# SmartROOT - Output 3
# SmartROOT Virtual Farm Hub

## TerriaJS

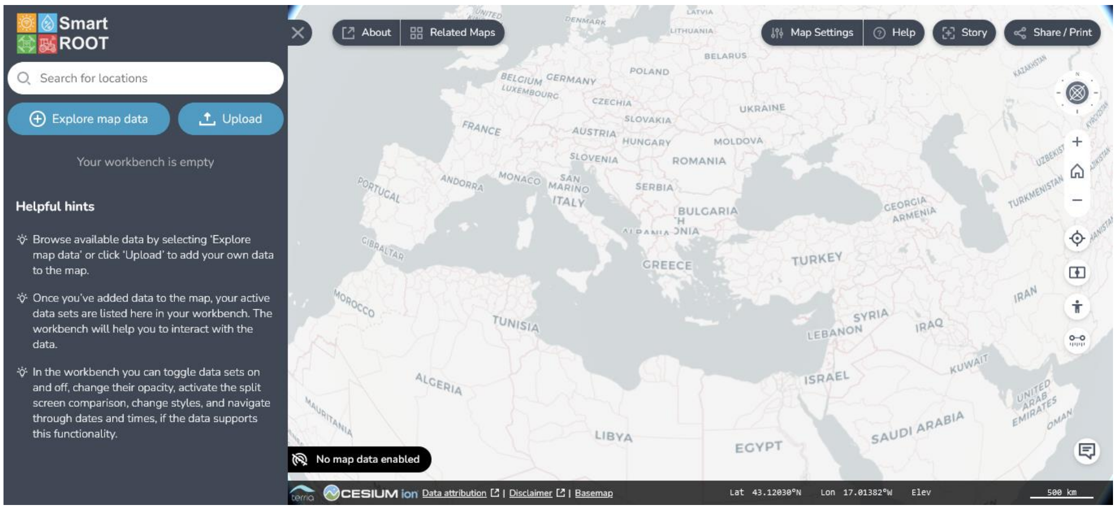
INFALIA

# Contents

## 1 General Information about the TerriaJS tool for web-based geospatial catalogue explorers

TerriaJS is a feature-rich, open-source solution for building spatial data federation web platforms.

The tool has been built in the context of the SmartROOT project for educational purposes.



Your workbench is empty

**Helpful hints**

- Browse available data by selecting 'Explore map data' or click 'Upload' to add your own data to the map.
- Once you've added data to the map, your active data sets are listed here in your workbench. The workbench will help you to interact with the data.
- In the workbench you can toggle data sets on and off, change their opacity, activate the split screen comparison, change styles, and navigate through dates and times, if the data supports this functionality.

## 2 Background Knowledge

To effectively use TerriaJS, it is helpful to have a basic understanding of Geospatial data and especially familiarity with geospatial data formats and concepts is important. Understanding concepts such as coordinate systems (e.g., latitude and longitude), projections, and common geospatial data formats like GeoJSON or Shapefiles will help you work with spatial data in TerriaJS.

Knowledge of RESTful APIs is also valuable as TerriaJS can consume data from web services using this approach. Understanding how to make HTTP requests, handle responses, and work with data formats commonly used in web APIs (e.g., JSON) will be beneficial for integrating external data sources into your TerriaJS applications.

Finally, as TerriaJS relies on CesiumJS for its 3D geospatial visualization capabilities, familiarity with CesiumJS concepts, such as entities, imagery layers, terrain rendering, and camera manipulation, will help you take full advantage of the mapping and visualization capabilities provided by TerriaJS.

## 2.1 Technology behind the tool

TerriaJS is an open-source, web-based geospatial data visualization platform developed by the Australian Government's National Map team. It provides a framework for building interactive geospatial applications and maps in a browser environment. The technology stack behind TerriaJS includes several key components:

1. JavaScript: TerriaJS is primarily built using JavaScript, a popular programming language for web development. It leverages modern JavaScript frameworks and libraries to create a rich and interactive user experience.
2. Web technologies: TerriaJS utilizes various web technologies such as HTML (Hypertext Markup Language) for structuring the content, CSS (Cascading Style Sheets) for styling, and JavaScript for interactivity.
3. CesiumJS: TerriaJS relies on CesiumJS, an open-source JavaScript library for creating 3D globes and maps in a browser. CesiumJS provides powerful geospatial visualization capabilities, including terrain rendering, imagery, and vector data.
4. React: TerriaJS employs the React library, a popular JavaScript framework for building user interfaces. React

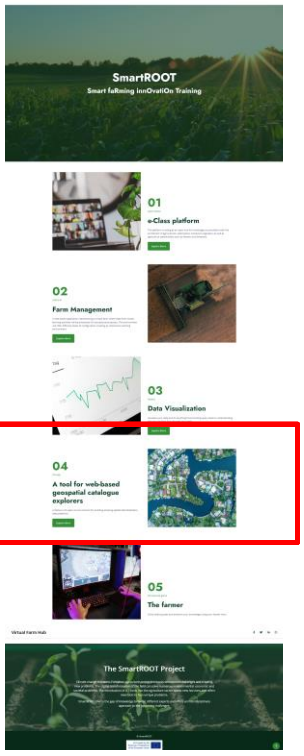
helps in creating reusable components and efficiently managing the application's state, making it easier to develop complex and interactive applications.

5. Redux: Redux is a predictable state container for JavaScript applications. TerriaJS uses Redux to manage application state, allowing for centralized control and easier tracking of changes across various components.
6. Node.js: TerriaJS can be run on the server-side using Node.js, a JavaScript runtime environment. Node.js allows TerriaJS to perform server-side operations and interact with external services, such as data sources or authentication systems.
7. RESTful APIs: TerriaJS can consume data from various sources using RESTful APIs (Representational State Transfer). It can fetch geospatial data, such as maps, imagery, and other spatial information, from web services and display them on the map interface.
8. GeoJSON and OGC standards: TerriaJS supports various geospatial data formats, including GeoJSON (a common format for representing geospatial data in JSON) and Open Geospatial Consortium (OGC) standards. This allows integration with a wide range of geospatial data sources and services that comply with these standards.
9. Plugin architecture: TerriaJS features a plugin architecture that allows developers to extend and customize its functionality. This architecture enables the integration of additional features, such as new data providers, geospatial analysis tools, or user interface enhancements.

Overall, TerriaJS leverages a combination of JavaScript, web technologies, geospatial libraries like CesiumJS, and modern web development practices to provide a powerful and flexible platform for building interactive geospatial applications and maps.

# 3 Walkthrough the TerriaJS tool

From the navigation page of the Virtual Farm Hub (IO3) https://virtualfarm.infalia.com/, anyone can access the TerriaJS tool https://terria.infalia.com/, which is the 4th available tool of the Virtual Farm Hub platform.



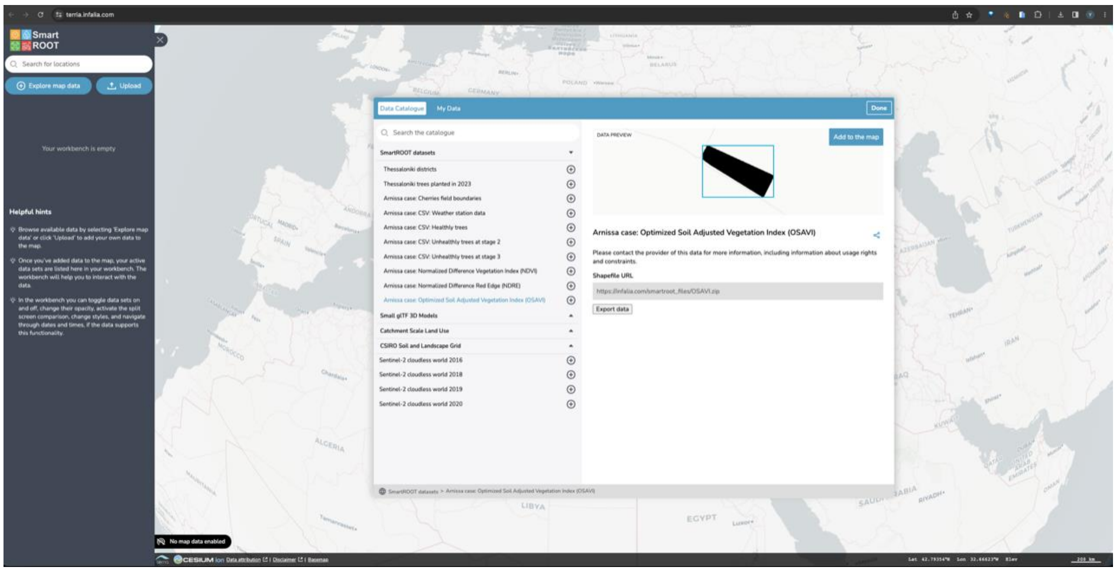
The following sections present the main functionality supported by the TerriaJS tool.

## 3.1 Overview

In SmartROOT Virtual Farm Hub, we customized the TerriaJS software to enable users to visualize their field data and plot parameters related to their fields.

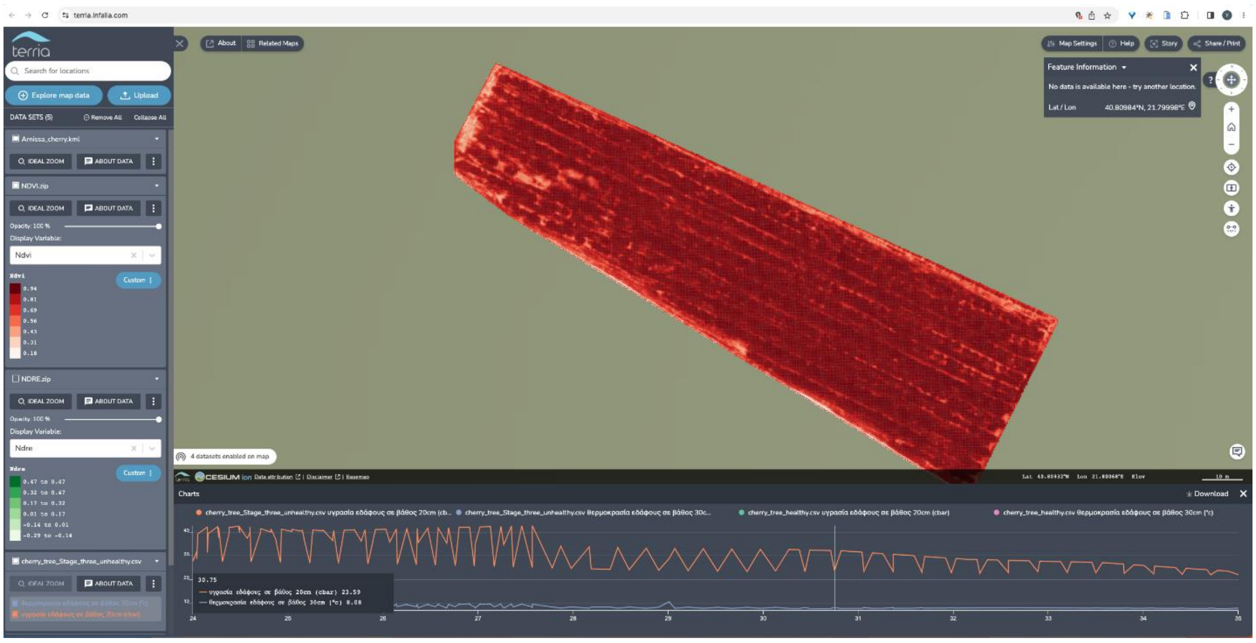
## 3.2 Customizations for the SmartROOT project

When the user enters the tool, a map is loaded and shows the European area. Moreover, the user is provided with a SmartROOT folder where s/he can find all available datasets from fields coming from the MARS project. By clicking on a dataset, the user can visualize the specific field and parameters related to that field.

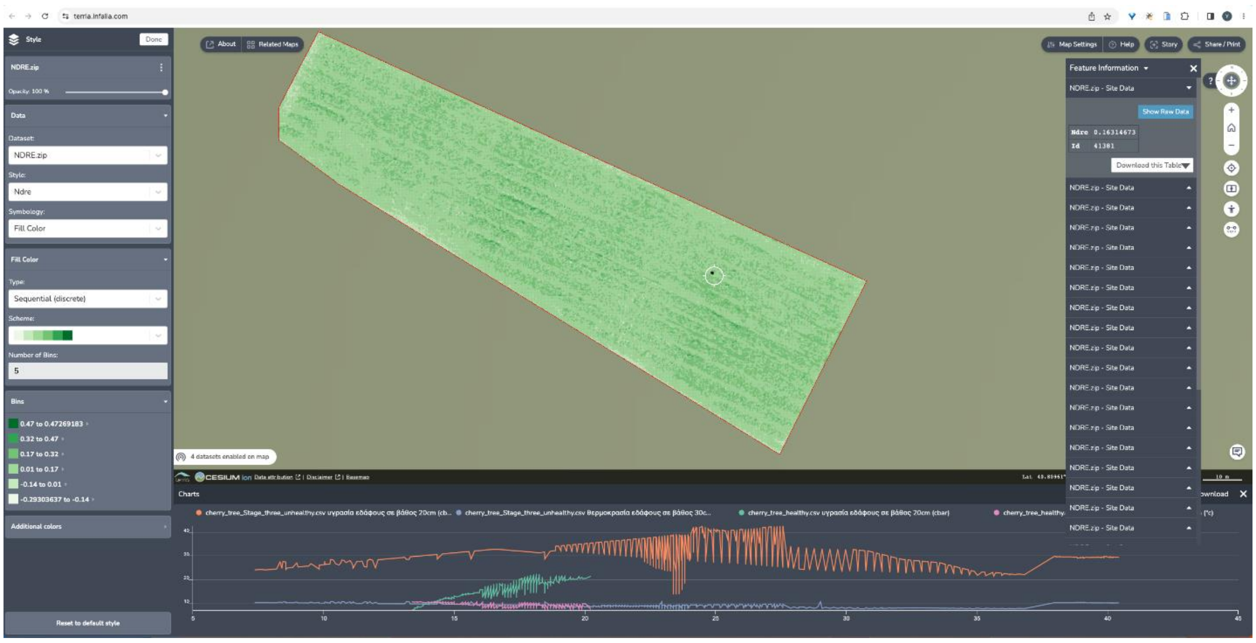

Smart ROOT
Search for locations
Explore map data
Upload
Your workbench is empty
Helpful hints
Data Catalogue
My Data
Done
Search the catalogue
SmartROOT datasets
Thessaloniki districts
Thessaloniki trees planted in 2023
Arnissa case: Cherries field boundaries
Arnissa case: CSV: Weather station data
Arnissa case: CSV: Healthy trees
Arnissa case: CSV: Unhealthy trees at stage 2
Arnissa case: CSV: Unhealthy trees at stage 3
Arnissa case: Normalized Difference Vegetation Index (NDVI)
Arnissa case: Normalized Difference Red Edge (NDRE)
Arnissa case: Optimized Soil Adjusted Vegetation Index (OSAVI)
Small glTF 3D Models
Catchment Scale Land Use
CSIRO Soil and Landscape Grid
Sentinel-2 cloudless world 2016
Sentinel-2 cloudless world 2018
Sentinel-2 cloudless world 2019
Sentinel-2 cloudless world 2020
DATA PREVIEW
Add to the map
Arnissa case: Optimized Soil Adjusted Vegetation Index (OSAVI)
Please contact the provider of this data for more information, including information about usage rights and constraints.
Shapefile URL
https://infalia.com/smartroot_files/OSAVI.zip
Export data
No map data enabled

## 3.3 Examples with visualizations

Below, we can see two visualization examples produced using the TerriaJS software from a field csv dataset coming from the MARS project. In the first visualization example, we can see the Ndvi of the field while below the visualization there are two plots with the soil temperature at a depth of 30cm and the soil humidity at a depth of 20cm.


terria
Search for locations
Explore map data
Upload
DATA SETS (5)
Remove All
Collapse All
Arnissa_cherry.kml
IDEAL ZOOM
ABOUT DATA
NDVI.zip
Opacity: 100 %
Display Variable:
Ndvi
Custom
NDRE.zip
Ndre
cherry_tree_Stage_three_unhealthy.csv
About
Related Maps
Map Settings
Help
Story
Share / Print
Feature Information
No data is available here - try another location.
Lat / Lon 40.80984°N, 21.79998°E
4 datasets enabled on map
Charts
Download
cherry_tree_Stage_three_unhealthy.csv υγρασία εδάφους σε βάθος 20cm (cb...
cherry_tree_Stage_three_unhealthy.csv θερμοκρασία εδάφους σε βάθος 30c...
cherry_tree_healthy.csv υγρασία εδάφους σε βάθος 20cm (cbar)
cherry_tree_healthy.csv θερμοκρασία εδάφους σε βάθος 30cm (°c)
υγρασία εδάφους σε βάθος 20cm (cbar) 23.59
θερμοκρασία εδάφους σε βάθος 30cm (°c) 8.88

Similarly, in the second visualization example (shown in the below figure), we can see the Ndre of the field. below the visualization, there are plots regarding the soil temperature and the soil humidity.



NDRE.zip

Opacity: 100 %

Data

Dataset: NDRE.zip

Style: Ndre

Symbology: Fill Color

Fill Color

Type: Sequential (discrete)

Number of Bins: 5

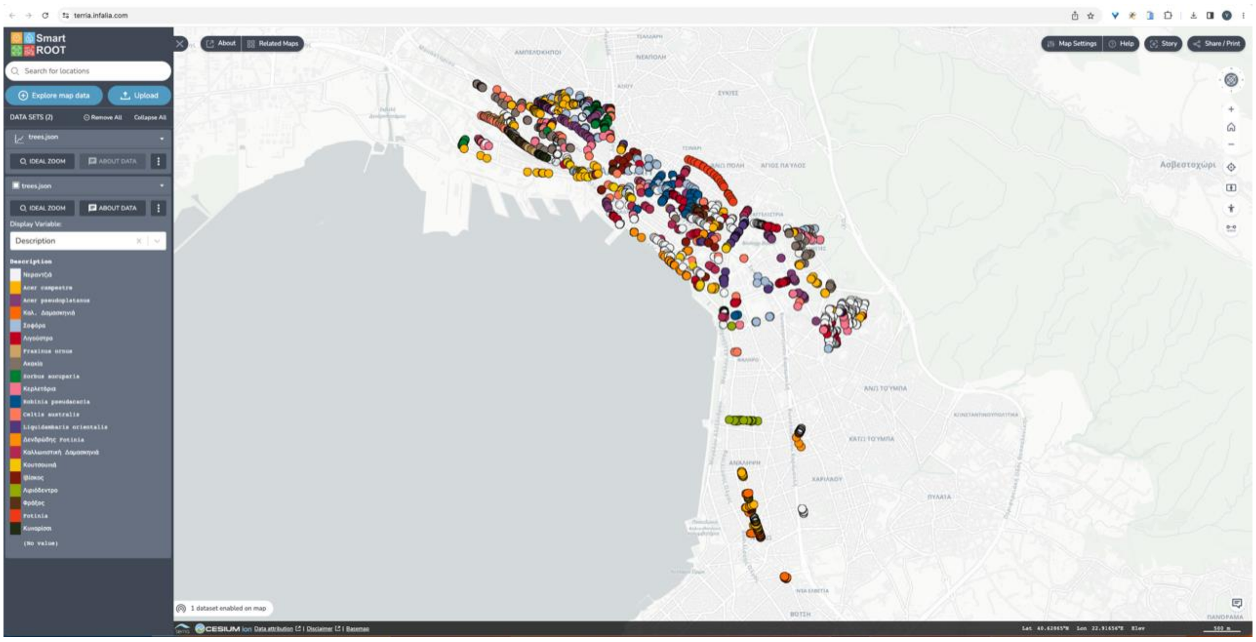
Bins

| | |
|---|---|
| 🟩 | 0.47 to 0.47269183 |
| 🟩 | 0.32 to 0.47 |
| 🟩 | 0.17 to 0.32 |
| 🟩 | 0.01 to 0.17 |
| 🟩 | -0.14 to 0.01 |
| ⬜ | -0.29303637 to -0.14 |

NDRE.zip - Site Data

| | |
|---|---|
| Ndre | 0.16314673 |
| Id | 41381 |

Another visualization example is coming from a dataset depicting the trees in Thessaloniki. With different colors are depicted the different tree categories.



Display Variable: Description

Description

| | |
|---|---|
| ⬜ | Νεραντζιά |
| 🟧 | Acer campestre |
| 🟪 | Acer pseudoplatanus |
| 🟧 | Καλ. Δαμασκηνιά |
| 🟦 | Σοφόρα |
| 🟥 | Λιγούστρο |
| 🟫 | Fraxinus ornus |
| 🟫 | Ακακία |
| 🟩 | Sorbus aucuparia |
| 🟥 | Κερλετόρια |
| 🟦 | Robinia pseudacacia |
| 🟥 | Celtis australis |
| 🟪 | Liquidambaris orientalis |
| 🟧 | Δενδρώδης Fotinia |
| 🟥 | Καλλωπιστική Δαμασκηνιά |
| 🟨 | Κουτσουπιά |
| 🟫 | Φίκος |
| 🟩 | Λιριόδεντρο |
| 🟫 | Φράξος |
| 🟥 | Fotinia |
| ⬛ | Κυπαρίσσι |
| | (No value) |