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5 Introduction to R and QGIS

b) Introduction to QGIS

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MARTIN-LUTHER-UNIVERSITÄT HALLE-WITTENBERG

UNIVERSITY OF BOTSWANA

INES Ruhengeri Institute of Applied Sciences

EARTH OBSERVATION RESEARCH

Learning objectives

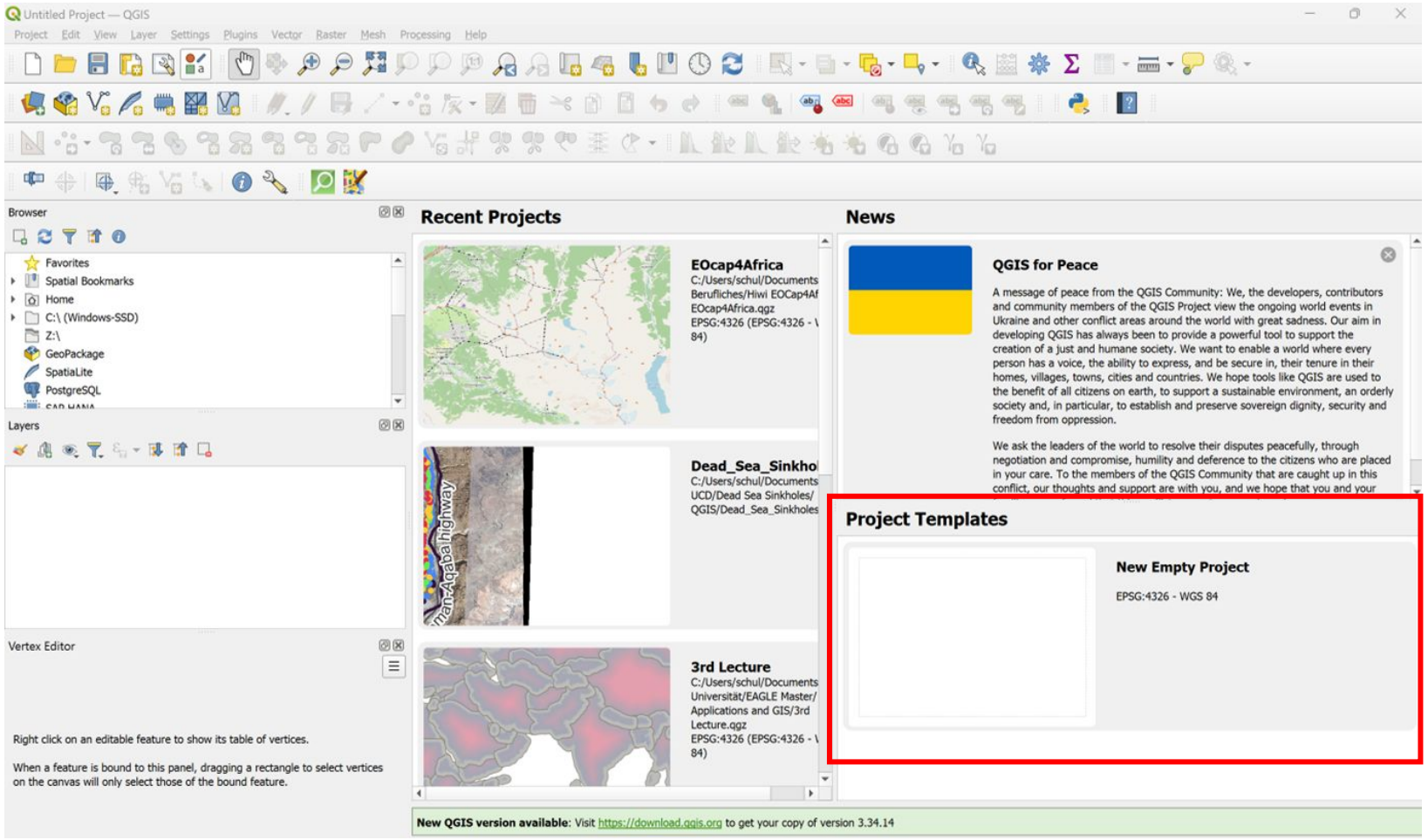
Understand the general layout of QGIS

Identify key toolbars and panels in the interface

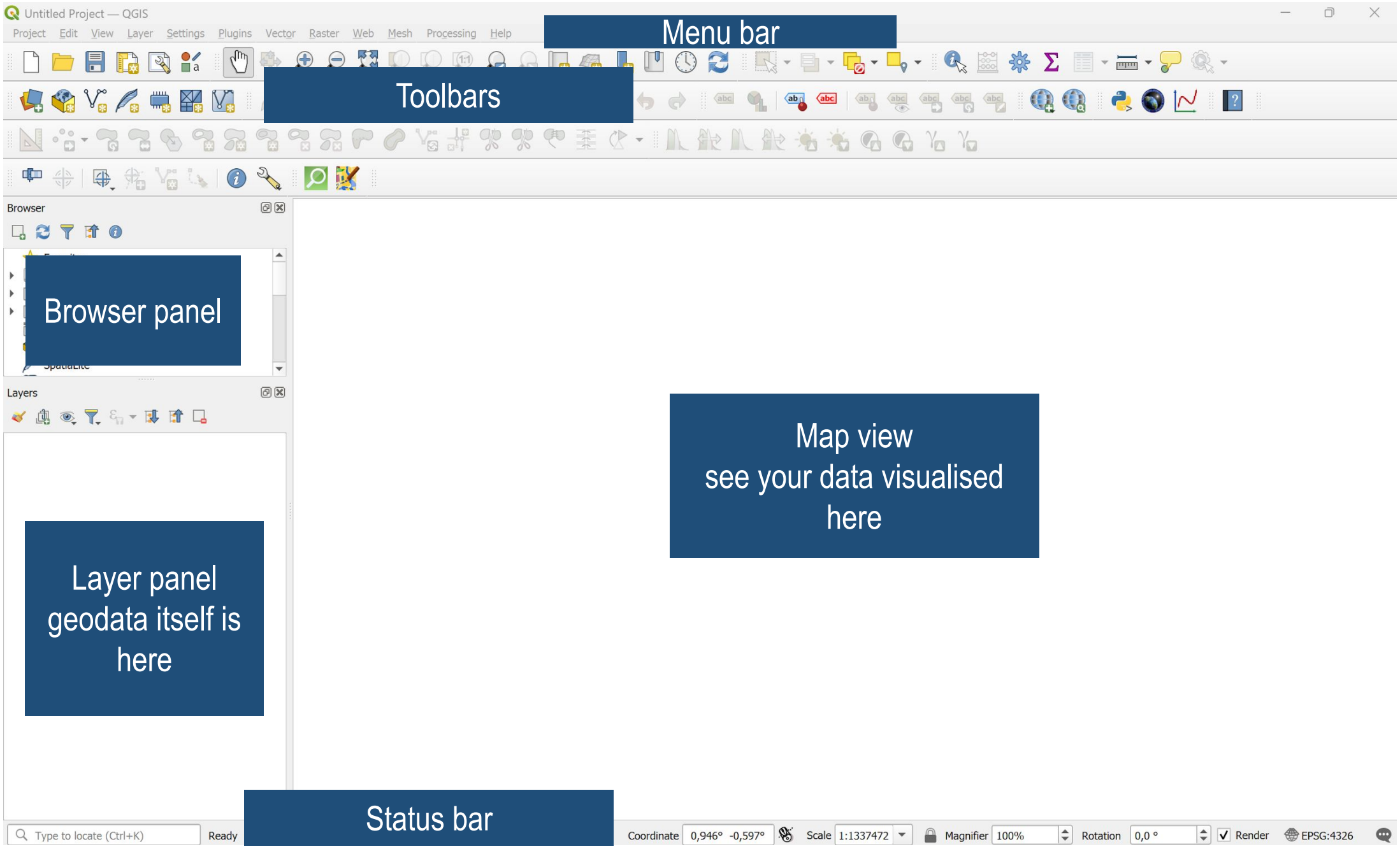
Learn the basics of coordinate reference systems (CRS) and projections

Install and activate essential QGIS plugins

Starting QGIS for the first time



- Start your QGIS application
- Open a new project on the left
- Old projects will appear on the right

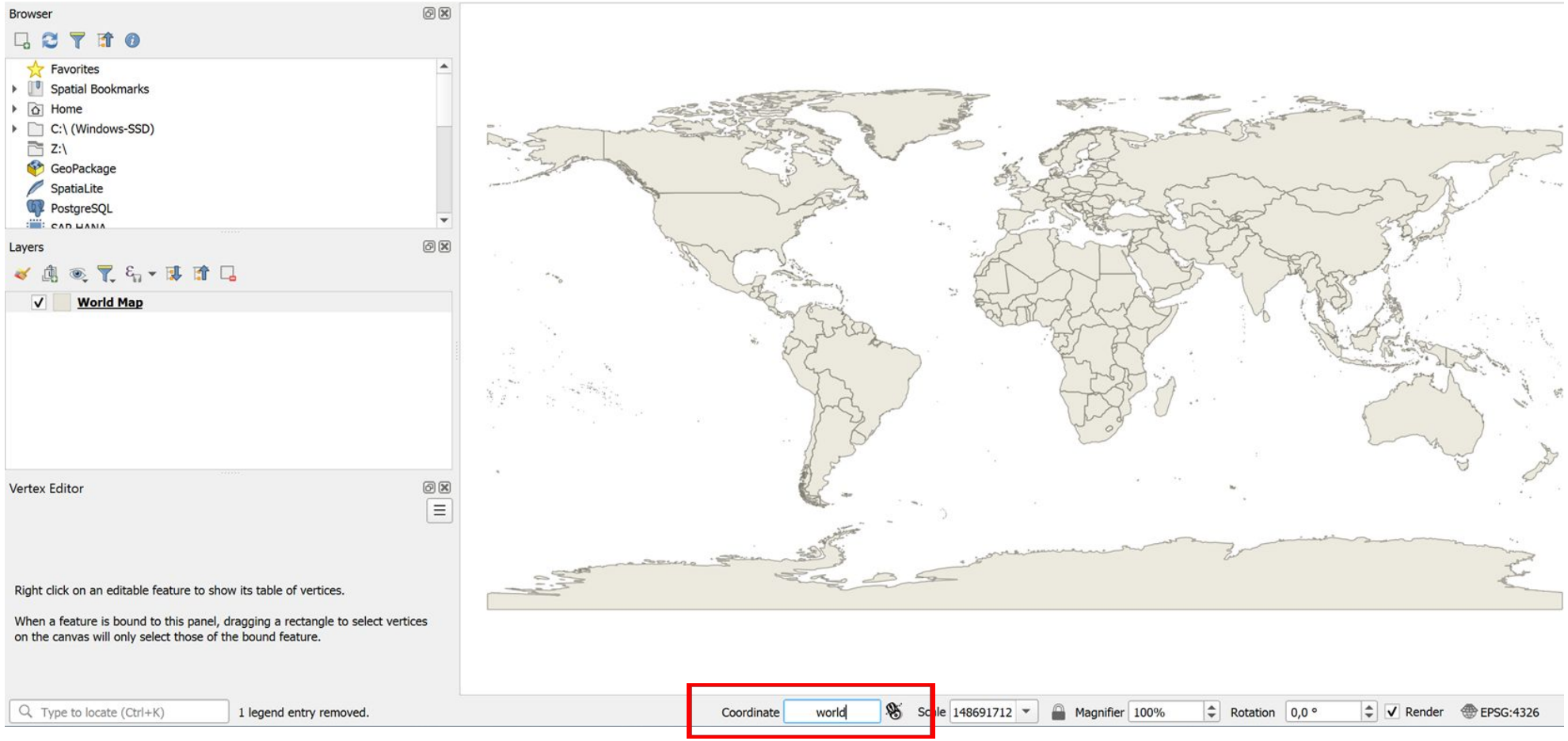

Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Web Mesh Processing Help
Menu bar
Toolbars
Browser
Browser panel
Layers
Layer panel
geodata itself is
here
Map view
see your data visualised
here
Type to locate (Ctrl+K)
Ready
Status bar
Coordinate 0,946° -0,597°
Scale 1:1337472
Magnifier 100%
Rotation 0,0 °
Render
EPSG:4326

Understanding the QGIS layout

Section	Function	Key Features
Menu bar	Access all functions	File, edit, view, layer, plugins
Toolbars	Quick access to tools	Add layers, zoom, measure, select features
Layers panel	Manage map layers	Turn layers on/off, reorder them
Browser panel	Find and add data	Connect to files, databases, online services
Map canvas	Display your map	Shows layers in the project
Status bar	Coordinates & scale	Shows CRS, rendering progress

Viewing data in QGIS

Type world in the coordinate field in the status bar to access a vector world map!



Viewing data in QGIS

Try it out for yourself!

1) What has changed in your QGIS after the data was added?

2) Zoom around the map and find where you are currently located.

Understanding projections and CRS

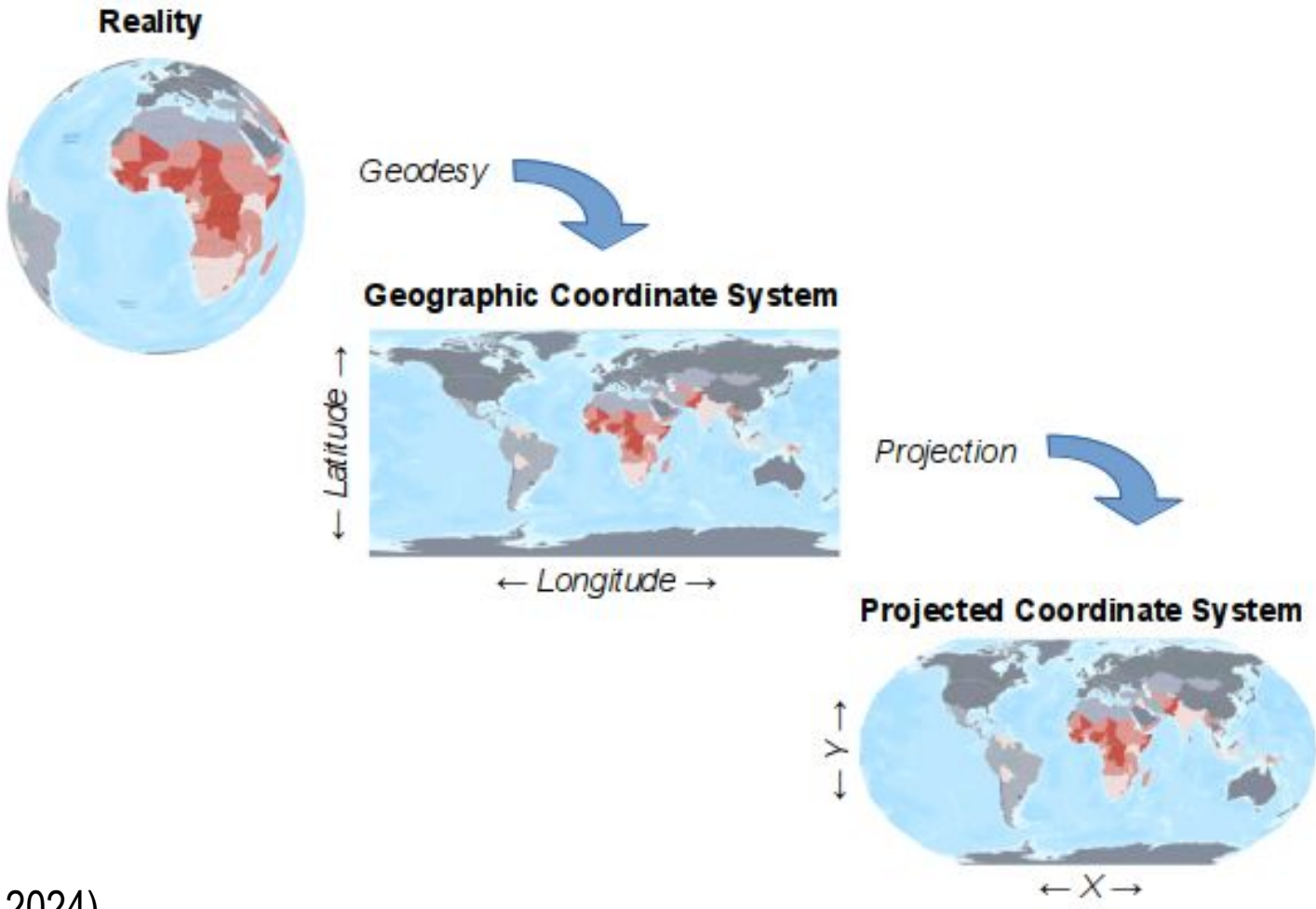
What is a CRS?

- A Coordinate Reference System (CRS) defines how spatial data is positioned on the earth's surface
- Every GIS dataset has a specified projection and datum that determine how it is displayed on a map
- Incorrect CRS settings can lead to misaligned or distorted maps

Key Components of a CRS:

- Datum: Defines the reference model of the earth's shape (e.g., WGS84, NAD83)
- Projection: A mathematical transformation that flattens the 3D Earth onto a 2D plane
- Coordinate system: Defines the measurement units (e.g., latitude/longitude, meters)

Understanding projections and CRS



(Minn 2024)

Why the CRS matters

Affects:
Accuracy of spatial analysis (distance, area, angles)
Alignment of datasets (combining multiple sources)
Correct display on maps (avoiding distortions)

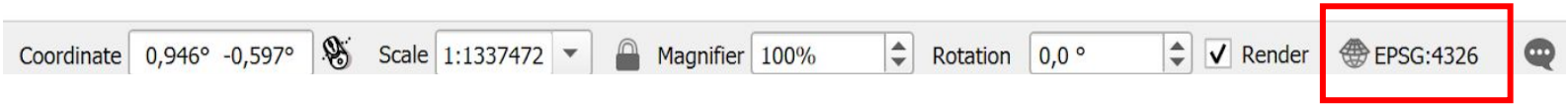
Problem	Cause	Solution
Misaligned layers	Different CRS in datasets	Convert to a common CRS
Distorted shapes	Using an unsuitable projection	Choose a projection suitable for the region
Incorrect measurements	Mixing projected and unprojected data	Ensure all layers use a projected CRS

Common CRS

Projection name	Type	Best used for	EPSG Code
WGS84	Geographic	Global datasets, GPS	EPSG:4326
UTM Zones	Projected	Local/regional precision mapping	EPSG:326XX
Web Mercator	Projected	Web-based maps (Google Maps, OpenStreetMap)	EPSG:3857
Albers Equal Area	Projected	Large-scale national maps	EPSG:5070
Africa Albers Equal Area Conic	Projected	Africa-focused data	EPSG:102022

Changing the CRS in QGIS

You can check the EPSG code in the status bar on the right



Changing the CRS in QGIS

Changing the CRS of a project

- Go to Project in the menu bar → properties → CRS
- Select a new projection (e.g., EPSG:4326 for global datasets)

Reprojecting a layer

- Select Layer in layer panel by right clicking → Export → Save As…
- Choose the desired CRS from the dropdown list
- Save the reprojected layer as a new file

Tasks

1. Try it out for yourself and reproject your data!
2. Describe the changes!
3. For which study would you use which CRS?

Installing and managing plugins

Why Use plugins?

- Extend QGIS functionality (e.g., web mapping, data analysis, automation)

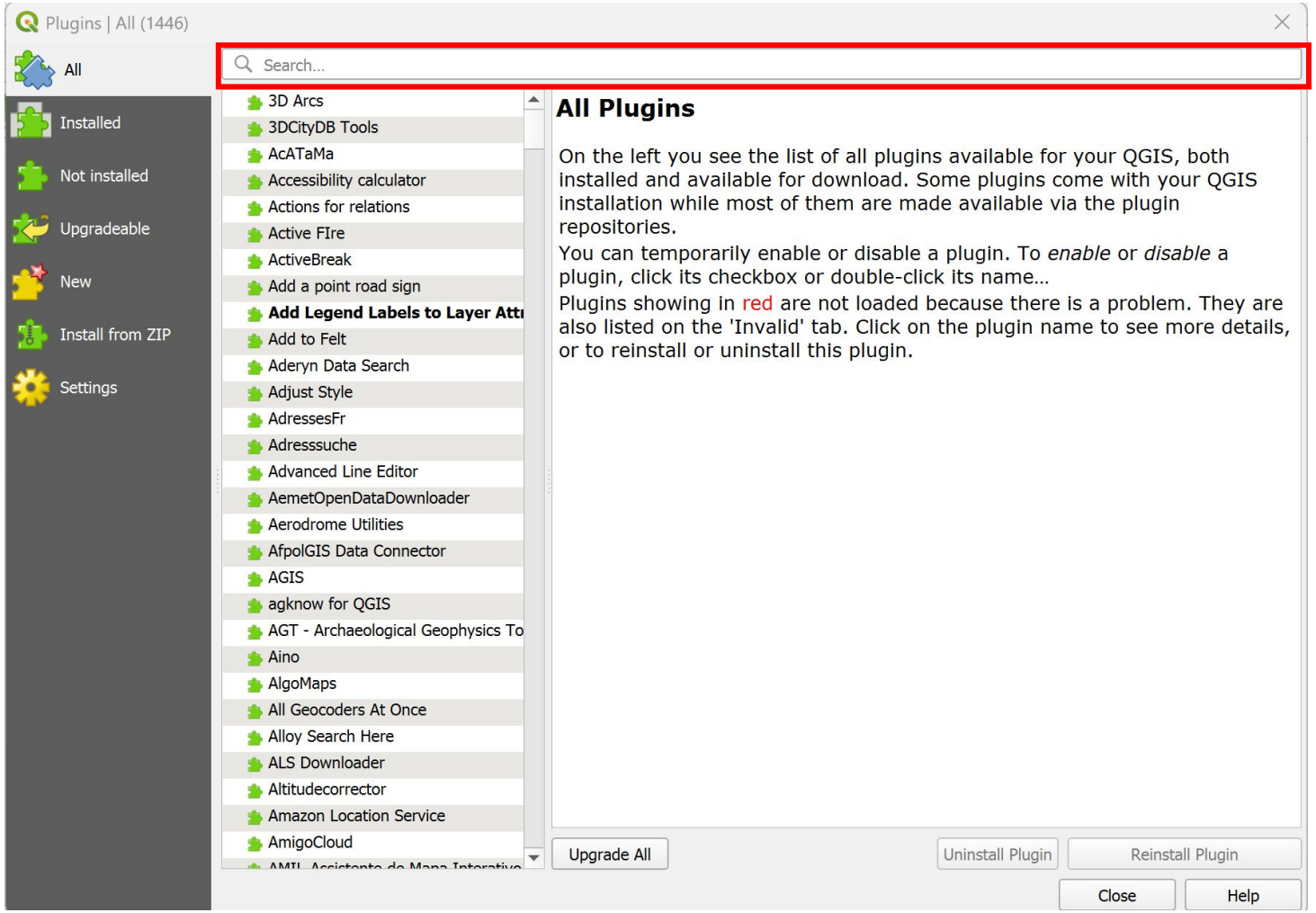
How to install a plugin:

- Go to plugins in the menu bar → Manage and install plugins
- Search for the desired plugin
- Click install and enable it

Installing and managing plugins

Lets install your first plugin!

Search for **QuickMapServices**

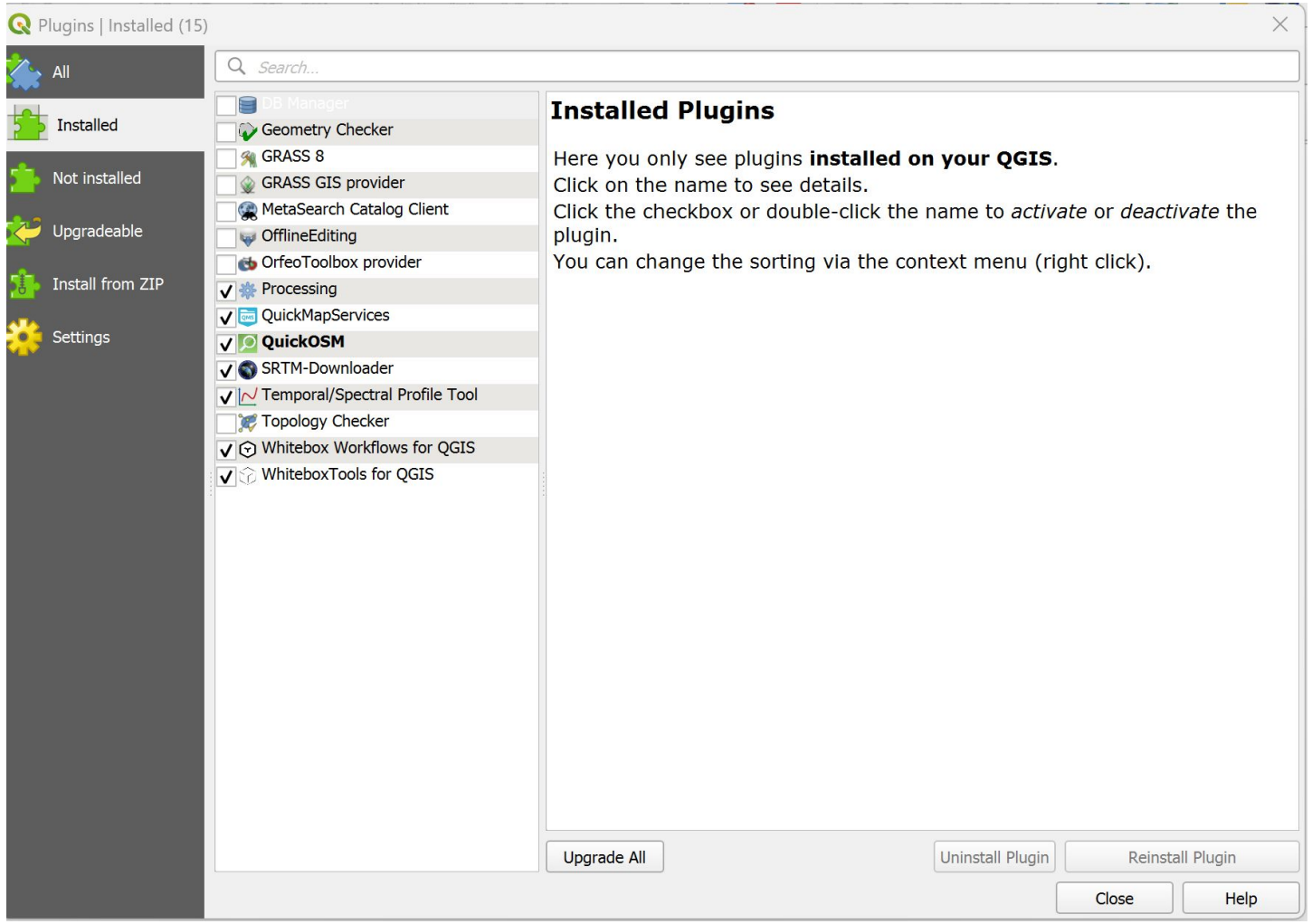


Installing and managing plugins

Once you have found it, the option to install it will show up on the bottom right

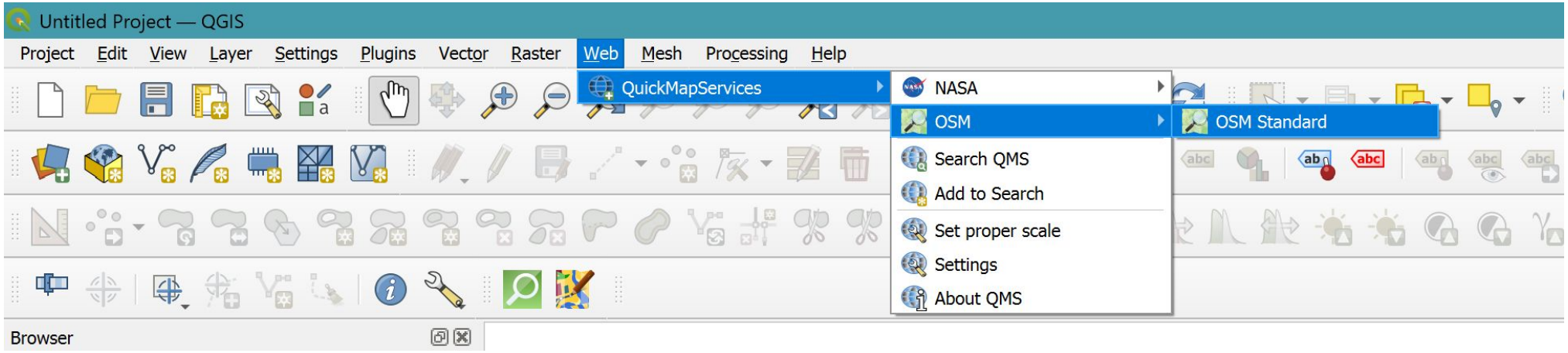
Installed packages show up on the installed page

Make sure that **QuickMapServices** and **Processing** both have their box ticked!



Using QuickMapServices

Web -> QuickMapServices -> OSM -> OSM Standard lets you add a map to the background



Task

Explore the OpenStreetMap!

Saving a QGIS project

Why Save your project?

- QGIS projects store layer arrangements, styles, and settings, allowing you to continue working without reloading everything
- Prevents losing progress when handling multiple datasets

How to Save a QGIS project:

- Go to Project → Save As…
- Choose a location and enter a meaningful filename (e.g., land_cover_analysis.qgz)
- Click Save to store the project

Task

Save your project!

Summary & key takeaways

QGIS has an intuitive layout with key panels: Layers, browser, and map canvas

Coordinate reference systems (CRS) determine how spatial data aligns on earth, and using the correct projection is crucial for accuracy

Common projections include WGS84 (global), UTM (local), Web Mercator (web mapping), and Africa Albers Equal Area Conic (for African studies)

Plugins enhance QGIS capabilities—OpenLayers, QuickMapServices, and GRASS GIS are useful additions

Saving your QGIS project regularly ensures you don't lose progress and maintains organized workflows

Sources

Minn, M. (2024, October 27). *Map projections*. Retrieved February 10, 2025, from https://michaelminn.net/tutorials/gis-projections/

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Thank you for your attention!

Dr. Insa Otte, Hanna Schulten
(on behalf of the EOCap4Africa Team)
and colleagues

insa.otte@uni-wuerzburg.de