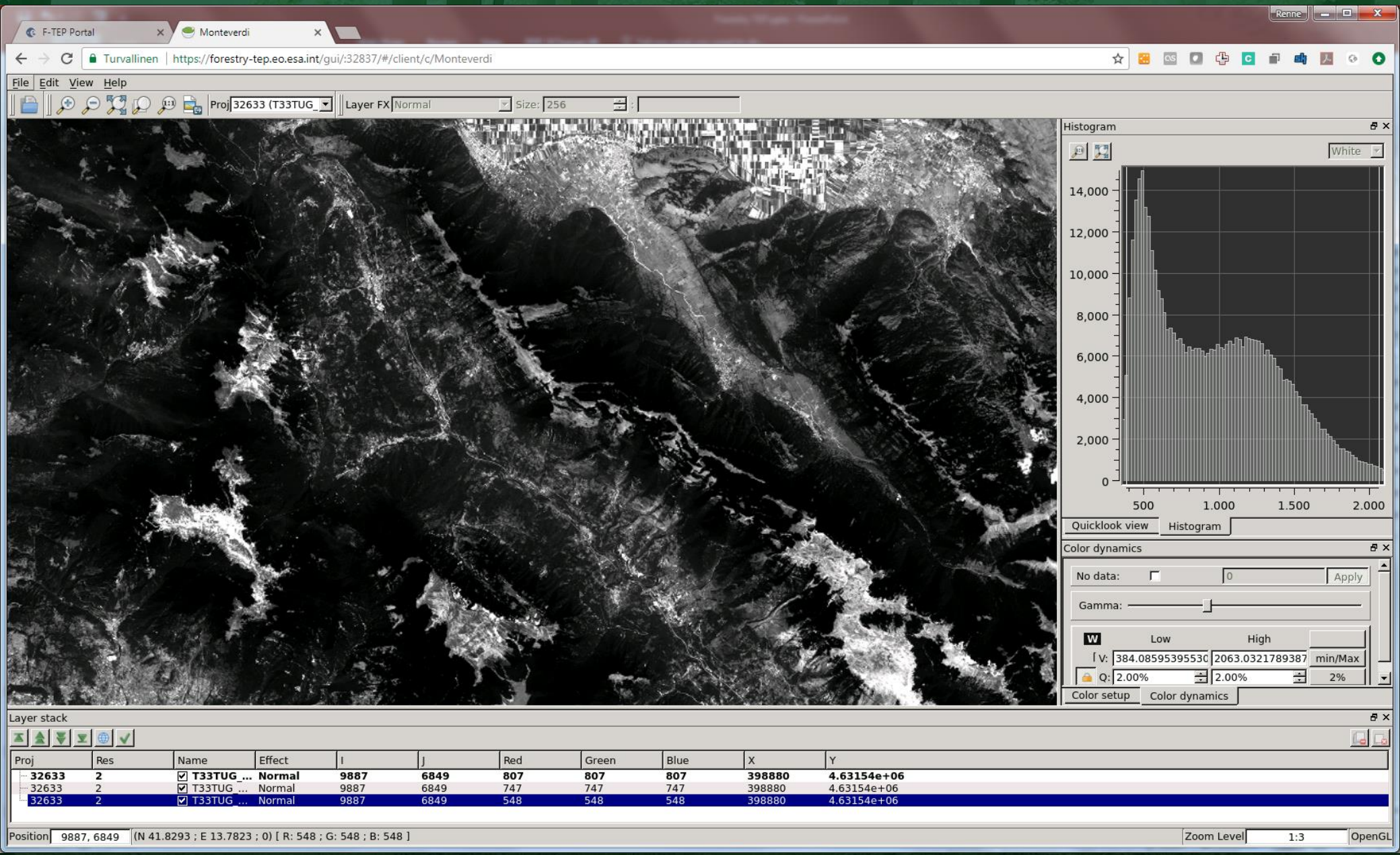
CENTRE NATIONAL D'ÉTUDES SPATIALES

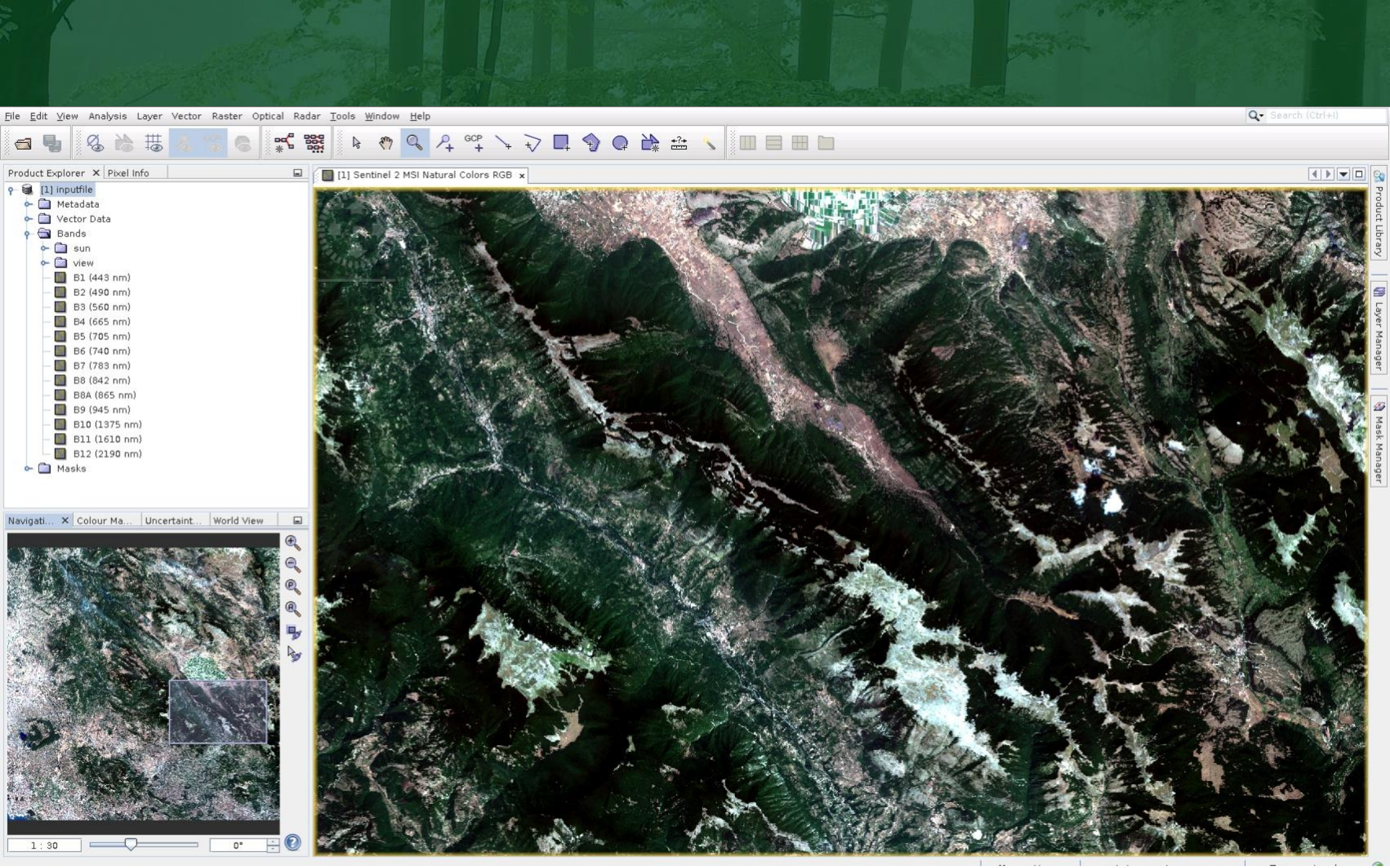
QGIS

Trademark

s-1tbx

s-2tbx


F-TEP Portal
Monteverdi
Turvallinen | https://forestry-tep.eo.esa.int/gui/:32837/#/client/c/Monteverdi
File Edit View Help
Proj 32633 (T33TUG_
Layer FX Normal
Size: 256
Histogram
White
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
500
1.000
1.500
2.000
Quicklook view
Histogram
Color dynamics
No data:
Apply
Gamma:
Low
High
V: 384.08595395530
2063.0321789387
min/Max
Q: 2.00%
2.00%
2%
Color setup
Color dynamics
Layer stack
Proj Res Name Effect I J Red Green Blue X Y
32633 2 T33TUG_... Normal 9887 6849 807 807 807 398880 4.63154e+06
32633 2 T33TUG_... Normal 9887 6849 747 747 747 398880 4.63154e+06
32633 2 T33TUG_... Normal 9887 6849 548 548 548 398880 4.63154e+06
Position 9887, 6849
(N 41.8293 ; E 13.7823 ; 0) [R: 548 ; G: 548 ; B: 548]
Zoom Level 1:3
OpenGL


File Edit View Analysis Layer Vector Raster Optical Radar Tools Window Help
Search (Ctrl+I)
Product Explorer
Pixel Info
[1] inputfile
Metadata
Vector Data
Bands
sun
view
B1 (443 nm)
B2 (490 nm)
B3 (560 nm)
B4 (665 nm)
B5 (705 nm)
B6 (740 nm)
B7 (783 nm)
B8 (842 nm)
B8A (865 nm)
B9 (945 nm)
B10 (1375 nm)
B11 (1610 nm)
B12 (2190 nm)
Masks
Navigati...
Colour Ma...
Uncertaint...
World View
1 : 30
0°
[1] Sentinel 2 MSI Natural Colors RGB
Product Library
Layer Manager
Mask Manager

Processing services by users

- Users can bring their own methods and turn them to new processing services on the platform
  - for themselves to use privately
  - or shared to colleagues / a project group -- or to all
- Based on Docker and shell script - templates provided
- *Note: request for the needed account role!*

Service Name *: EOOpenScienceTest

Docker Tag: ftep/eoopensciencetest

Title: EOOpenScienceTest

Version: 0.1

Service Type: Processor

Description: Description

FILES | INPUT DEFINITIONS | OUTPUT DEFINITIONS

- Dockerfile
- workflow.sh

File Language: Dockerfile

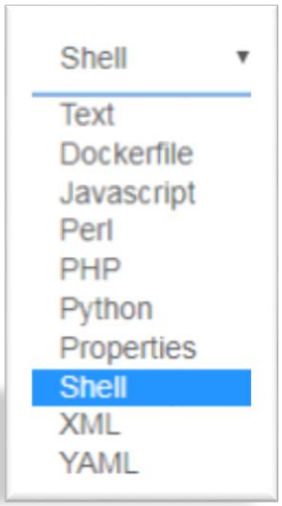
```
FROM ubuntu:16.04

MAINTAINER Forestry TEP

# Dependencies
RUN apt-get update && apt-get install -y\
 bc\
 curl\
 libfreetype6\
 python\
 python-dev\
 && apt-get clean && rm -rf /var/lib/apt/lists/*

############################
# Download and install SNAP
ENV SNAP_MAJ_VER='5'\
 SNAP_MIN_VER='0'\
 SNAP_POINT_VER='0'

ENV SNAP_BASE_URL="http://step.esa.int/downloads/${SNAP_MAJ_VER}.${SNAP_MIN_VER}/installers"\
 SNAP_INSTALLER="esa-snap_sentinel_unix_${SNAP_MAJ_VER}_${SNAP_MIN_VER}.sh"

LABEL snap.version="${SNAP_MAJ_VER}.${SNAP_MIN_VER}.${SNAP_POINT_VER}"

RUN curl -sL "${SNAP_BASE_URL}/${SNAP_INSTALLER}" >/var/tmp/${SNAP_INSTALLER}
```

File Language: Shell

```
#!/usr/bin/env bash

set -x -e

# F-TEP service environment
WORKFLOW=$(dirname $(readlink -f "$0"))
WORKER_DIR="/home/worker"
IN_DIR="${WORKER_DIR}/workDir/inDir"
OUT_DIR="${WORKER_DIR}/workDir/outDir"
WPS_PROPS="${WORKER_DIR}/workDir/FTEP-WPS-INPUT.properties"
PROC_DIR="${WORKER_DIR}/procDir"
TIMESTAMP=$(date --utc +%Y%m%d_%H%M%SZ)

# Temporary file storage
mkdir -p ${PROC_DIR}

# Input parameters available as shell variables
source ${WPS_PROPS}

# Input files available under ${IN_DIR}
# Output files to be written to ${OUT_DIR}/<parameter>/<outputfilename>

```

Flexible development

- Software logic can also be in e.g. python or javascript
- Define also the parameters to be asked from the user



Service Name * VegetationIndices

Docker Tag ftep/vegindexsingletile

Title Calculate a variety of radiometric indices for vegetation

Version 1.0

Service Type Processor

Description Radiometric indices for single-tile Sentinel-2 images, provided by Orfeo Toolbox. A core F-TEP service.

FILES | INPUT DEFINITIONS | OUTPUT DEFINITIONS

ID	Title	Description	Type	Default Value	Min Occurs	Max Occurs
inputfile	Input data	Single-tile input Sentinel-2	stri...		1	1
vegIndex	Radiometric index algorith	Vegetation index to calcul	stri...		1	2
crs	Target coordinate system	EPSG coordinate referenc	stri...		1	1
aoi	Area Of Interest	AOI to be processed, in th	stri...		1	1
targetResolution	Output pixel spacing	Requested output spacing	stri...		1	1

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Pilots in Mexico and Finland

Mexico: Forest cover mapping over the states of Chiapas and Durango → carbon monitoring

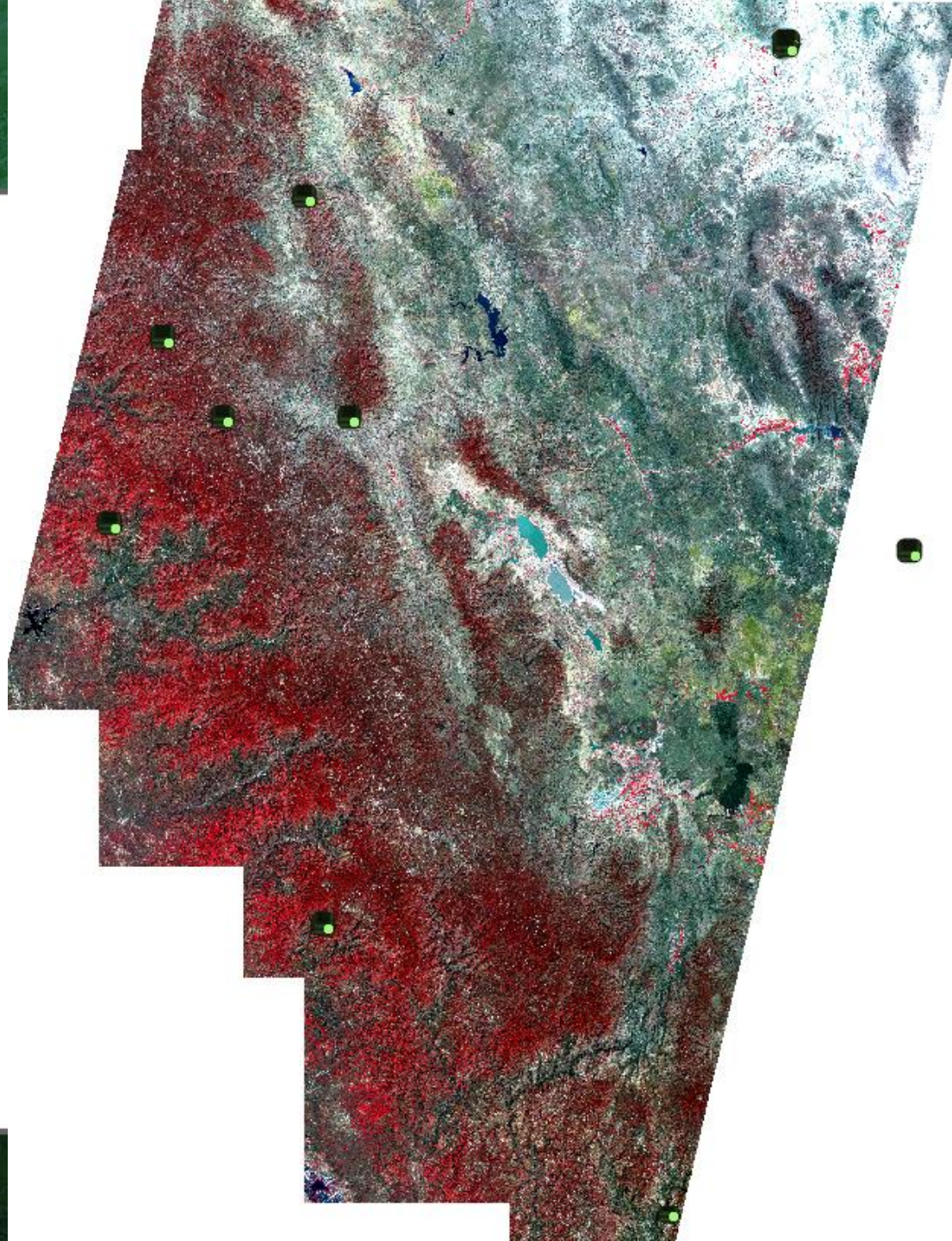
Finland: Mapping of harmful broadleaved shrubs in regeneration areas

Land cover mapping example

- 9 classes
- 625 km^2

Sentinel-2 data in Durango

- A mosaic of 18 granules (from 27 March 2017)
- Covers almost the whole state without clouds



F-TEP Portal

https://forestry-tep.eo.esa.int/app/#/

Search

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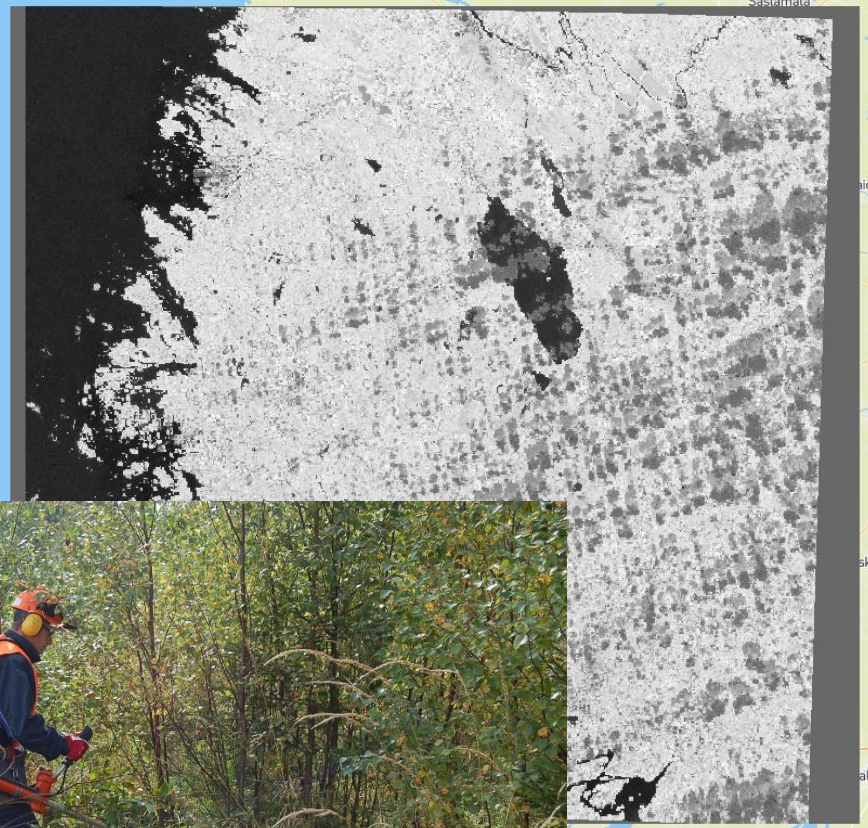
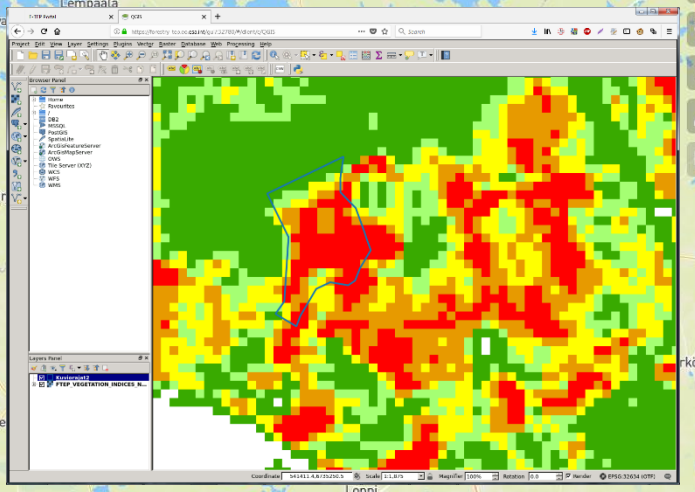
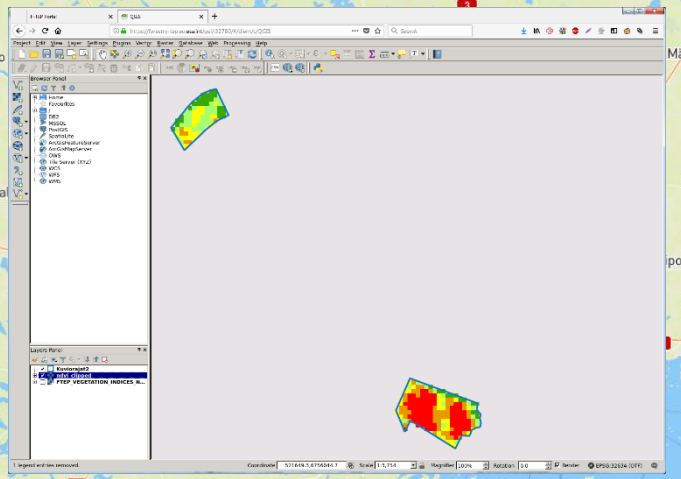
Explorer | Developer | Manage / Share | Helpdesk | Admin | My Account | Logout

1.3.0







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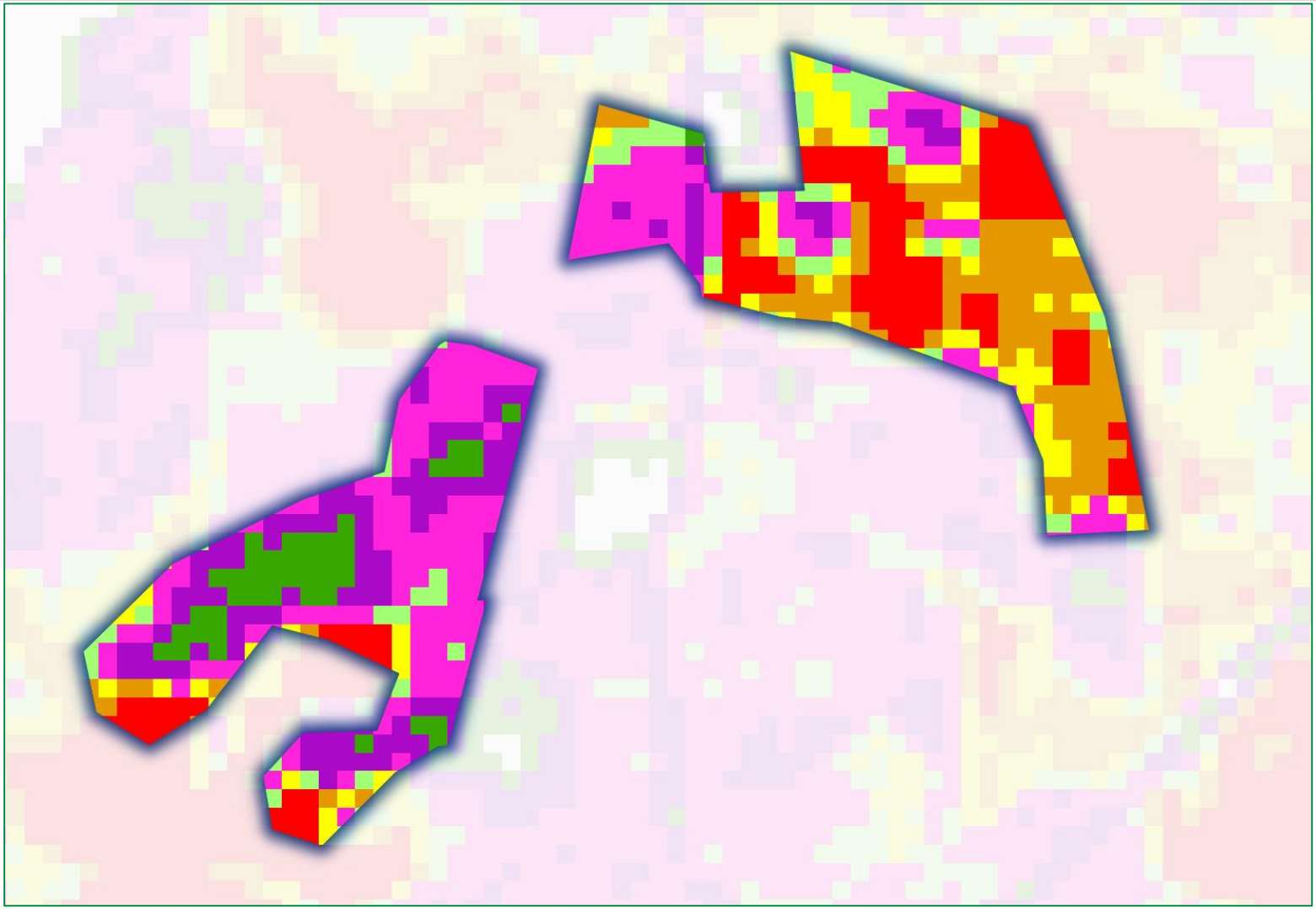

Detail: shrub abundance map with stand borders on two regeneration areas in Finland

Missing
No shrub
Very young shrub
Young shrub
Little shrub
Moderate shrub
Abundant shrub
Very abundant shrub

Forestry TEP in 2018

- Currently ~150 users
- User on-boarding continuing
  - Further user trainings: introductory and advanced
- Development
  - VTT and 3rd party services, evolution services
  - Improvements in stability and features
  - User interface development
- Towards operational services
  - Long-term data, infra and governance arrangement
  - Inclusion of commercial data

Join the user community!

- Follow the instructions on https://forestry-tep.eo.esa.int/, register, and try it out
- Contact us: forestry-tep@esa.int
- Follow the website and @forestry_tep

- *Consider us also as a partner for H2020*

One-stop shop for forestry remote sensing services for the academic, operational public and commercial sectors

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Contact

forestry-tep.eo.esa.int

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