

Supported by:



Federal Ministry for the Environment, Nature Conservation and Nuclear Safety



Federal Agency for Nature Conservation



EOCap4Africa

Introduction to R and QGIS 5

Introduction to QGIS b)





MARTIN-LUTHER-UNIVERSITÄT



HALLE-WITTENBERG











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

Q Untitled Project - QGIS Project Edit View Layer Settings Plugins Vector Raster Mesh Processing Help 🗋 늘 🖥 🚯 😰 🕼 🕲 🖗 🗩 💭 💭 🔍 💭 💭 💭 🧛 🖫 🧠 🕓 🕛 🕓 😂 🛯 🖓 - 🖏 - 🧞 - 🔍 - 🔍 🖄 🗰 - 🌄 - 🤤 - 🤤 - 🤤 -🤹 🎕 Vi 🔏 🖏 🎇 VI. / 🖶 / · · i k · 🕺 🖥 🛰 🗈 🖬 🔶 / · · i 🖓 🧠 🧠 🧠 🧠 🧠 🖏 🦷 2 Ming a Bag a Bag a Power to the state of the | 🖶 😤 V6 🕵 | 🕜 🔧 | [🖉 👹 ØX **Recent Projects** Browser News G 2 7 1 0 Favorites EOcap4Africa **QGIS for Peace** Spatial Bookmarks C:/Users/schul/Documents A message of peace from the QGIS Community: We, the developers, contributors Berufliches/Hiwi EOCap4Af + O Home and community members of the QGIS Project view the ongoing world events in EOcap4Africa.qgz C:\ (Windows-SSD) EPSG:4326 (EPSG:4326 - 1 Ukraine and other conflict areas around the world with great sadness. Our aim in T Z:\ developing QGIS has always been to provide a powerful tool to support the creation of a just and humane society. We want to enable a world where every GeoPackage person has a voice, the ability to express, and be secure in, their tenure in their SpatiaLite homes, villages, towns, cities and countries. We hope tools like QGIS are used to PostgreSQL the benefit of all citizens on earth, to support a sustainable environment, an orderly society and, in particular, to establish and preserve sovereign dignity, security and CAD UANA freedom from oppression. ØX Layers 🗸 🕼 🙊 🍸 🖏 - 🔃 😭 🗔 We ask the leaders of the world to resolve their disputes peacefully, through negotiation and compromise, humility and deference to the citizens who are placed **Dead Sea Sinkho** in your care. To the members of the QGIS Community that are caught up in this C:/Users/schul/Documents conflict, our thoughts and support are with you, and we hope that you and your UCD/Dead Sea Sinkholes/ QGIS/Dead_Sea_Sinkholes **Project Templates New Empty Project** EPSG:4326 - WGS 84 Vertex Editor ØX Ξ 3rd Lecture C:/Users/schul/Documents Universität/EAGLE Master/ Applications and GIS/3rd Lecture.qgz Right click on an editable feature to show its table of vertices. EPSG:4326 (EPSG:4326 - 1 When a feature is bound to this panel, dragging a rectangle to select vertices on the canvas will only select those of the bound feature New QGIS version available: Visit https://download.ggis.org to get your copy of version 3.34.14

Starting QGIS for the first time



Start your QGIS

Open a new Project on

Old projects will appear

application

on the right

the left

•

OB





Understanding the QGIS Layout



ARCI С Ш ш OBSE

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

UNIVERSITÄT WÜRZBURG

AR

OBSI



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



6



Viewing Data in QGIS



EARC EARTH OBSER

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.

THARESEARCH

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 specific 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)



A R **OBSI**

Understanding Projections and CRS



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 CR



Common CRS



R 4 ш OBSER

Projection Name	Туре	Best Used For	EPSG Code
NGS84	Geographic	Global datasets, GPS	EPSG:4326
JTM Zones	Projected	Local/regional precision mapping	EPSG:326XX
Veb 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

		22		28. – Z								
Coordinate	0,946° -0,597°	8	Scale 1:1337472	•	Magnifier	100%	Ro	otation	0,0 °	Render	EPSG:4326	

Changing the CRS in QGIS



Changing the CRS of a Project

- Go to Project in the Menu Bar \rightarrow Properties \rightarrow CRS
- Select a new projection (e.g., EPSG:4326 for global datasets)

Reprojecting a Layer

- Select Layer in Layer Panel by right clicking \rightarrow Export \rightarrow 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 \rightarrow Manage and Install Plugins
- Search for the desired plugin
- Click Install and enable it



Installing and Managing Plugins



Search for **QuickMapServices**

Lets install your first Plugin!

All	Q Search	
	🔹 3D Arcs 🔺	All Plugins
nstalled	s 3DCityDB Tools	····· ································
	놜 AcATaMa	On the left you see the list of all plugins available for your QGIS, both
lot installed	s Accessibility calculator	installed and available for download. Some plugins come with your QGIS
	Actions for relations	installation while most of them are made available via the plugin
Jpgradeable	📤 Active FIre	repositories.
	📤 ActiveBreak	You can temporarily enable or disable a plugin. To <i>enable</i> or <i>disable</i> a
lew	📤 Add a point road sign	plugin, click its checkbox or double-click its name
	📤 Add Legend Labels to Layer Atti	Plugins showing in red are not loaded because there is a problem. They a
nstall from ZIP	📤 Add to Felt	or to reinstall or uninstall this plugin
	🖕 Aderyn Data Search	
ettings	놜 Adjust Style	
	📤 AdressesFr	
	📤 Adresssuche	
	📤 Advanced Line Editor	
	🍐 AemetOpenDataDownloader	
	📤 Aerodrome Utilities	
	📤 AfpolGIS Data Connector	
	📤 AGIS	
	📤 agknow for QGIS	
	🖕 AGT - Archaeological Geophysics To	
	📤 Aino	
	🖕 AlgoMaps	
	📤 All Geocoders At Once	
	📤 Alloy Search Here	
	놜 ALS Downloader	
	📤 Altitudecorrector	
	nazon Location Service	
	nigoCloud	Uninstall Division
	AMIL Accistante de Mana Interative	Opyrade All Oninstall Plugin Reinstall Plugin

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!

All	C Search			
To shall a d	DB Manager	Installed Plugins		
Installed	Geometry Checker			
	GRASS 8	Here you only see plugins installed on your QGIS.		
lot installed	GRASS GIS provider	Click on the name to see details.		
	MetaSearch Catalog Client	Click the checkbox or double-click the name to active	ate or deacti	vate the
pgradeable	OfflineEditing	plugin.		
	🔤 🚳 OrfeoToolbox provider	You can change the sorting via the context menu (rig	ght click).	
istall from ZIP	✓ ♣ Processing			
	✓ QuickMapServices			
Settings	V 🙍 QuickOSM			
	✓ 🕥 SRTM-Downloader			
	✓ Mathematical Version Ver			
	📄 💓 Topology Checker			
	✓			
		Upgrade All Uninstall Plugin	Reinsta	III Plugin

Using QuickMapServices



ARC ш OBSER

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

😡 Untitled Pr	oject — QGIS								
Project <u>E</u> dit	<u>View Layer</u> Setting	s <u>P</u> lugins Vect <u>o</u>	r <u>R</u> aster <u>W</u> eb	<u>M</u> esh	Processing	g <u>H</u> elp			-
		1 (m) 🤹		QuickMap	Services		INASA	•	
							SM OSM	Þ	SM Standard
I 🔽 餐				· • • • •	18 -		Search QMS		abc abc abc abc abc
					na 10		Add to Search		
				CP \	3	% %	Ret proper scale		
		A					Rettings		
া 🔽 আল							୍ର୍ମ୍ମ୍ About QMS		
Browser		0 X							



Task



Explore the OpenStreetMap!

RESEARC

OBSI

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 \rightarrow 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







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



Supported by:





Federal Agency for Nature Conservation



Thank you for your attention!

Dr. Insa Otte, Hanna Schulten, and colleagues

insa.otte@uni-wuerzburg.de





MARTIN-LUTHER-UNIVERSITÄT

HALLE-WITTENBERG





