Space Business Innovation Challenge

Beginner’s Guide for Downloading and Viewing ALOS World 3D (AW3D) Digital Surface Model (DSM) data.

Prepared by:

PHILIPPINE SPACE AGENCY

September 12, 2025

BEGINNERS GUIDE OVERVIEW

This document is a beginner's guide designed to help users get started with accessing and working with ALOS World 3D (AW3D) Digital Surface Model (DSM) data. It covers:

- Registering for an account on the AW3D data distribution site.
- Downloading AW3D tiles at different grid levels.
- Installing QGIS, an open-source software for geospatial data visualization and analysis.
- Viewing and exploring the downloaded DSM data in QGIS.

Beyond visualization, AW3D data has a wide range of practical applications, including:

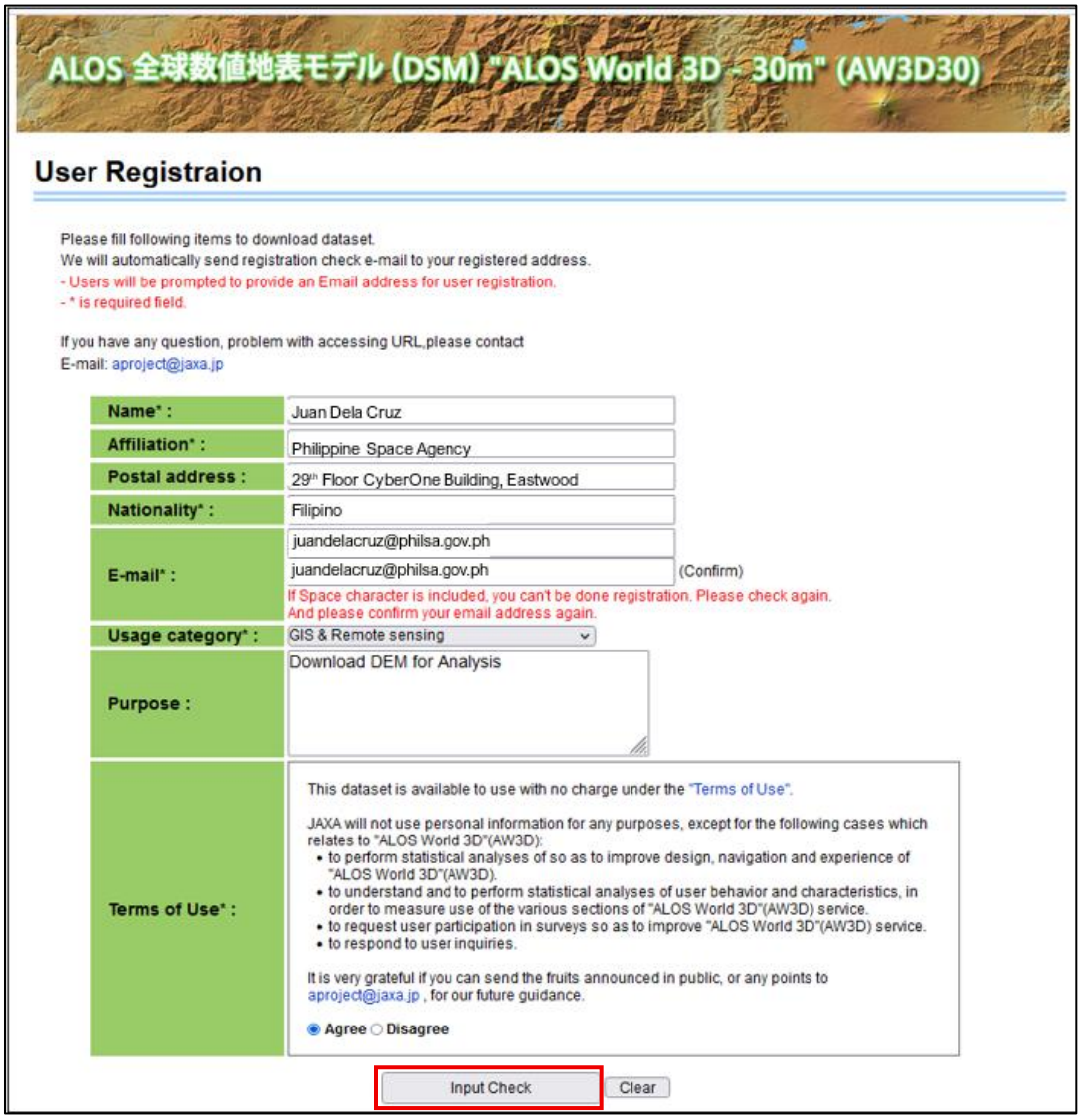
- **Topographic mapping** for land use, urban planning, and environmental monitoring.
- **Disaster risk assessment and management,** including flood modeling, landslide analysis, and earthquake impact studies.
- **Infrastructure and engineering projects**, such as route planning, construction design, and site suitability analysis.
- **Telecommunications planning,** particularly line-of-sight and coverage analysis.
- **Forestry and natural resource management,** including vegetation analysis and watershed studies.
- **and many more.**

This guide is intended for beginners and focuses on the essential steps for acquiring and visualizing AW3D data. It does not cover advanced processing or analysis techniques. Future updates may include additional resources, tips, and references to support more in-depth exploration of DSM datasets.

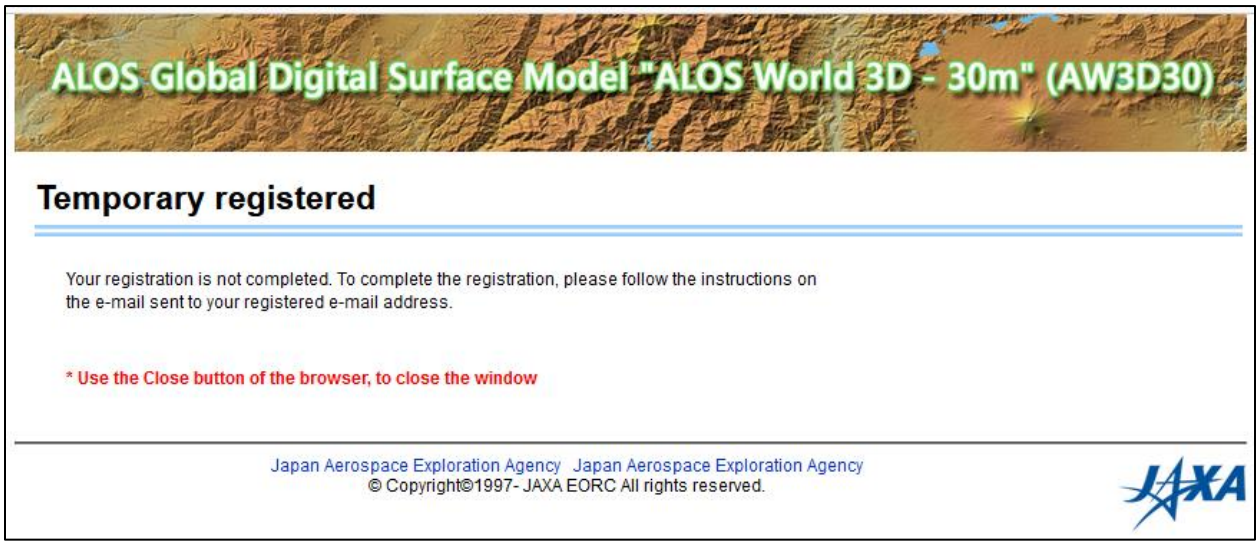
1. Creating an Account on the ALOS Registration Website

1.1. Account Registration

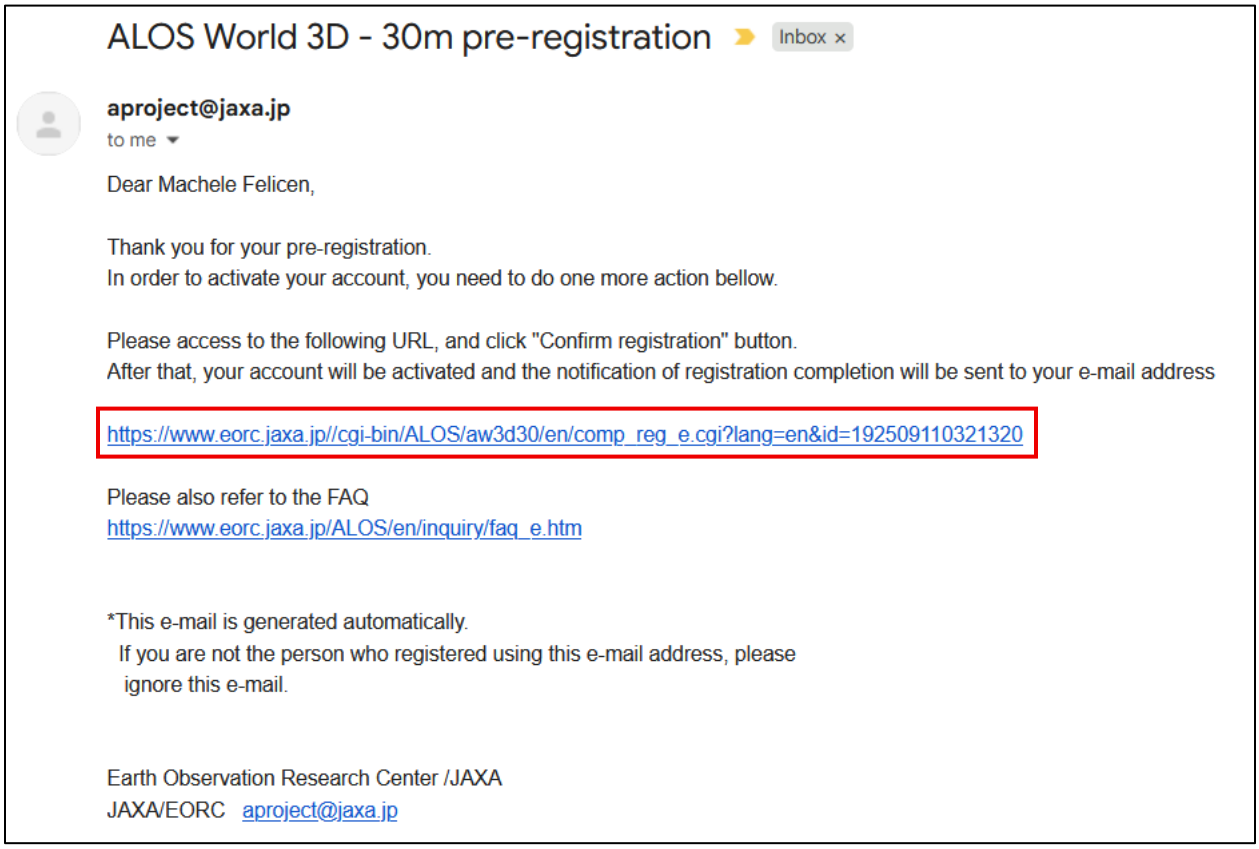
1. Go to the official **ALOS registration portal** through this site.
2. Complete all the required fields in the registration form.
3. For **Usage Category**, select **GIS and Remote Sensing** from the drop-down menu.
4. Tick the box to agree to the **Terms of Use**, then click **Input Check** to proceed.



Click Send Mail.



Click the link to complete the registration process.



ALOS World 3D - 30m pre-registration Inbox ×

aproject@jaxa.jp
to me

Dear Machele Felicen,

Thank you for your pre-registration.
In order to activate your account, you need to do one more action bellow.

Please access to the following URL, and click "Confirm registration" button.
After that, your account will be activated and the notification of registration completion will be sent to your e-mail address

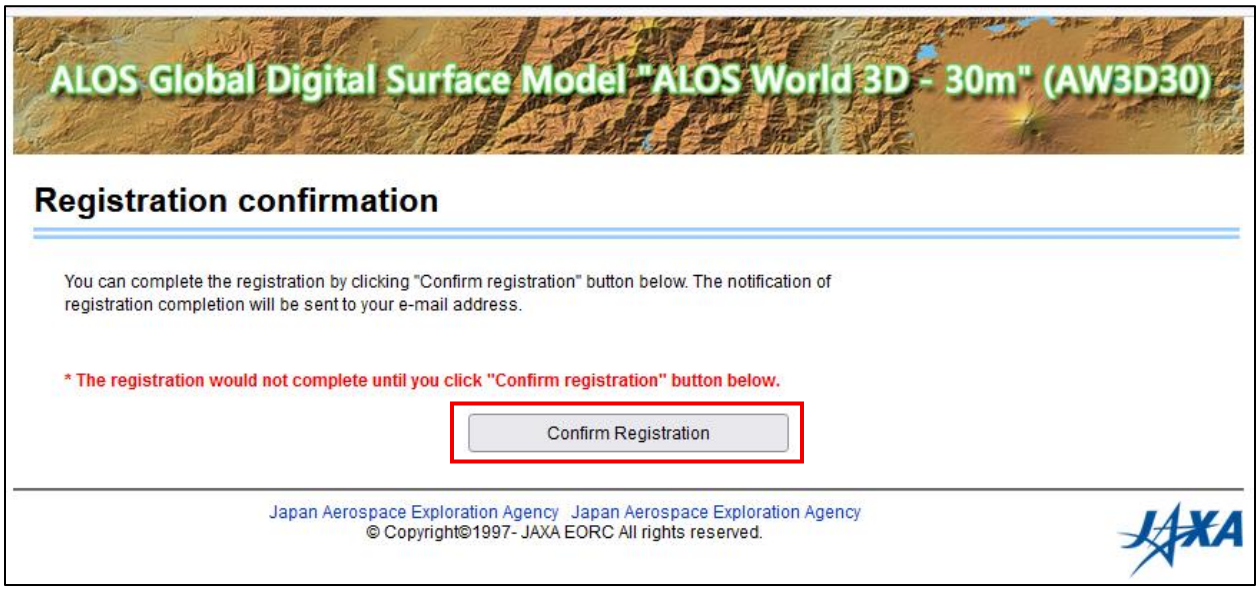
https://www.eorc.jaxa.jp//cgi-bin/ALOS/aw3d30/en/comp_reg_e.cgi?lang=en&id=192509110321320

Please also refer to the FAQ
https://www.eorc.jaxa.jp/ALOS/en/inquiry/faq_e.htm

*This e-mail is generated automatically.
If you are not the person who registered using this e-mail address, please ignore this e-mail.

Earth Observation Research Center /JAXA
JAXA/EORC aproject@jaxa.jp

Click Confirm Registration.



ALOS Global Digital Surface Model "ALOS World 3D - 30m" (AW3D30)

Registration confirmation

You can complete the registration by clicking "Confirm registration" button below. The notification of registration completion will be sent to your e-mail address.

* The registration would not complete until you click "Confirm registration" button below.

Confirm Registration

Japan Aerospace Exploration Agency Japan Aerospace Exploration Agency
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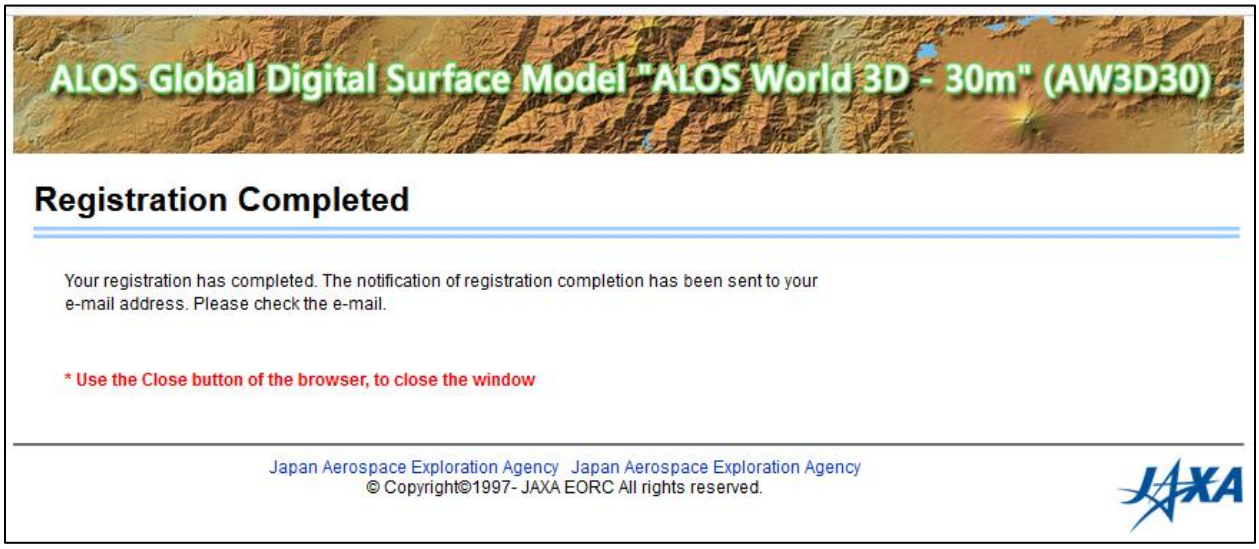
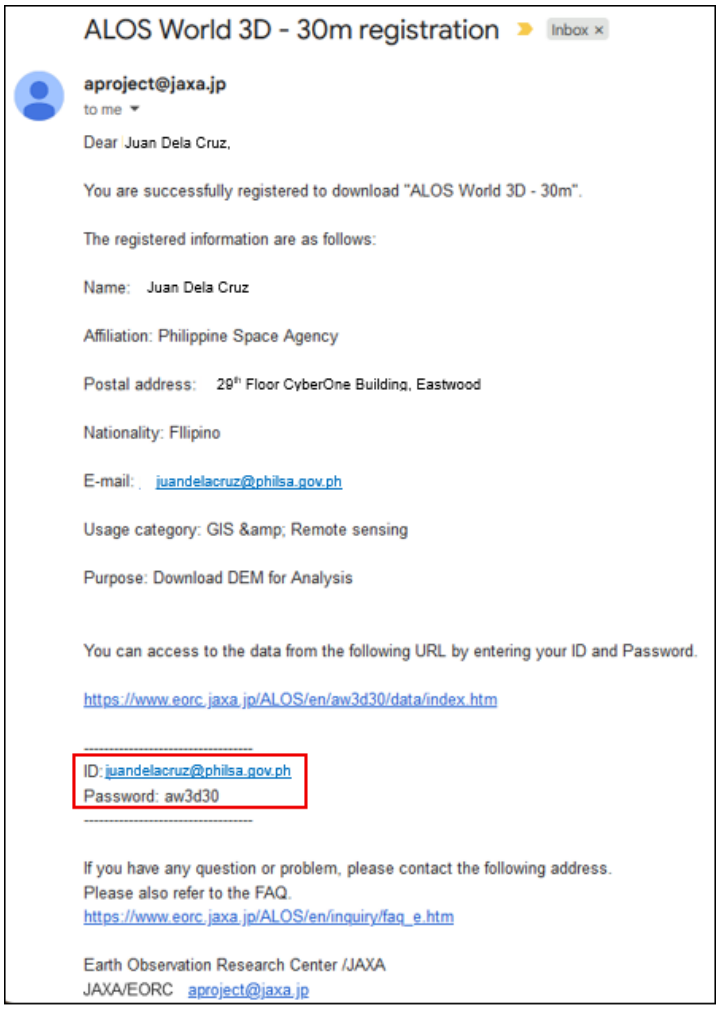


A second email will be sent once the registration has been completed. The said email will summarize the details you indicated in your registration and provide you with your username and password.



ALOS World 3D - 30m registration Inbox ×

aproject@jaxa.jp
to me

Dear Juan Dela Cruz,

You are successfully registered to download "ALOS World 3D - 30m".

The registered information are as follows:

Name: Juan Dela Cruz

Affiliation: Philippine Space Agency

Postal address: 29th Floor CyberOne Building, Eastwood

Nationality: Fllipino

E-mail: juandelacruz@philsa.gov.ph

Usage category: GIS & Remote sensing

Purpose: Download DEM for Analysis

You can access to the data from the following URL by entering your ID and Password.

https://www.eorc.jaxa.jp/ALOS/en/aw3d30/data/index.htm

ID: juandelacruz@philsa.gov.ph
Password: aw3d30

If you have any question or problem, please contact the following address.
Please also refer to the FAQ.
https://www.eorc.jaxa.jp/ALOS/en/inquiry/faq_e.htm

Earth Observation Research Center /JAXA
JAXA/EORC aproject@jaxa.jp

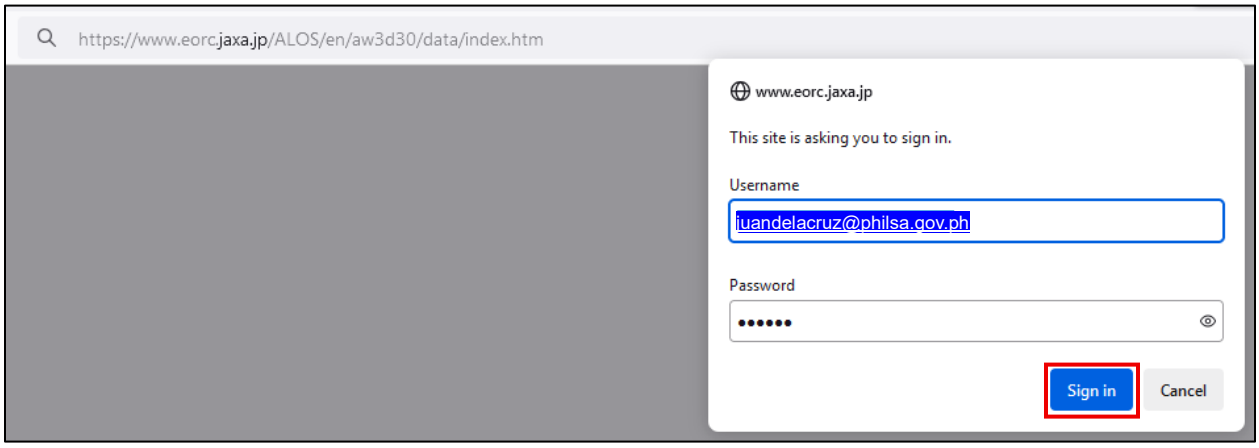
2. Accessing ALOS Global Digital Surface Model

2.1 Access the ALOS Site

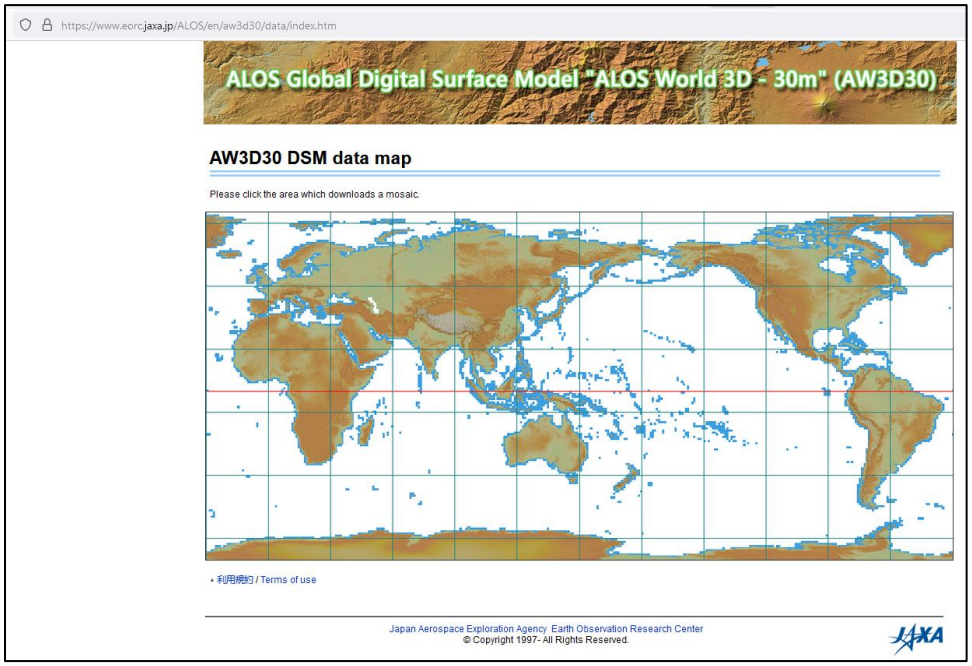
Go to: https://www.eorc.jaxa.jp/ALOS/en/aw3d30/data/index.htm

2.2 Log In

- Enter your registered credentials.
- Make sure your username and password are correct, then click **Sign In**.

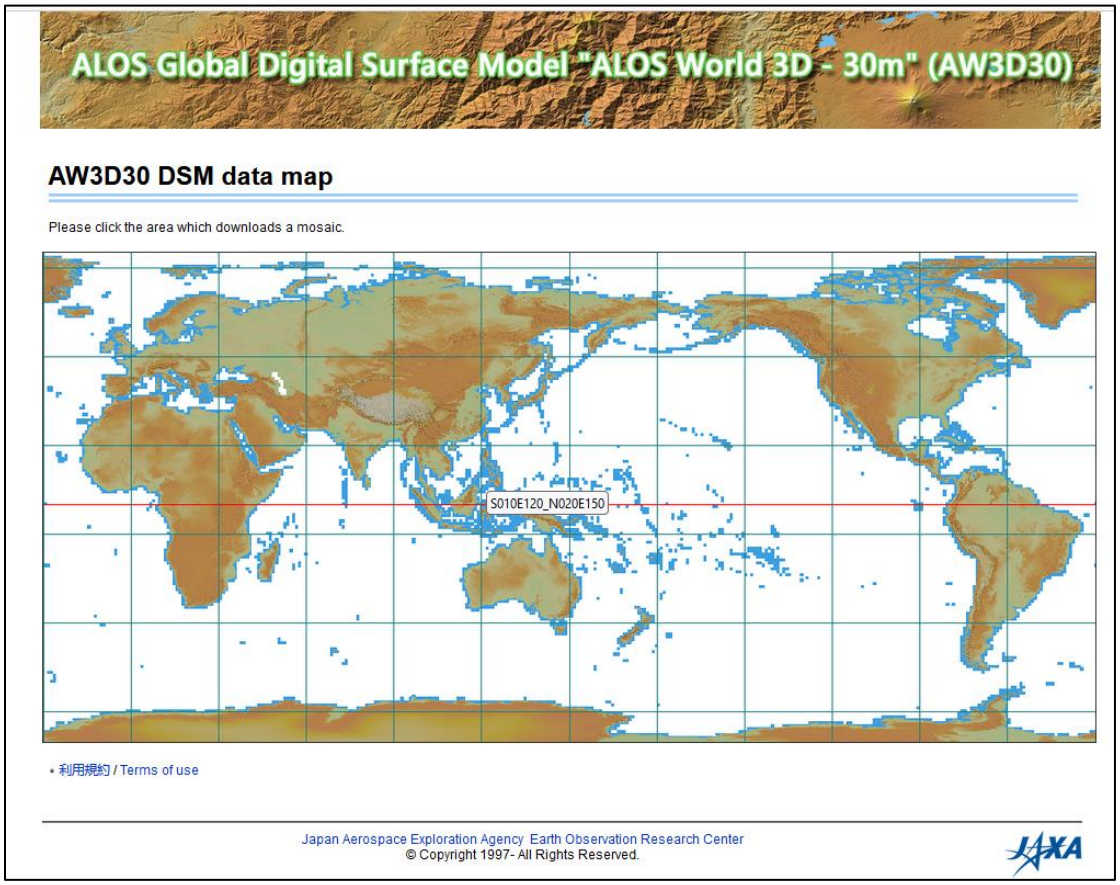


- Once logged in, the map of available ALOS Digital Surface Model (DSM) tiles will be displayed.



2.3 Navigating the Map

- Click on a region of interest to zoom in.
- Green grids represent available DSM data. Clicking a green grid zooms further into that area.


ALOS Global Digital Surface Model "ALOS World 3D - 30m" (AW3D30)
AW3D30 DSM data map
Please click the area which downloads a mosaic.
S010E120_N020E150
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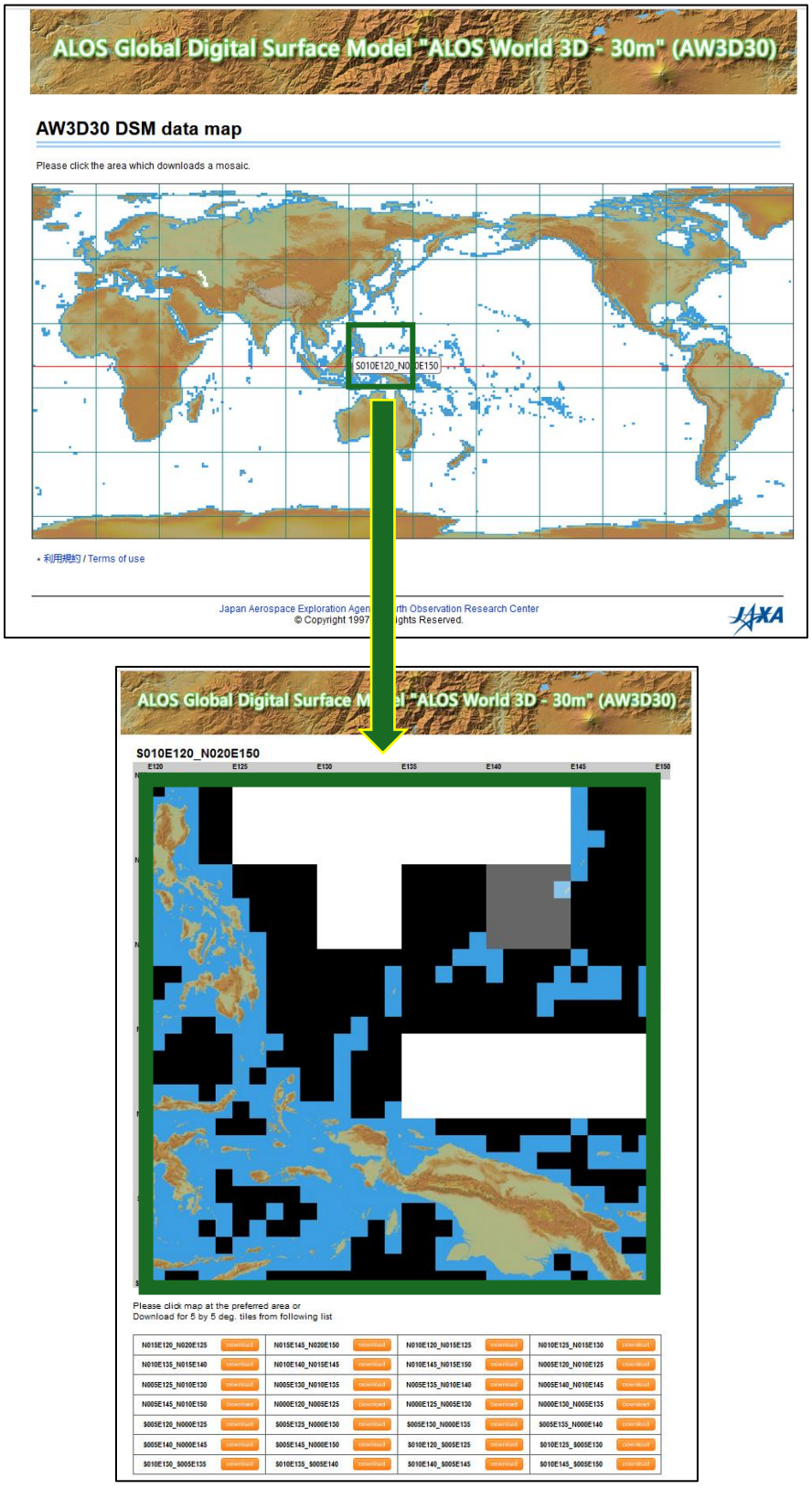
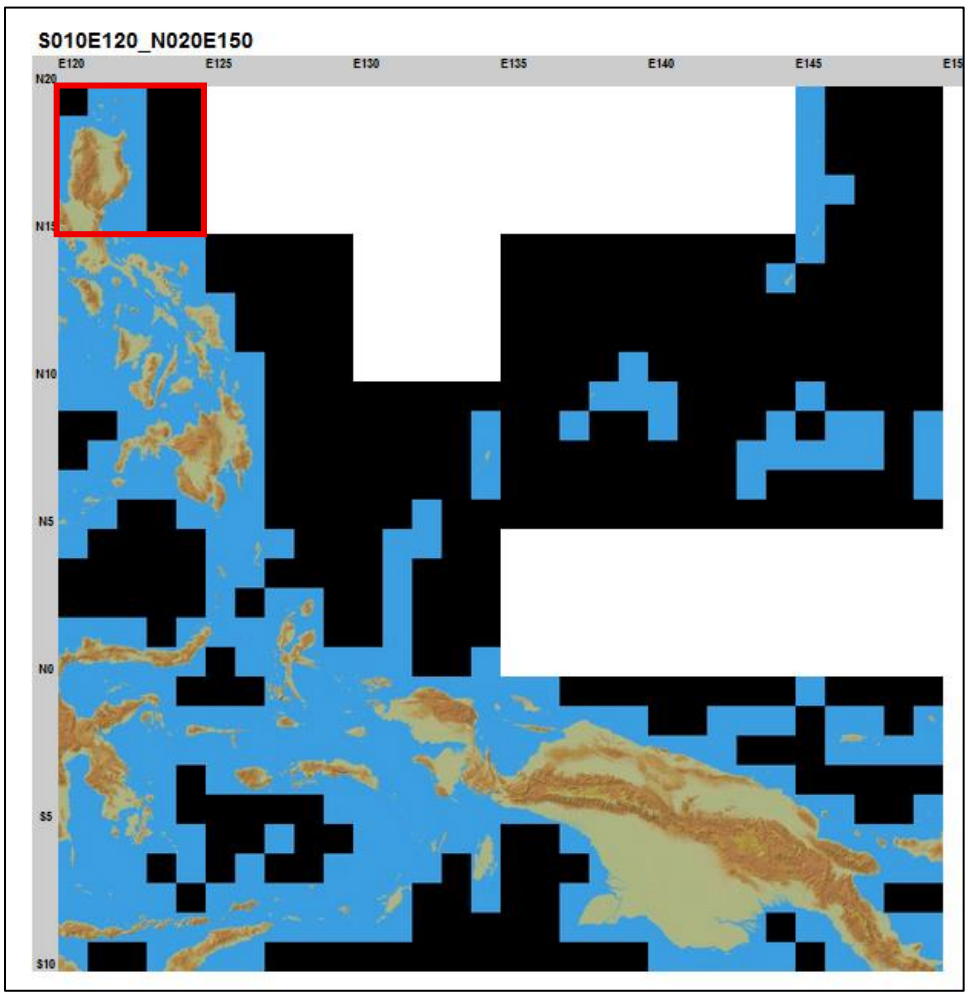
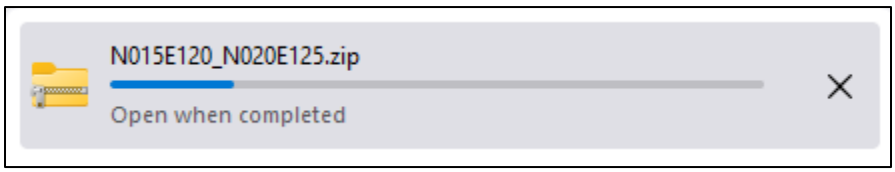


- Each large grid represents a **5° × 5° tile**. These can be further subdivided into **1° × 1° tiles** based on the latitude and longitude labels at the map edges.

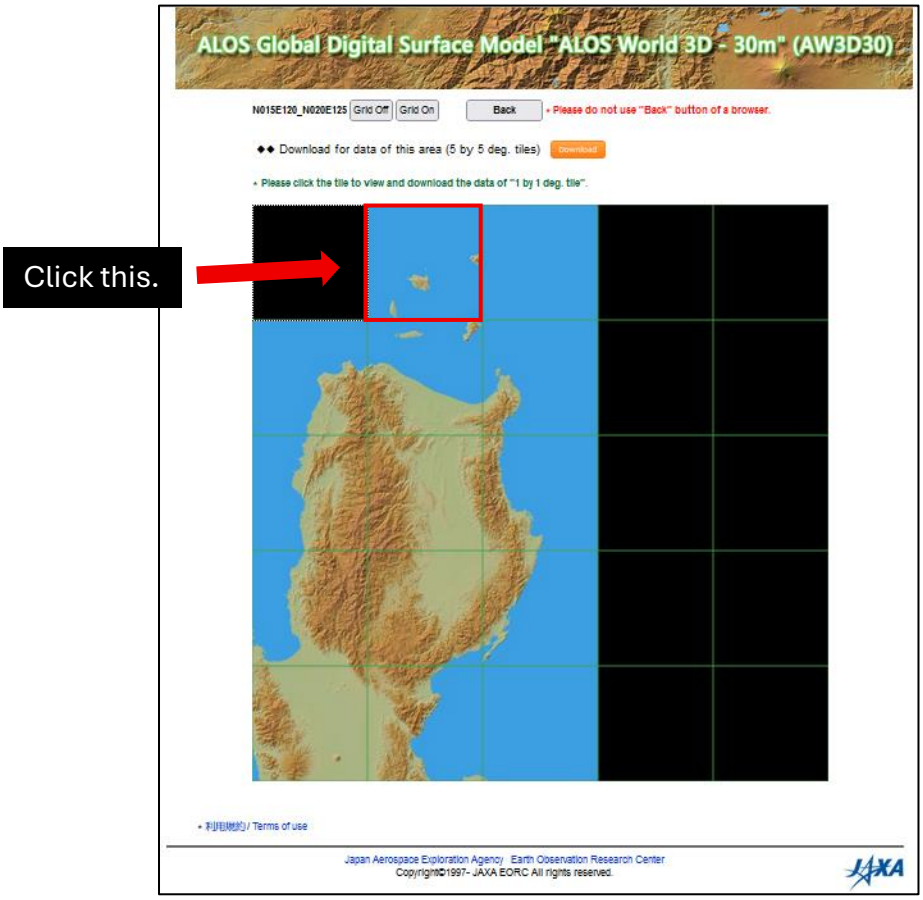


2.4 Download Options

- **5° × 5° Grids**:
    - To download an entire 5-degree tile, click the **Download** button at the top.



- **1° × 1° Grids**:
  - To download a single one-degree tile, click on your desired grid.
  - ⚠ Do not click on **black box grids** — these indicate areas with no data.
  - Clicking a valid grid will redirect you to the page for that tile, where you can select **Download**.


ALOS Global Digital Surface Model "ALOS World 3D - 30m" (AW3D30)
N015E120_N020E125
Grid Off
Grid On
Back
• Please do not use "Back" button of a browser.
◆◆ Download for data of this area (5 by 5 deg. tiles)
Download
• Please click the tile to view and download the data of "1 by 1 deg. tile".
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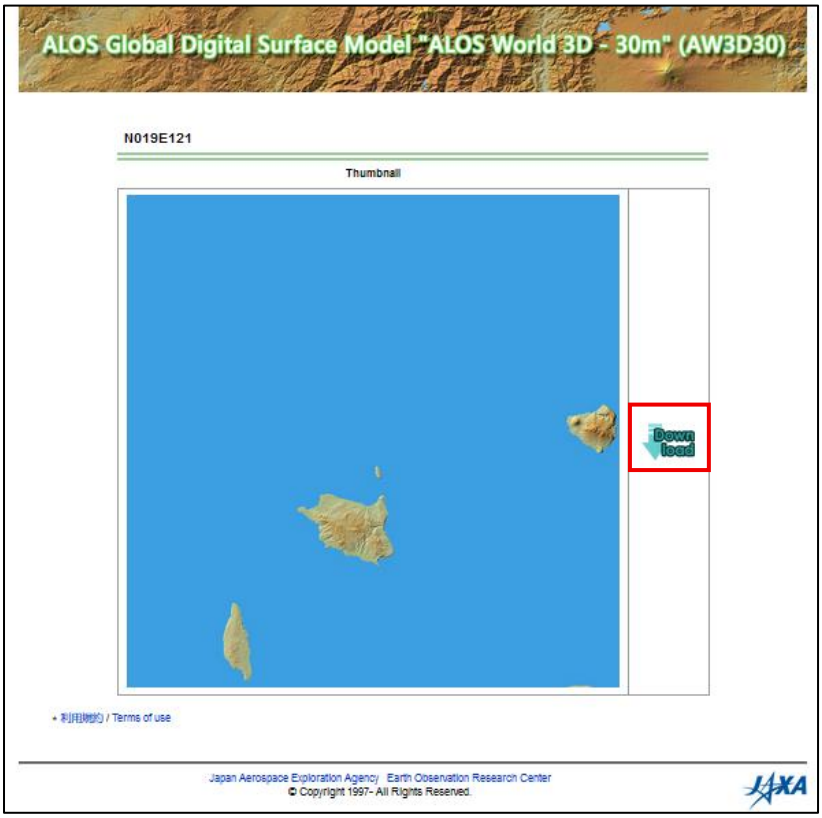
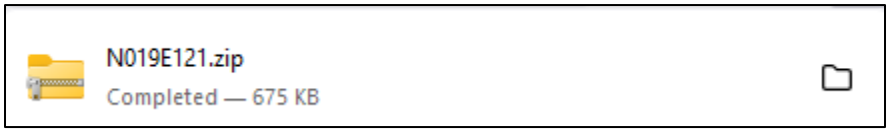
JAXA

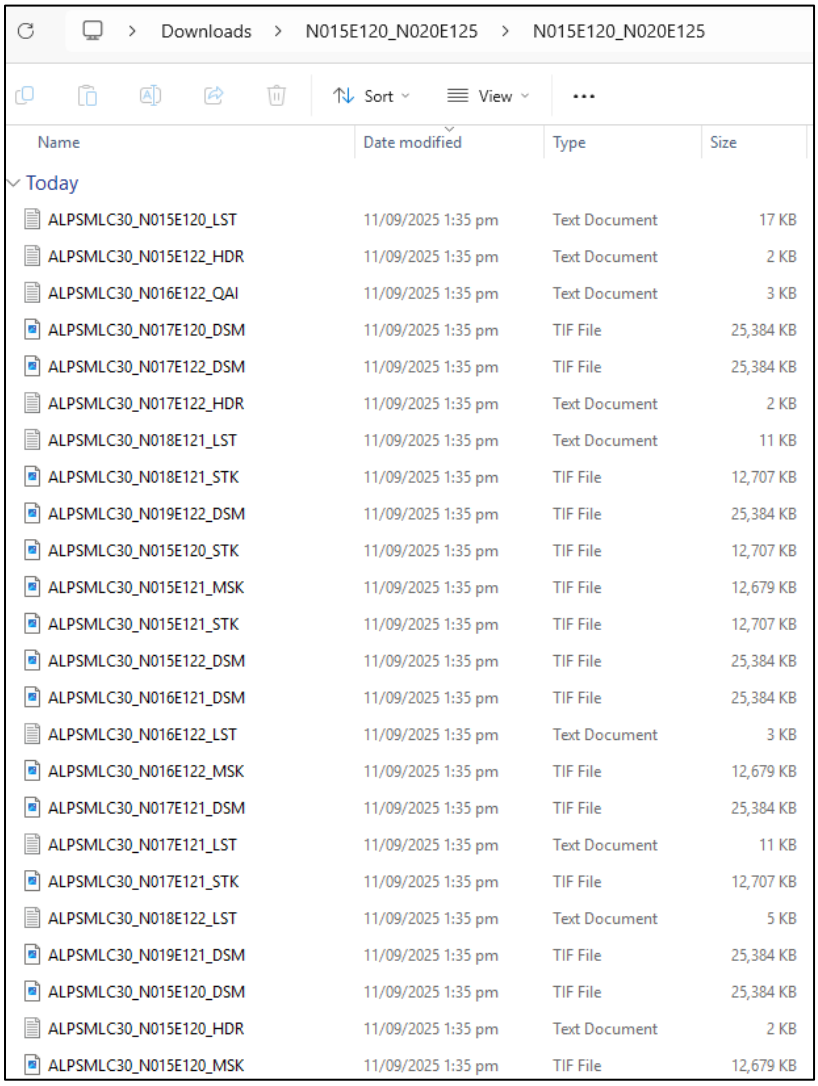
Click this.





2.5 Extracting the Files

- The downloaded files are compressed. Unzip the folder to access the data.
- Inside the extracted folder, you will find several files (e.g., DSM.tif, HDR.txt, MSK.tif, STK.tif, QAI.txt, LST.txt). Each serves a specific function for data and quality assessment.



The following are the meaning of the files in the folder:

- ***_DSM.tif** – **Digital Surface Model**
  The main elevation data raster. Pixel values = surface elevation in meters above mean sea level (EGM96). NoData = -9999.
- ***_HDR.txt** – **Header / Metadata**
  A text file with essential tile information: projection (geographic lat/long), pixel spacing (1 arc-second ≈ 30 m), corner coordinates, data type, and no-data value. Useful for quick inspection without opening the raster.
- ***_LST.txt** – **Source Scene List**
  Lists the PRISM scenes (ALOS optical stereo images) used to generate this DSM tile. Lets you trace data provenance and acquisition dates.
- ***_MSK.tif** – **Mask File**
  A raster mask showing which DSM pixels are valid or filled. Typical values:

  - 0 = No data
  - 1 = Valid DSM value
  - 2 = Interpolated (gap-filled)
- ***_QAI.txt** – **Quality Assurance Information**
  Contains statistics and quality indicators for the tile. Examples: percentage of valid data, areas of voids, correlation coefficients from stereo matching, etc. Helps judge reliability.
- ***_STK.tif** – **Stack Number (Observation Count)**
  A raster showing how many stereo image pairs contributed to each pixel.
  - Higher values = more reliable elevation estimate.
  - 0 = void / no observation.

To view a Digital Surface Model (DSM), you must install software that supports DSM file formats such as QGIS.

3 Using of QGIS for Data Analysis

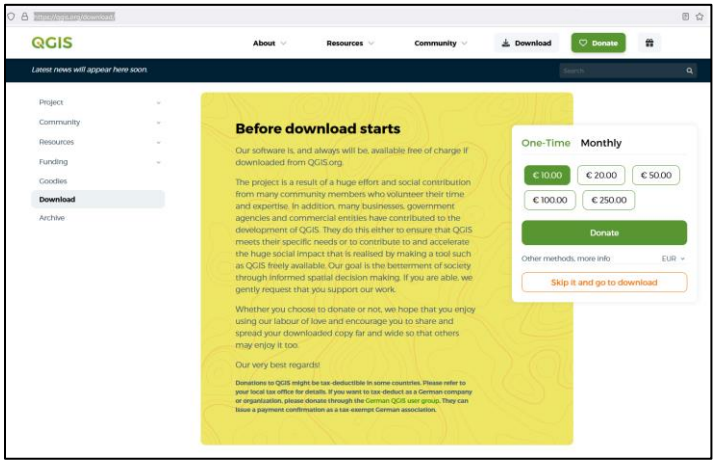
3.1 About QGIS

QGIS is a free and open-source geographic information system (GIS) software used for viewing, editing, analyzing, and visualizing geospatial data. It supports a wide range of vector, raster, and database formats, and its extensible plugin architecture allows users to perform specialized tasks such as remote sensing, spatial statistics, and 3D visualization.

3.2 Downloading QGIS

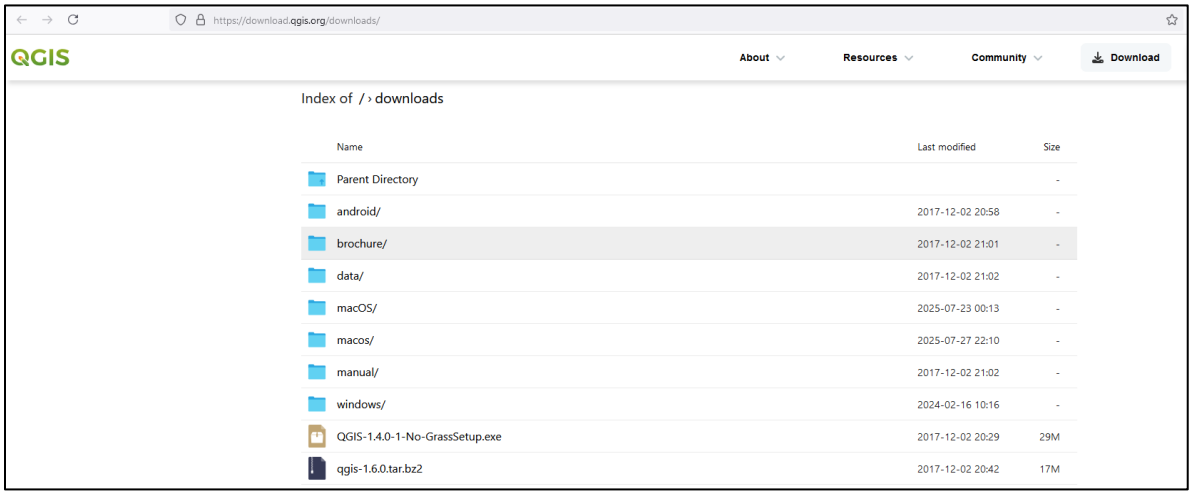
QGIS can be downloaded from the following official sources:

Option 1: https://qgis.org/download/

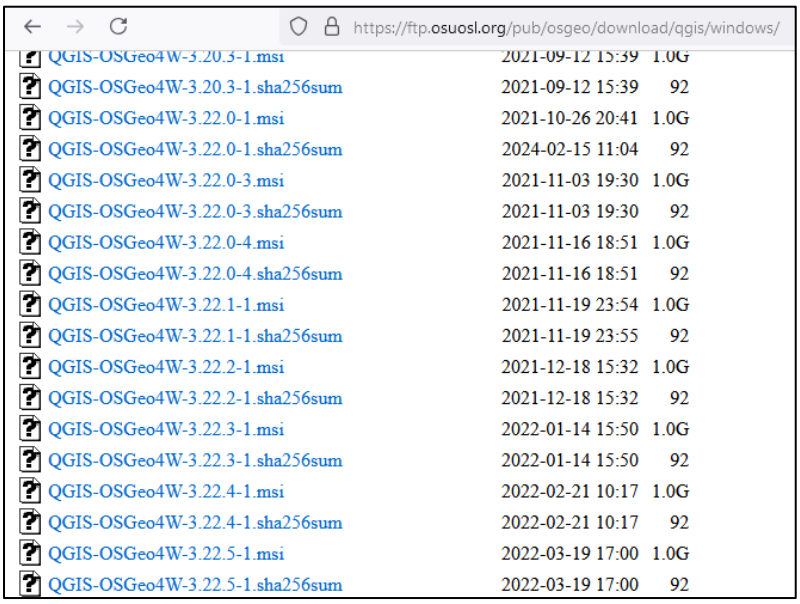


Option 2: https://download.qgis.org/downloads/

Select the QGIS installer that matches your operating system (Windows, macOS, or Linux).

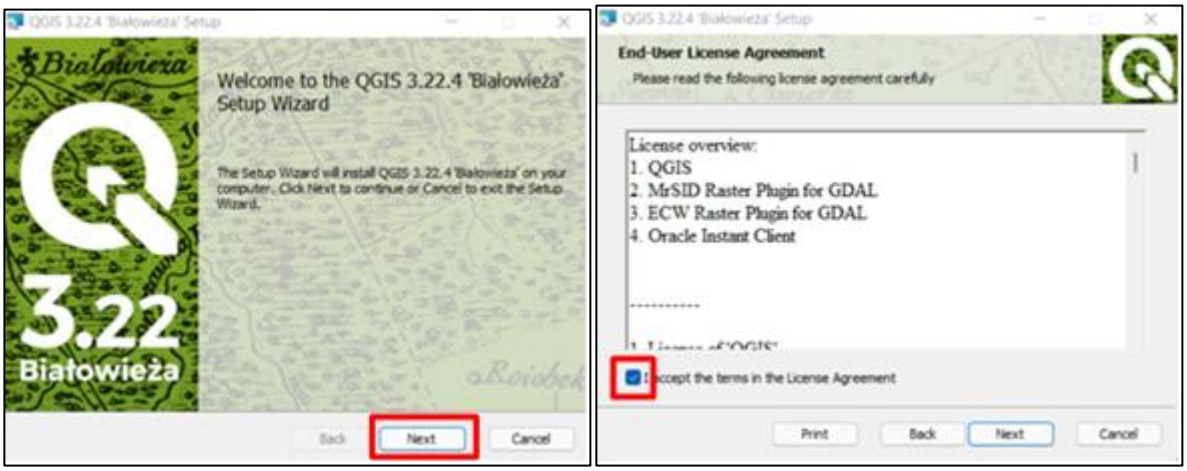


For this challenge, you will need **QGIS version 3.18 or later**. After selecting the appropriate installer, wait for the file to finish downloading before proceeding with the installation.

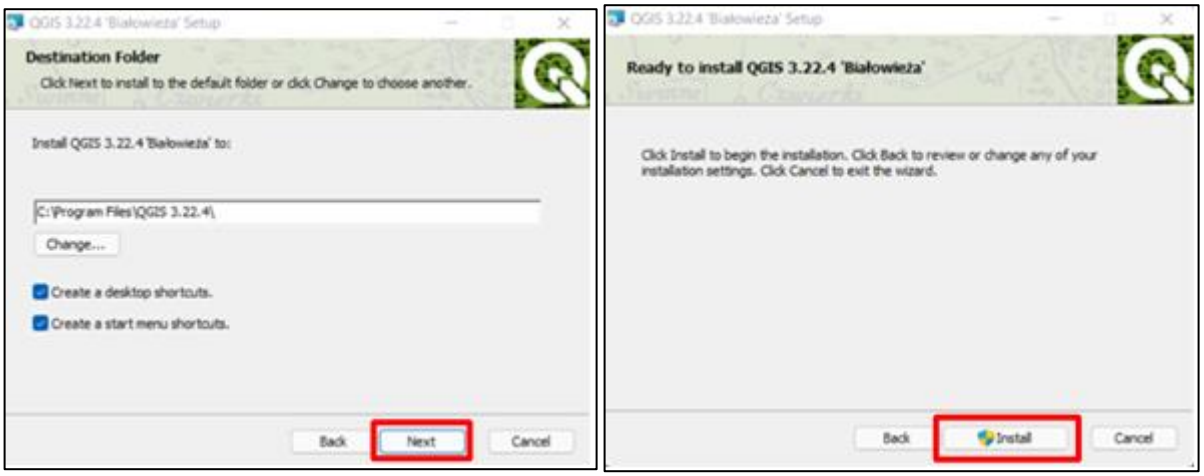


3.3. Installation of QGIS

After download, double-click the downloaded file and follow the series of steps below to install the software. The welcome page will show, click Next to proceed to the end-user license agreement page. Check the box to agree with the terms and conditions.



Click Next then the Install button. The software will automatically for installation.



After the installation process, QGIS will create a desktop shortcut, which will be in a folder named QGIS 3.22.4. Look for the QGIS Desktop 3.22.4 (or a higher version – depending on the latest available version) and open the application - QGIS Desktop.

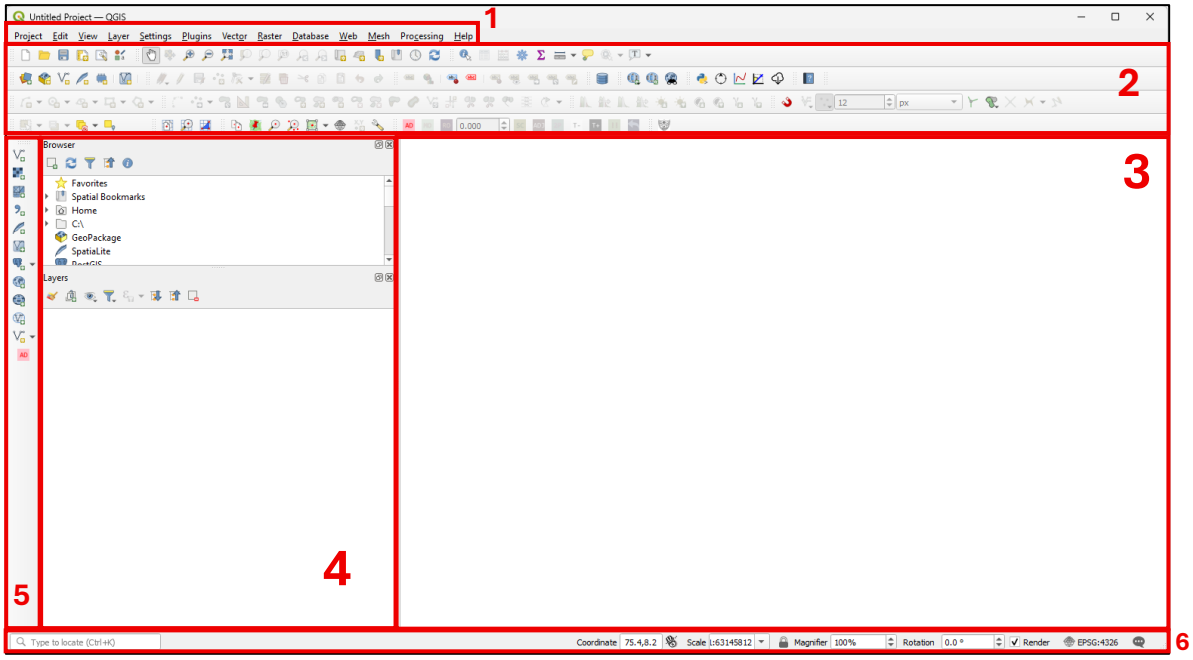
3.4. Introduction to the QGIS Interface

Open QGIS either by clicking the desktop shortcut or by searching for the program in your computer's start/search menu.

The **QGIS interface** is composed of several key components (see image below):

1. **Menu Bar**
2. **Toolbars**
3. **Map Canvas**
4. **Browser / Layer Panel**
5. **Side Toolbar**

6. **Status Bar**



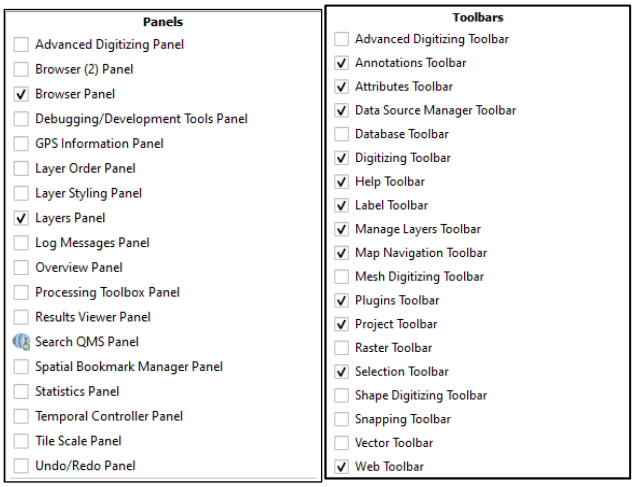
3.4.1. QGIS Interface

The **Menu Bar** in **QGIS** is the main toolbar at the top of the application window that organizes all of QGIS's functions into **categories of menus**. It allows users to access nearly every feature and operation in QGIS through drop-down menus. Each menu contains commands or tools grouped by function.

3.4.2. Toolbars

In **QGIS**, **Toolbars** are collections of buttons that give you **quick access to commonly used tools and functions** without having to go through the Menu Bar. They are usually located below the Menu Bar and can be customized based on your workflow. If you hover on an icon in the toolbar, it will tell you what that icon does.

Toolbars can be customized by enabling or disabling specific panels. To do this, right-click on any blank area of the toolbar. A checklist of available panels and toolbars will appear, allowing you to turn them on or off as needed.



3.4.3. Map Canvas

The **Map Canvas** is the main display area where the map is rendered. All loaded datasets and layers are visualized here.

3.4.4. Browser/Layer panel

- Browser Panel – Provides quick access to files and data sources. It displays folders, subfolders, and files available on your computer or connected databases.
- Layer Panel – Lists all the layers currently loaded in QGIS. From here, you can manage layer visibility, order, and styling.

3.4.5. Side Toolbar

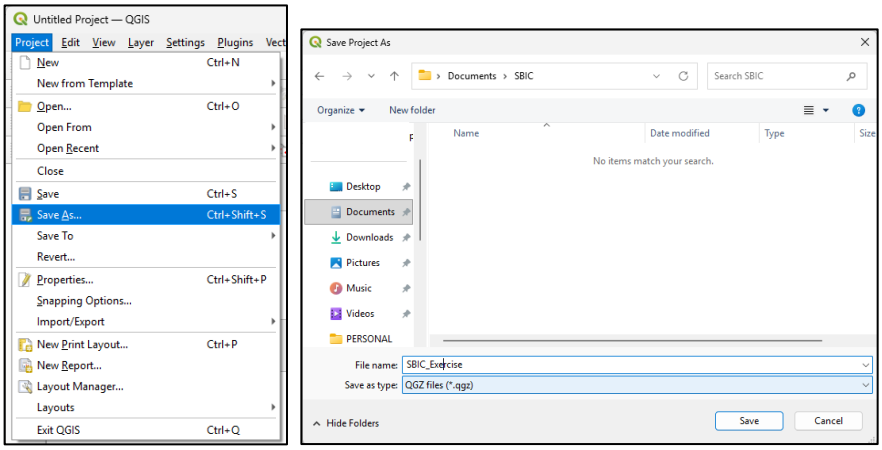
The **Side Toolbar** contains tools for adding data depending on the file format. In some QGIS installations, this toolbar may not be visible by default. To enable it, right-click on a blank area in the toolbar to open the list of toolbars and then check **Manage Layers Toolbar**.

3.4.6. Status Bar

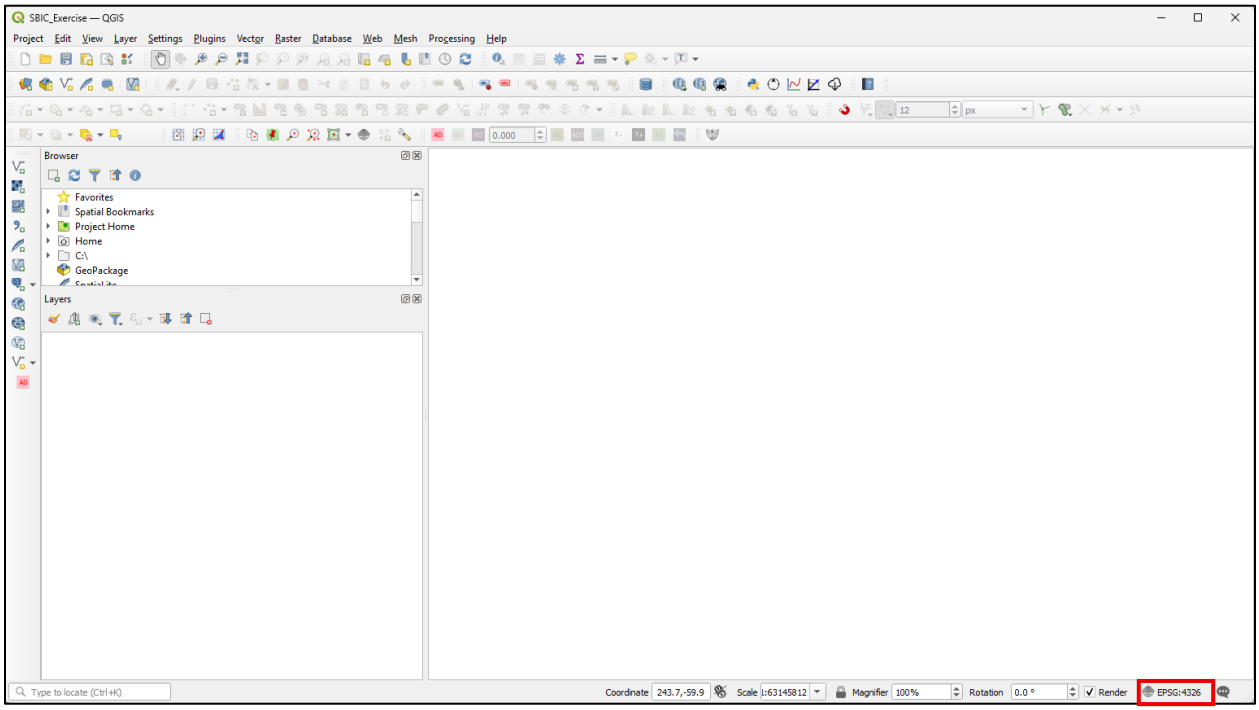
The **XY coordinates** (e.g., Easting/Northing or Longitude/Latitude) are displayed in the status bar and update dynamically as you move the cursor across the Map Canvas. This panel also allows you to view and adjust the **map scale** and set the **map orientation (northing)**.

3.5. Creating File and Setting Coordinate Reference System (CRS)

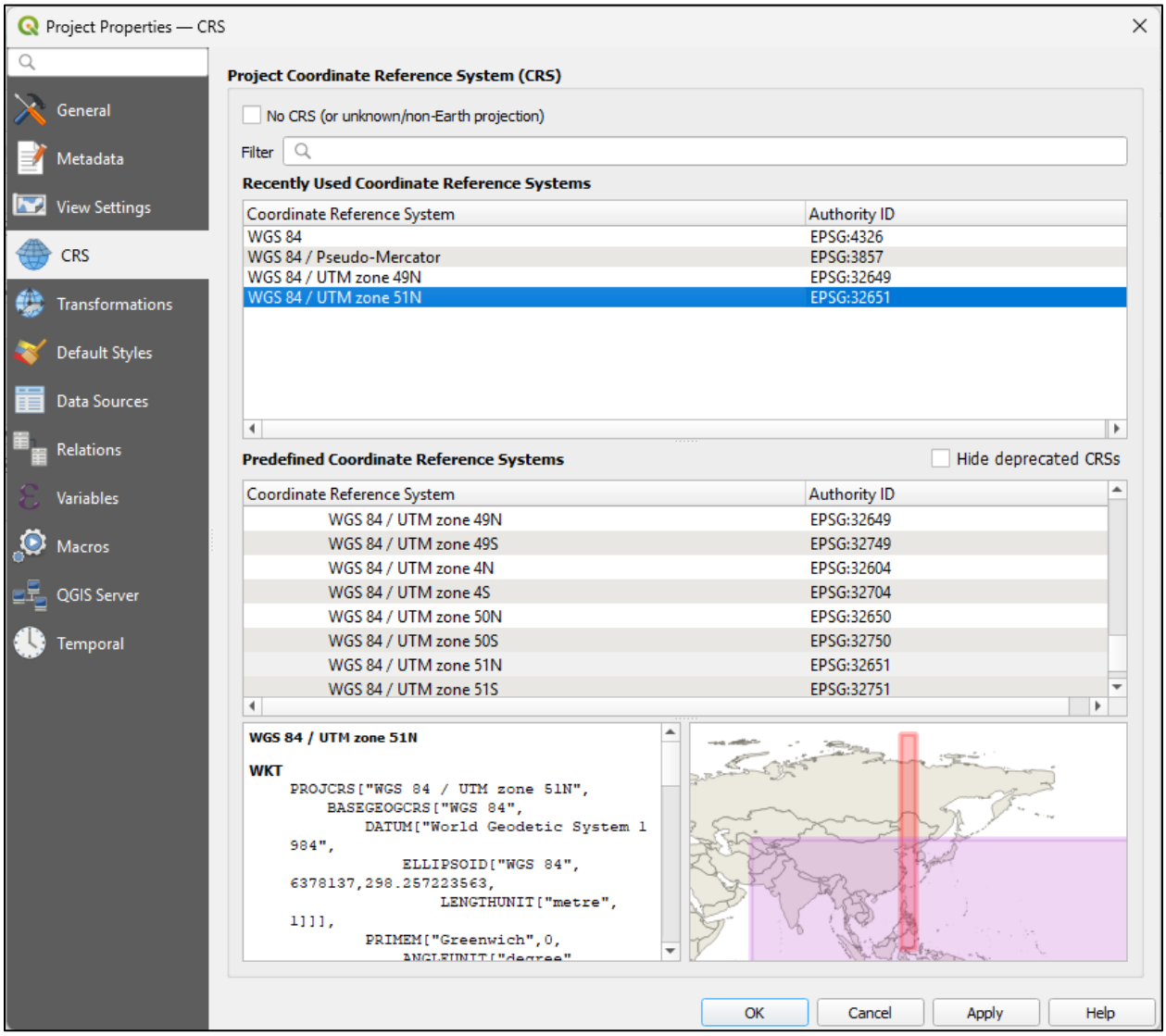
Upon opening QGIS, it will open a new file. To save your current file, click **Project** in the menu bar and select **Save As.** Save your file with your chosen file name and in its designated folder.



Once **Project** is created, set your CRS or Coordinate Reference System. You may do this by clicking the **EPSG** button (EPSG:4326) found on the lower right corner of your QGIS window.



Once clicked a **Project Properties – CRS** window will open. Under **Filter**, search on **WGS 84/ UTM Zone 51N or EPSG:32651.** Then click **Apply** and **OK.**



3.6. Adding Spatial Data

There are two primary types of data models used in Geographic Information Systems (GIS): **Vector data** and **Raster data**.

- **Vector Data** represents geographic features using points, lines, and polygons. It is ideal for discrete features such as roads, boundaries, buildings, or sampling locations. Vector data is highly precise and allows for the storage of both geometry and attribute information, making it suitable for tasks such as mapping infrastructure, analyzing networks, or defining administrative boundaries.
- **Raster Data** represents geographic information as a grid of cells (pixels), where each cell contains a value that corresponds to information such as color, temperature, elevation, or reflectance. Raster data is well-suited for continuous phenomena, such

as satellite imagery, aerial photographs, digital elevation models (DEMs), and land cover classifications. However, because it is grid-based, the precision of raster data depends on its resolution (cell size).

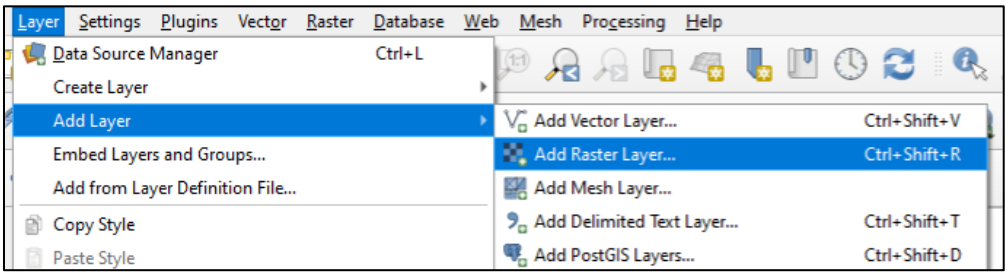
For the purposes of module, we will focus only on **loading DSM raster data** into QGIS.

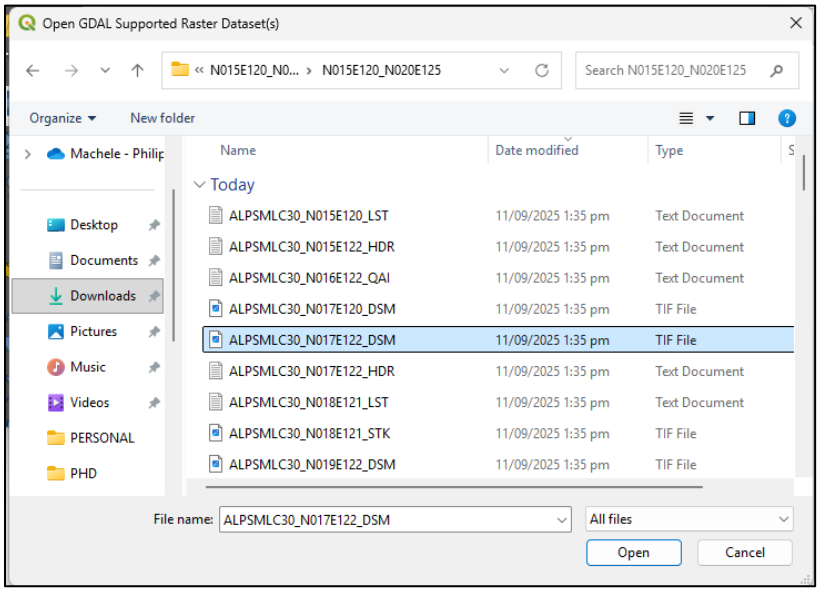
3.6.1 Adding Raster Data

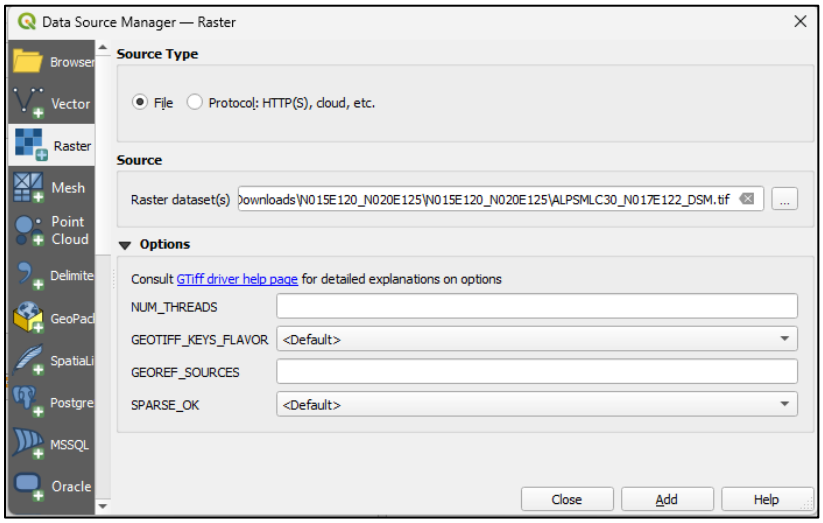
There are several ways to load raster data.

Option 1: Adding a Raster Layer through the Layer Menu Bar

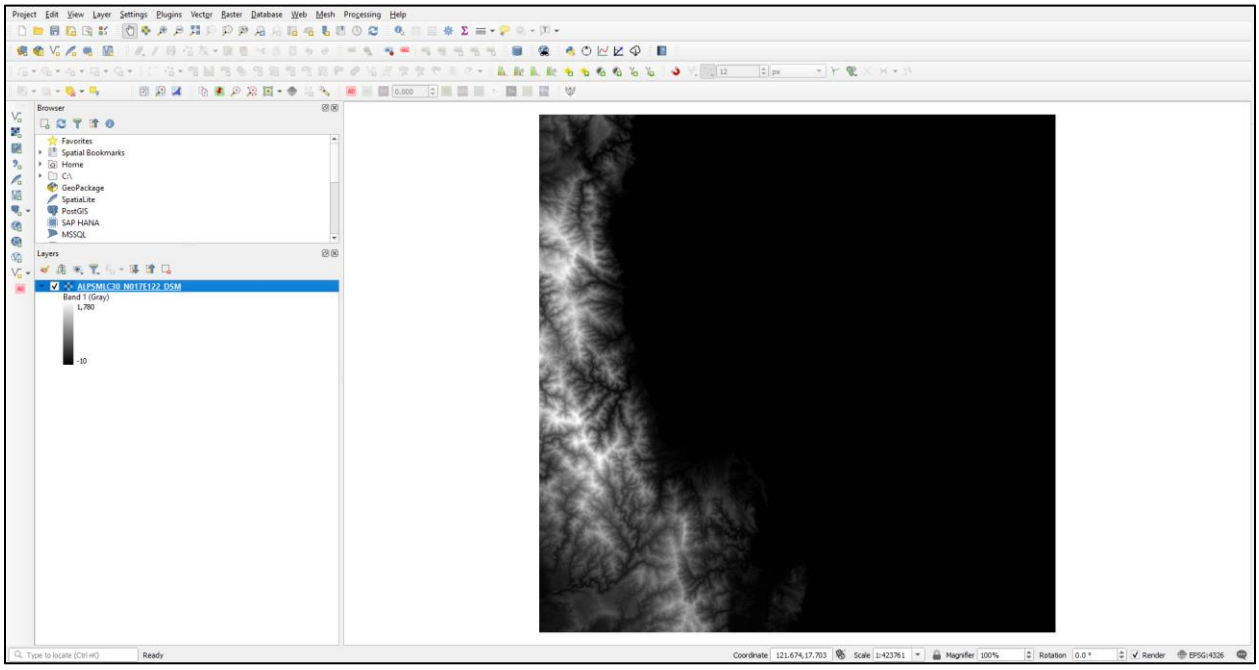
1. In the top menu, go to **Layer > Add Layer > Add Raster Layer…**
2. Navigate to the folder where you saved the extracted **DSM data** from the previous section.
3. Select the file and click **Add**.



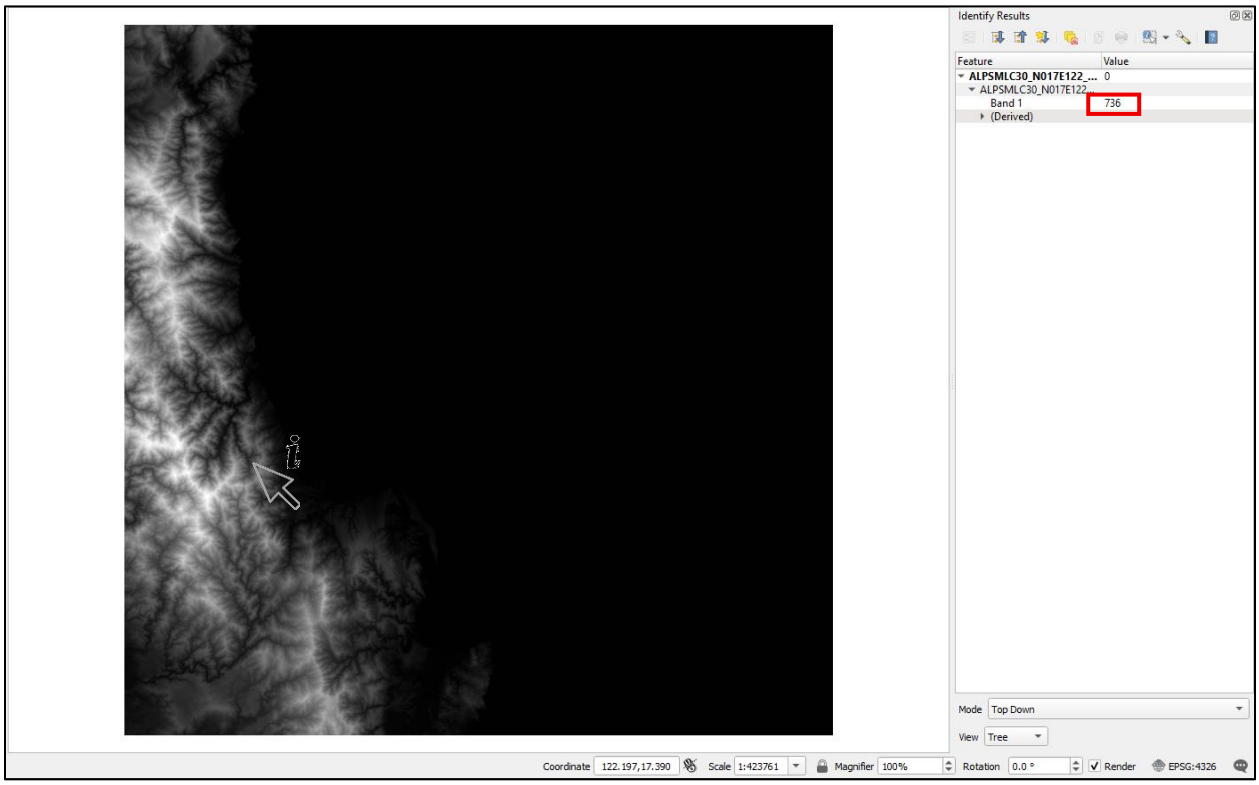




Once added, the raster image will appear in the **Map Canvas**, and its file name will be listed in the **Layers Panel**.

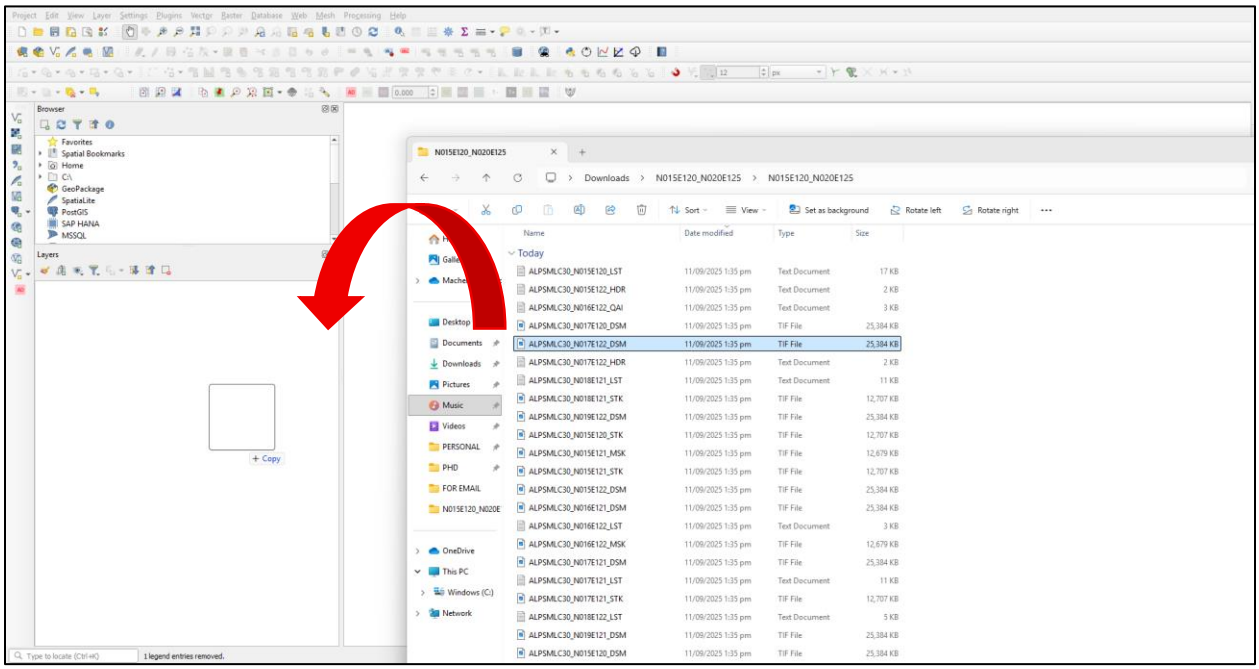


Using the *Identify Features* icon  in the toolbar, you can obtain the elevation value of any pixel on the map canvas. Simply click on a pixel, and its **elevation** will be displayed in the *Identify Results* panel on the right side of the map canvas.

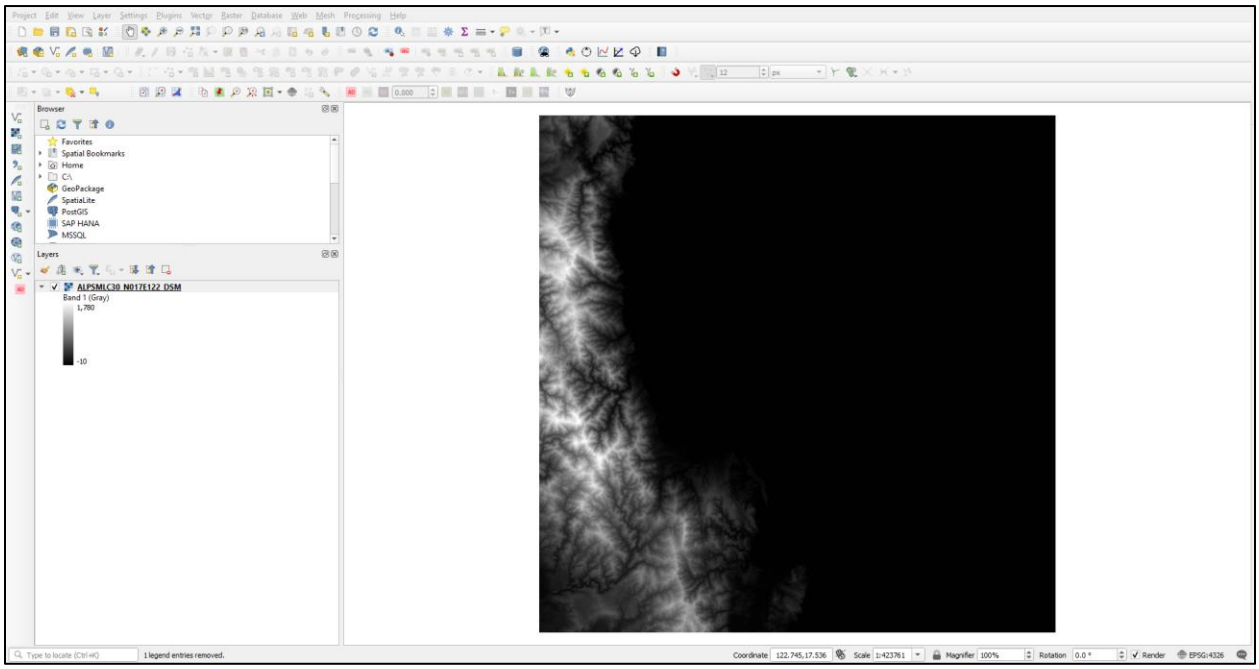


Option 2: Adding a Raster Layer via Drag and Drop

Locate the folder where the image file (e.g., TIFF or JP2 format) was downloaded. Simply drag the image file into the **Layers Panel** of QGIS to load it.



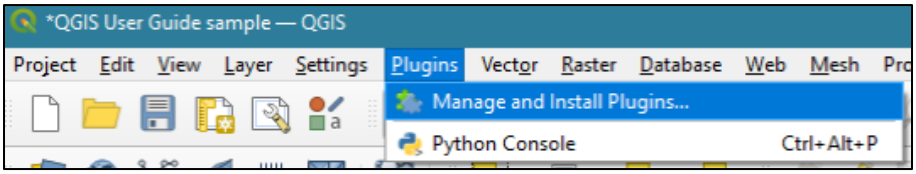
The result of this process will be similar with the first option.



3.7. Adding a Basemap

Basemaps provide a reference layer for overlaying and visualizing your spatial data, giving context to its location. Common examples include web maps (e.g., Google Maps, OpenStreetMap) and satellite imagery (e.g., Landsat, Google Satellite).

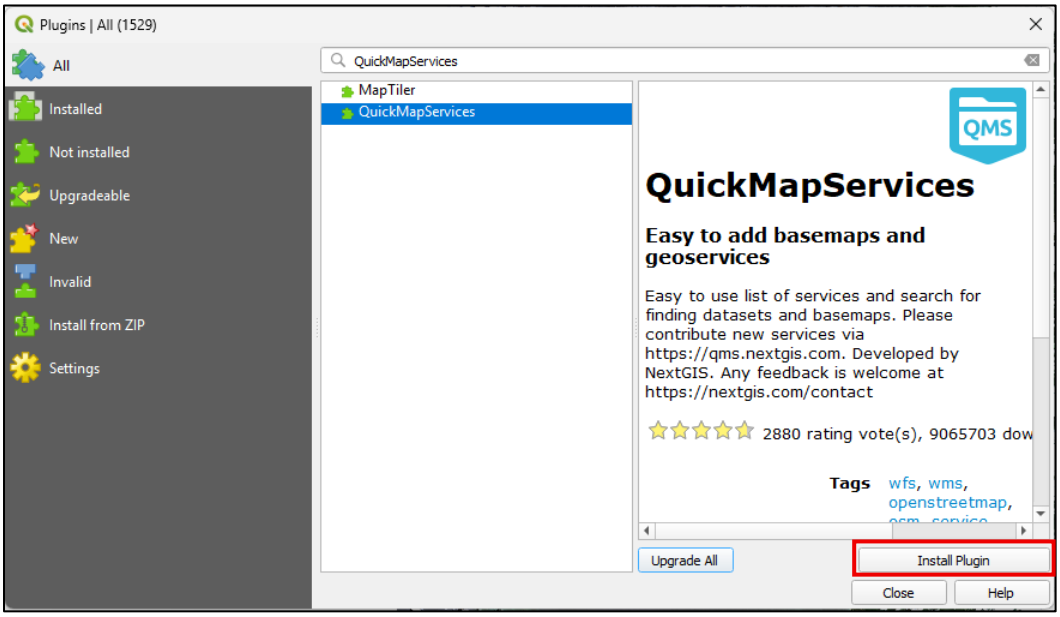
To add a basemap in QGIS, install the **QuickMapServices** plugin by navigating to **Menu Bar** → **Plugins** → **Manage and Install Plugins…**. This will open the Plugins window.



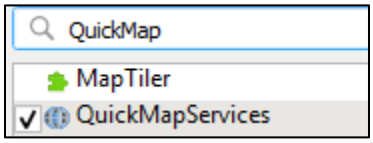
Option 1: Install via Search Bar

Note: An active internet connection is required for this.

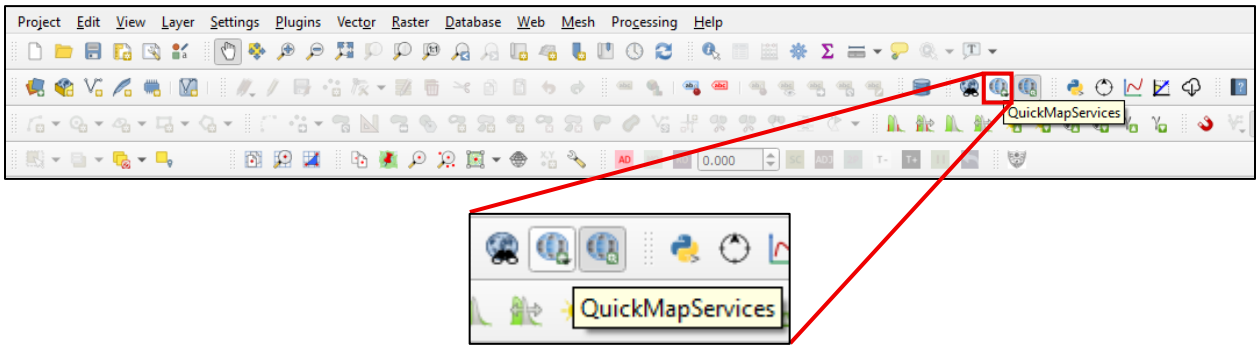
1. In the Plugins window, type **QuickMapServices** in the search bar.
2. From the list of available plugins, select **QuickMapServices**.
3. Click **Install Plugin** to automatically add it to QGIS.



4. Once installed, make sure that the said QuickMapServices is checked.



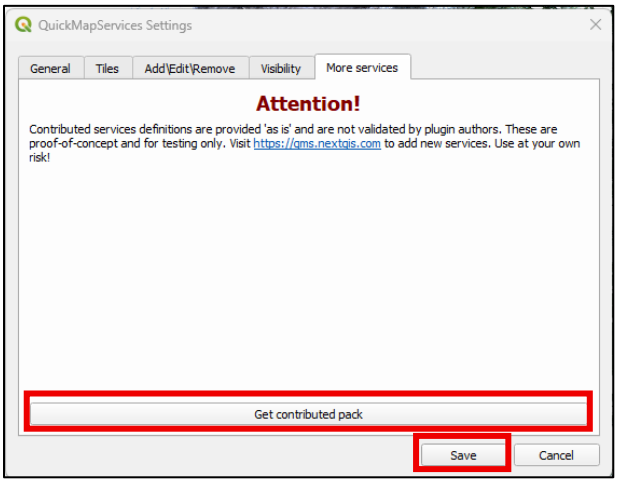
5. Once installation is complete, you may close the Plugins window. The QuickMapServices should appear in the Toolbars.



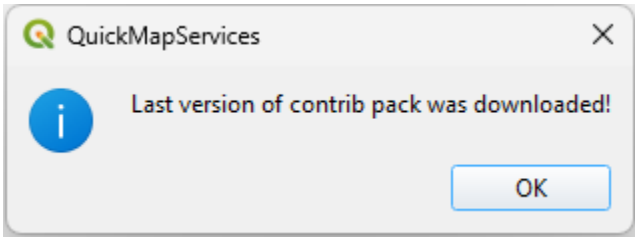
By default, **QuickMapServices** provides only a limited set of basemaps. To access a wider selection:

1. Open **QuickMapServices** and go to **Settings**.
2. In the **More Services** tab, click **Get Contributed Pack**.
3. Click **Save** to apply the changes.

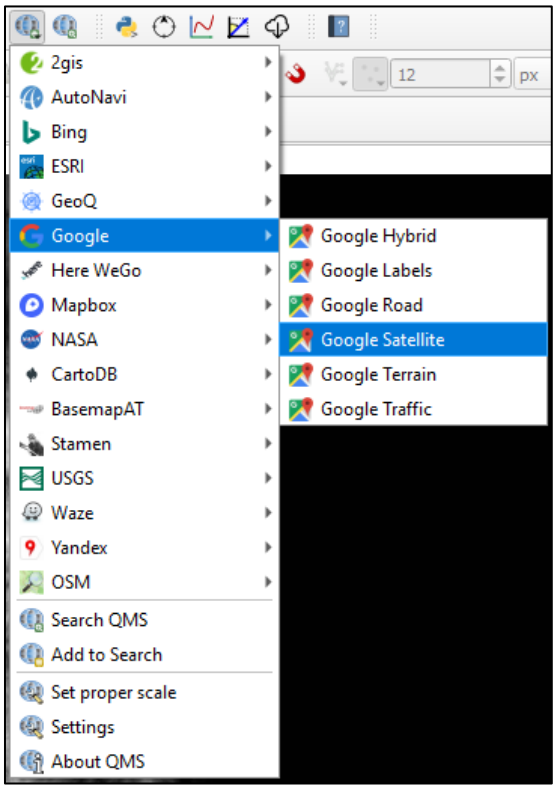
This will add many additional basemap options for use in QGIS.



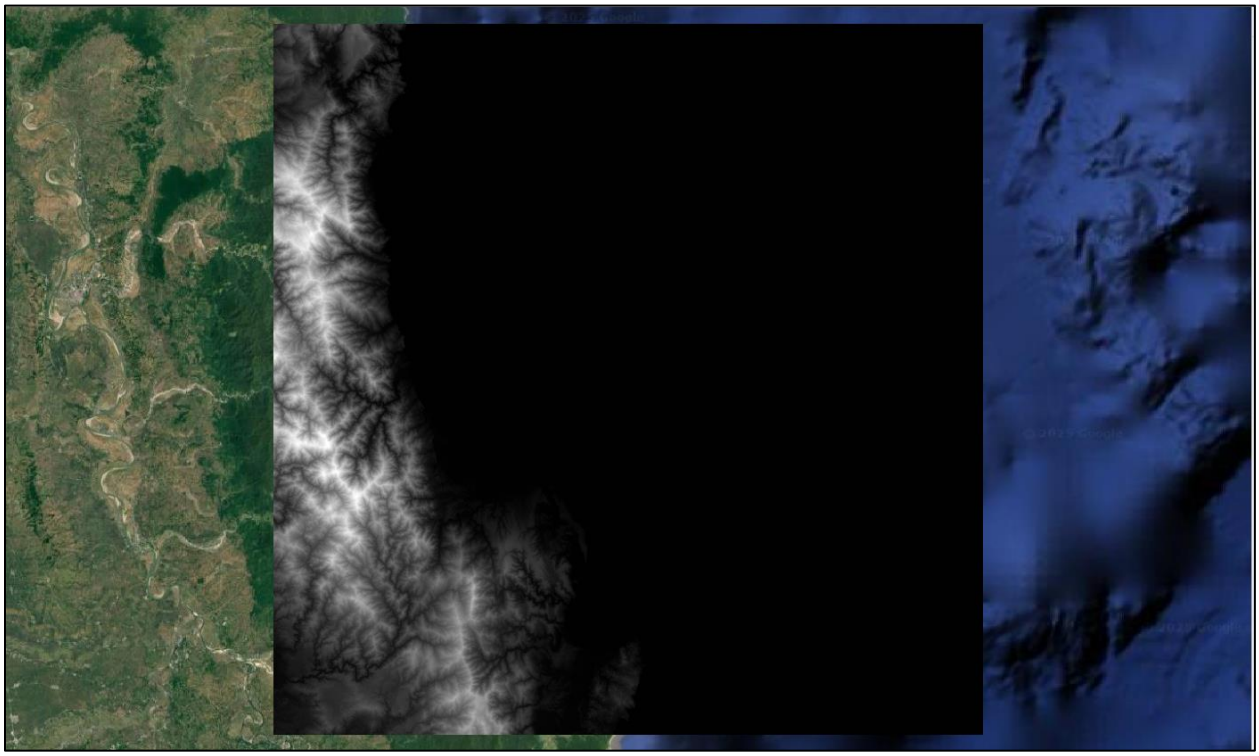
Once the contributed pack is downloaded, a pop-up message will confirm it.



To add a basemap, click the icon on QuickMapServices and select your preferred basemap.

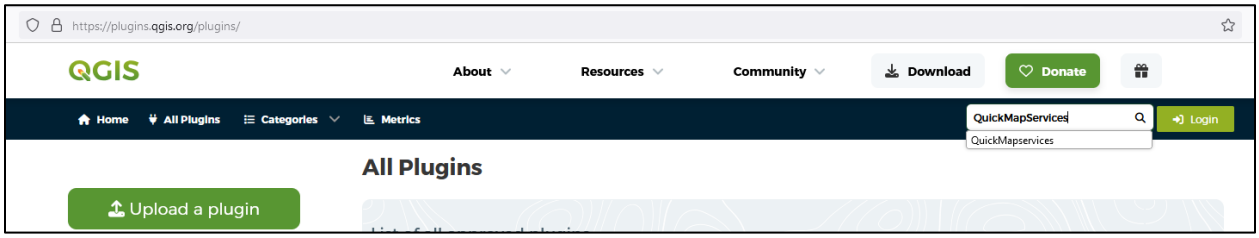


This will display the selected basemap in the map canvas as a background.

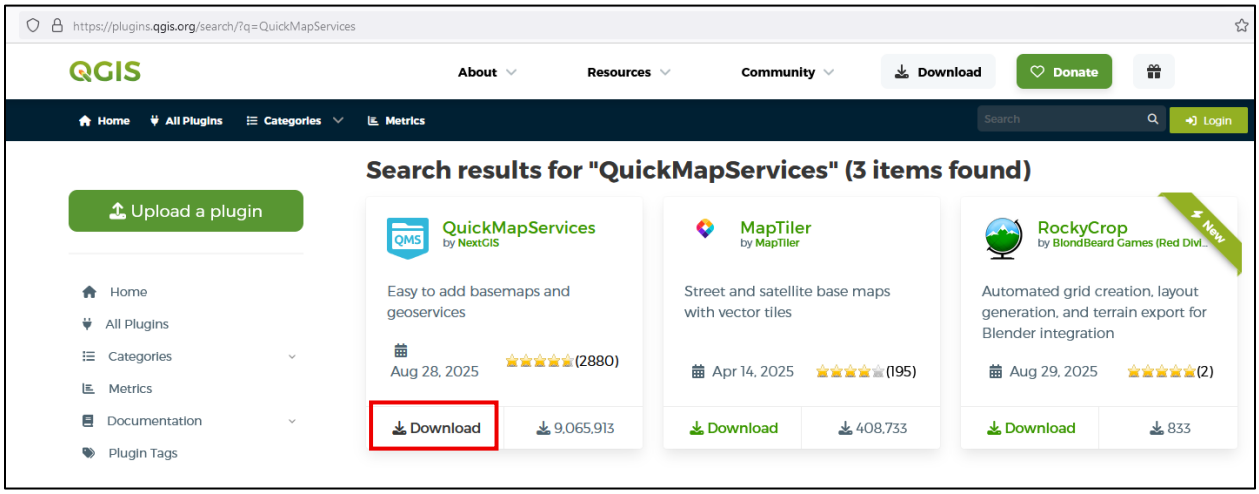


Option 2: Install from ZIP File
This method is useful when internet access is limited. You can download the plugin file in advance and install it offline.

1. **Visit the QGIS Plugins Repository:** https://plugins.qgis.org/plugins/
2. In the search bar, type **QuickMapServices** and press **Enter**.



3. From the results, select **QuickMapServices** and click **Download** to obtain the ZIP file.



4. Return to the **Plugins** dialog in QGIS and select **Install from ZIP**.
5. Browse to the folder where you saved the downloaded plugin ZIP file, select it, and click **Install Plugin**.