TRAINING GIS

GIS BASICS

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Breda University OF APPLIED SCIENCES

PURPOSE OF THIS TRAINING

This training is offered through the Places and Flows research line, where geographic data analysis plays a central role in researching mobility, urban development, and spatial patterns. The skills you acquire are not only valuable for teaching, but also directly applicable to our own research projects

GIS LAB

- Tangible landscape
- Emotion Mapping
- GIS-Analyses

Ondrej Mitas, Paul van de Coevering, Jeroen Klijs, Maciej Czerniak and Sait Durgun

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Received topics from your side

- What is a useful background in QGIS for creating maps? →PLUGINS
- What settings should I use to export a map to PDF? →PLOTLAYOUT
- How can I add information that is not in the basic data? →JOINING DATA

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Today's program:

- GIS IN A GENERAL SENSE
- BASIC ELEMENTS (data type, crs, data operations)
- PRACTISING IN QGIS (basic plugins, plot-layout, properties, attributetabel, processing toolbox, join, symbology)

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WHAT IS GIS?

A geographic information system (GIS) is **a system** that **creates, manages, analyzes, and maps all types of data**. GIS connects data to a map and integrates location data (**where things are**) with all descriptive information (**how things are there**).

GIS helps users understand patterns, relationships, and geographical context. (ESRI, 2022)

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HOW DOES GIS WORK?

Maps x Data x Analysis

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MAPS

Maps are the geographic container for the data layers and analytics you want to work with.

DATA

GIS integrates many different types of data layers using spatial location. Most data has a geographical component. GIS data includes images, features, and basemaps that are linked to spreadsheets and tables.

ANALYSIS

Spatial analysis allows you to evaluate, estimate and predict, interpret and understand, and much more in a correct and proficient manner, reinforcing your insight and decision-making from a new perspective.

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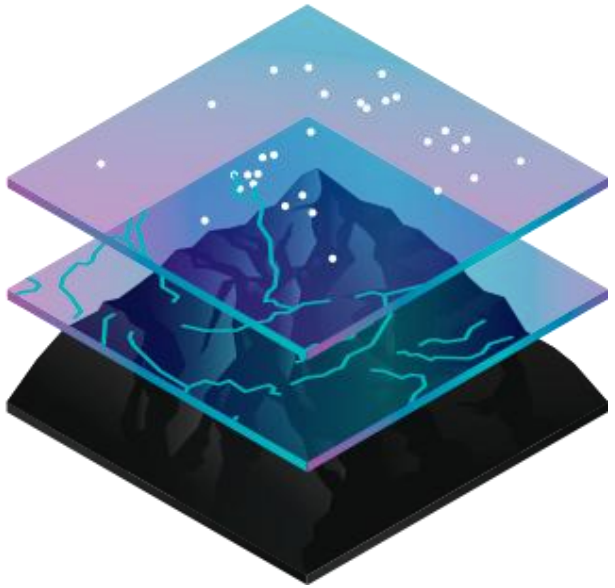
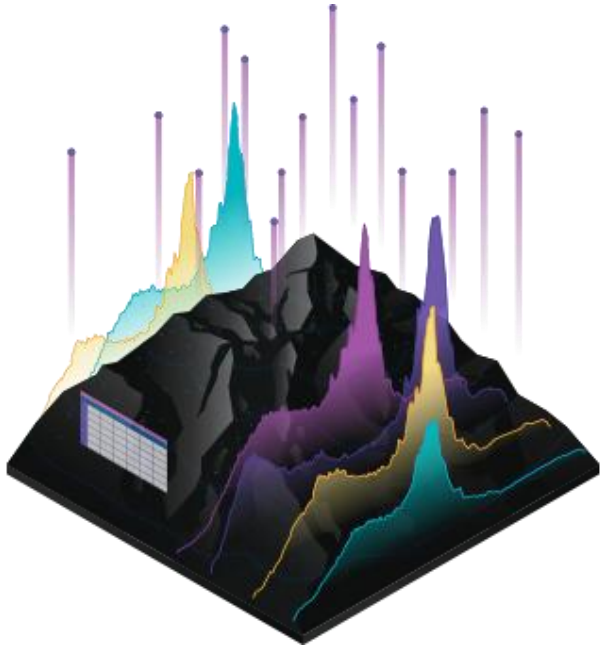
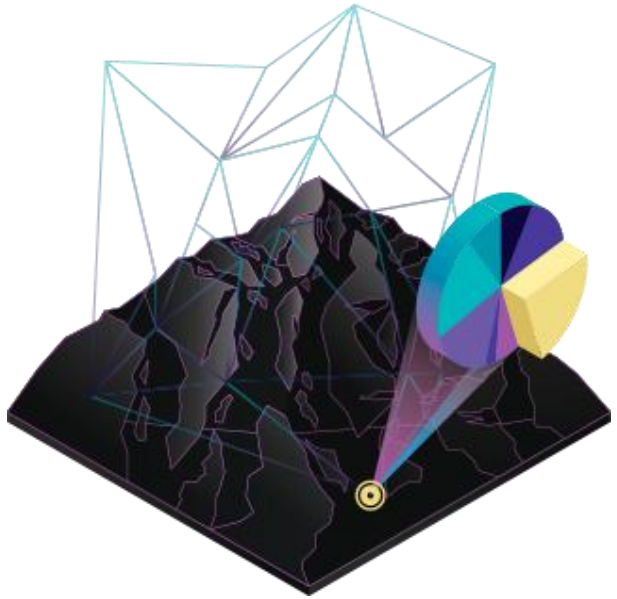
MAPS



DATA



ANALYSIS



Source: https://www.esri.com/en-us/what-is-gis/overview

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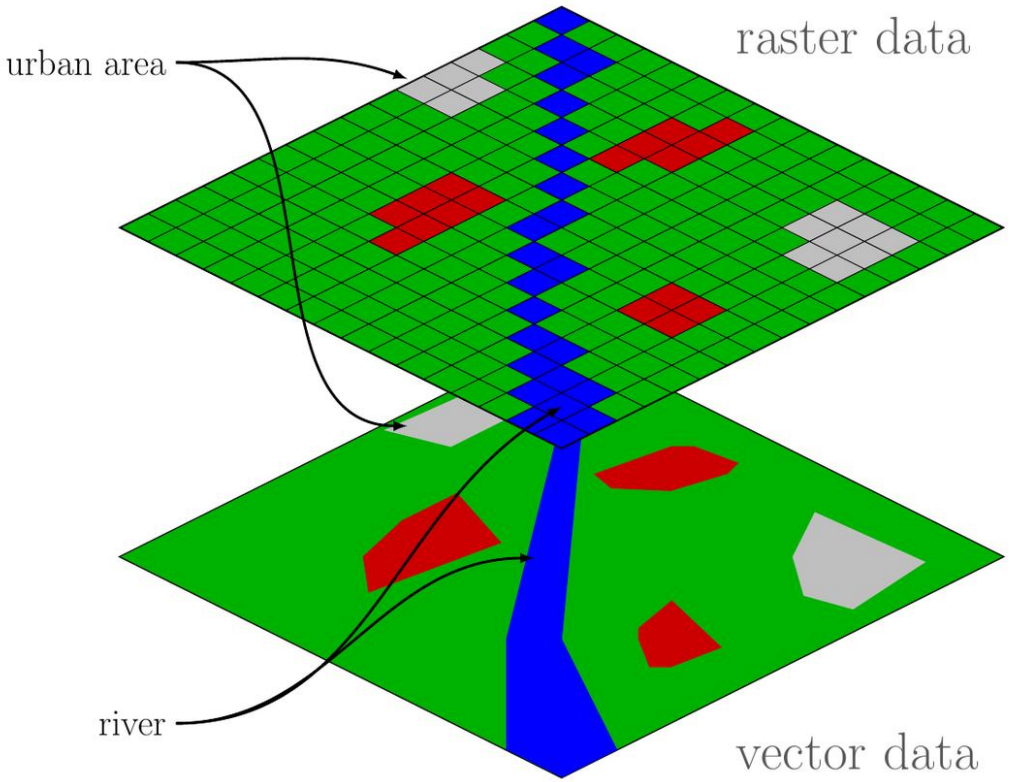
Storing data: 2 ways

Vector formats:
Accurate representation of reality

Raster formats:
Square cells represent reality



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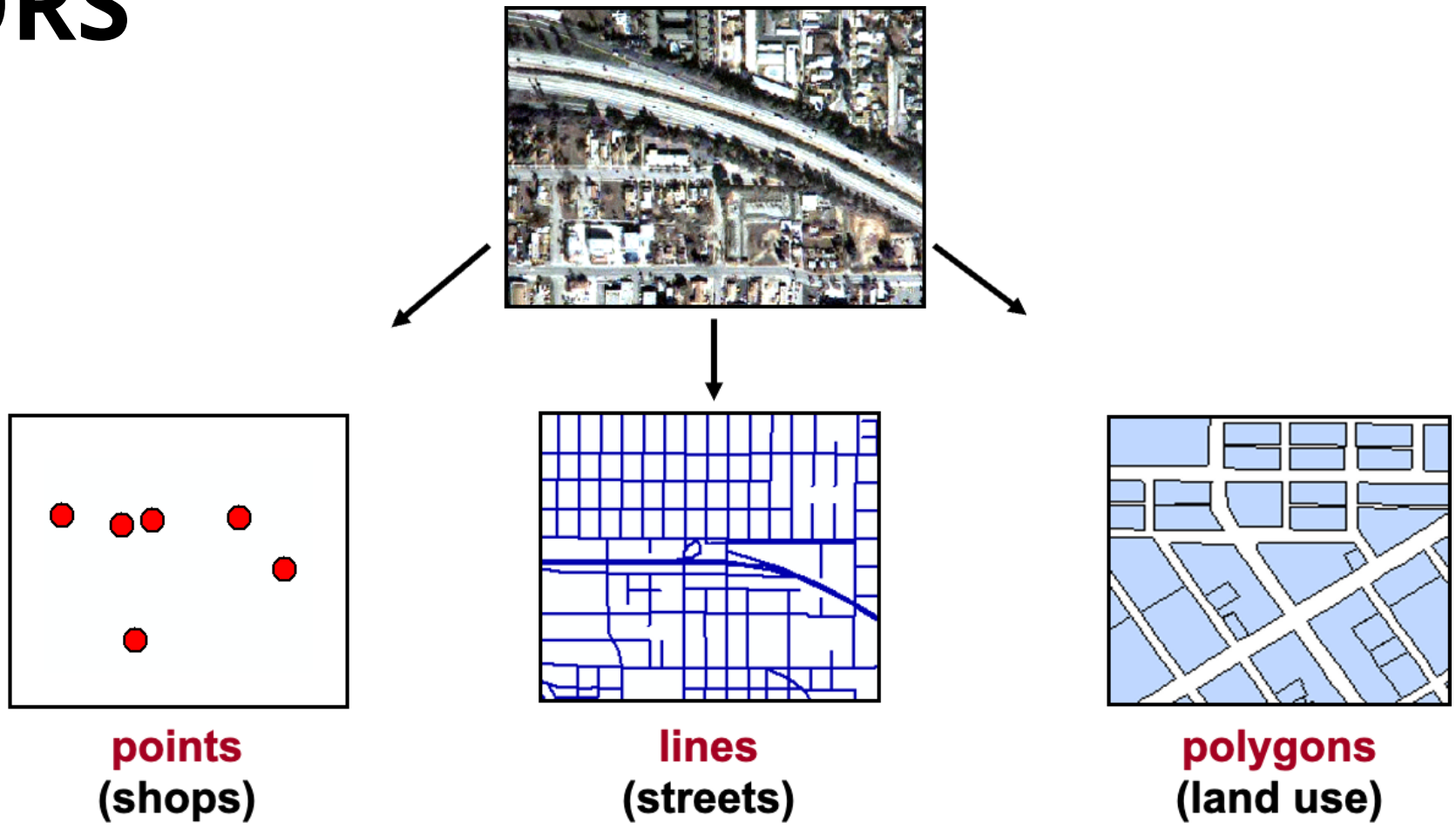
POINTS, LINES, AND POLYGONS IN VECTORS



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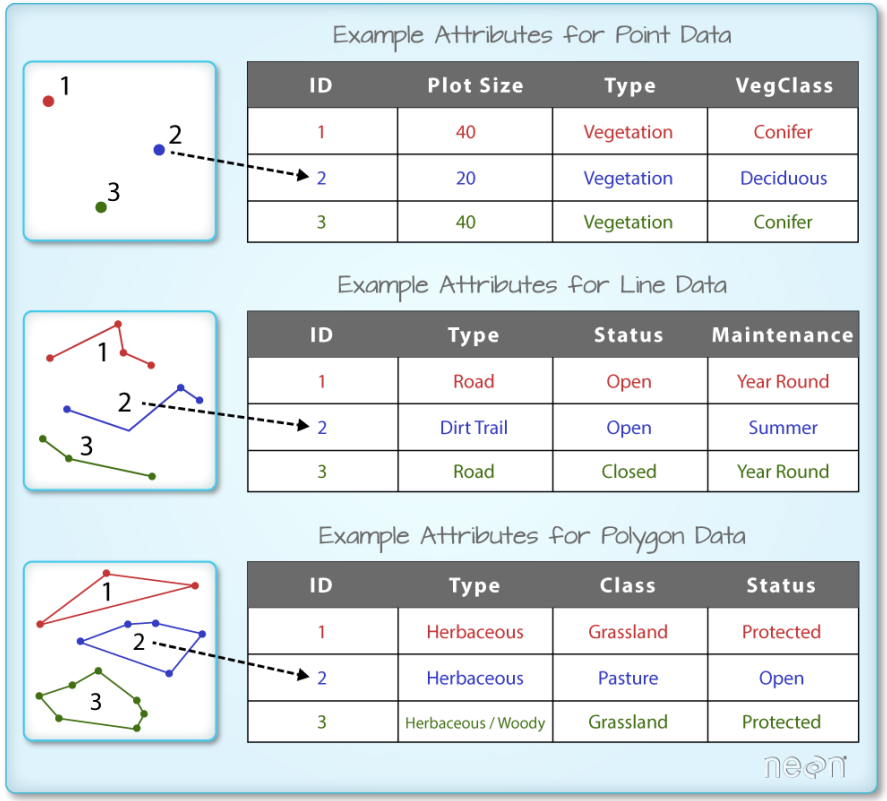
STORAGE OF DATA IN THE ATTRIBUTE TABLE

Neighborhoods

	BU_CODE	NE_NAME	WK_CODE	GM_CODE	MU_NAME	IND_WBI
1	BU07581000	Teteringen	WK075810	GM0758	Breda	
2	BU07580909	Buitengebied Pri...	WK075809	GM0758	Breda	
3	BU07581009	Buitengebied Te...	WK075810	GM0758	Breda	
4	BU07581008	Vuchtpolder	WK075810	GM0758	Breda	
5	BU07580800	Ulvenhout	WK075808	GM0758	Breda	
6	BU07580709	Buitengebied Ba...	WK075807	GM0758	Breda	
7	BU07580900	Prinsenbeek	WK075809	GM0758	Breda	
8	BU07580809	Buitengebied Ul...	WK075808	GM0758	Breda	
9	BU07580609	Hagebeemd	WK075806	GM0758	Breda	
10	BU07580607	Emer	WK075806	GM0758	Breda	
11	BU07580701	Nieuw Wolfslaar	WK075807	GM0758	Breda	
12	BU07580700	Bavel	WK075807	GM0758	Breda	
13	BU07580604	Heksenwiel	WK075806	GM0758	Breda	
14	BU07580603	Muizenberg	WK075806	GM0758	Breda	
15	BU07580606	Kroeten	WK075806	GM0758	Breda	
16	BU07580605	Overkroeten	WK075806	GM0758	Breda	



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EXAMPLE OF AN ATTRIBUTE

Number of inhabitants, number of man, number of woman, etc.

	NE_NAME	NUMB_INH	NUMB_MAN	NUMB_WOMAN	P_00_14_YR	P_15_24_YR	P_25_44_YR	P_45_64_YR	P_65_AO_YR
1	Valkenberg	1960	960	1000	5	26	32	19	18
2	Chassé	3225	1635	1590	8	15	31	23	23
3	Fellenoord	1590	785	800	10	21	38	21	10
4	Schorsmolen	3400	1755	1645	3	24	42	16	14
5	Station	2300	1200	1100	8	21	49	16	6
6	City	2480	1320	1160	3	33	39	17	9
7	Belcrum	3990	1980	2005	20	13	34	23	10
8	Doornbos-Linie	4365	2255	2105	14	17	35	22	13
9	Biesdonk	5075	2405	2665	17	13	26	24	19
10	Geeren-Zuid	3750	1790	1960	18	13	29	22	18
11	Wisselaar	4210	2050	2160	17	13	25	26	18
12	Krogten	185	100	85	9	15	20	40	16
13	Geeren-Noord	2740	1350	1390	18	11	27	25	19
14	Waterdonken	1225	600	625	31	5	47	14	3
15	Brabantpark	10095	4750	5345	13	19	29	22	17

WHERE CAN YOU FIND THIS KIND OF DATA?

Centraal Bureau voor de Statistiek

eurostat

opernicus
Europe's eyes on Earth

pdok

Open Street Map

GEOFABRIK

Klimaateffectatlas

Planbureau voor de Leefomgeving

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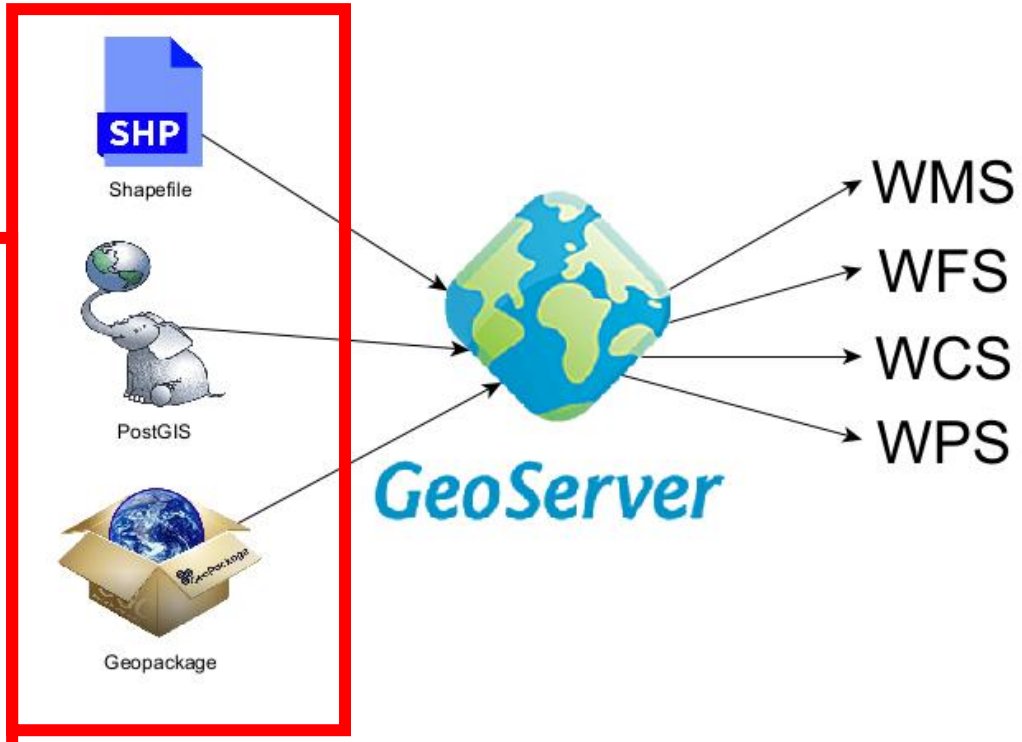
WHAT KIND OF FILE FORMAT SHOULD YOU PAY ATTENTION TO?

WMS:
The WMS (Web Mapping Service) is an image to look at.

WFS:
The WFS (Web Feature Service) is to download the data or parts of it, after which further processing can be done on it.

GeoJSON:
GeoJSON is a JSON-based format designed to represent the geographical features with their non-spatial features.



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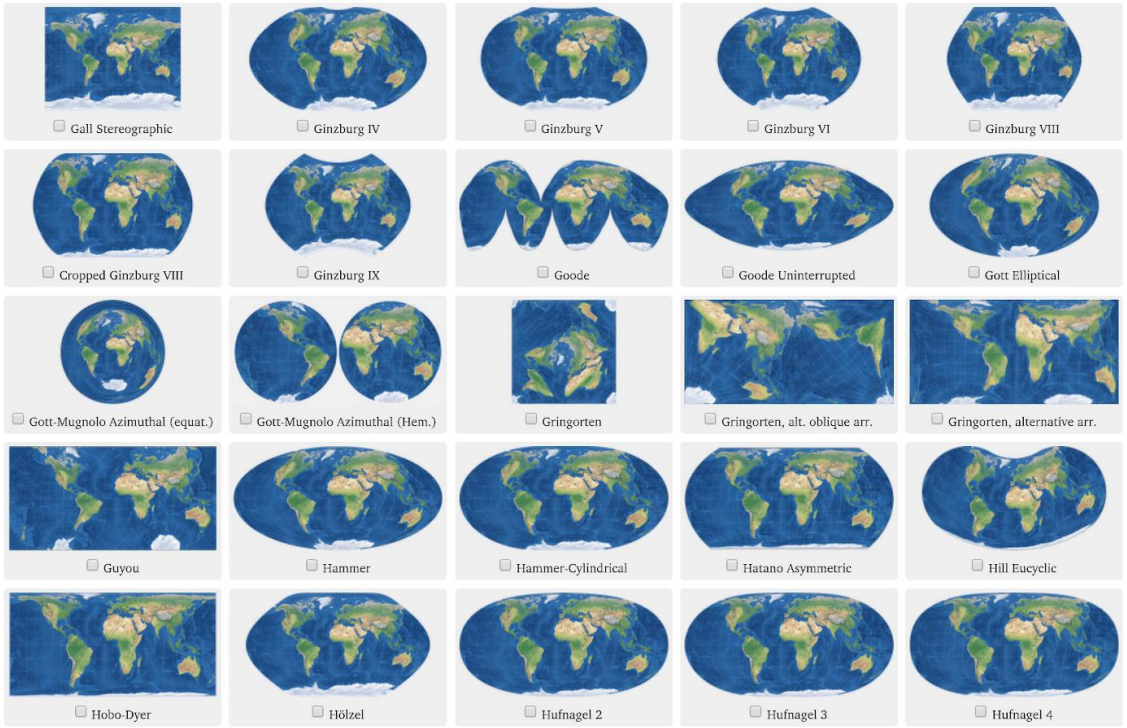
COORDINATE REFERENCE SYSTEM (CRS)

PROJECTIONS THAT HELP TO **VISUALIZE AND DESCRIBE REALITY.**



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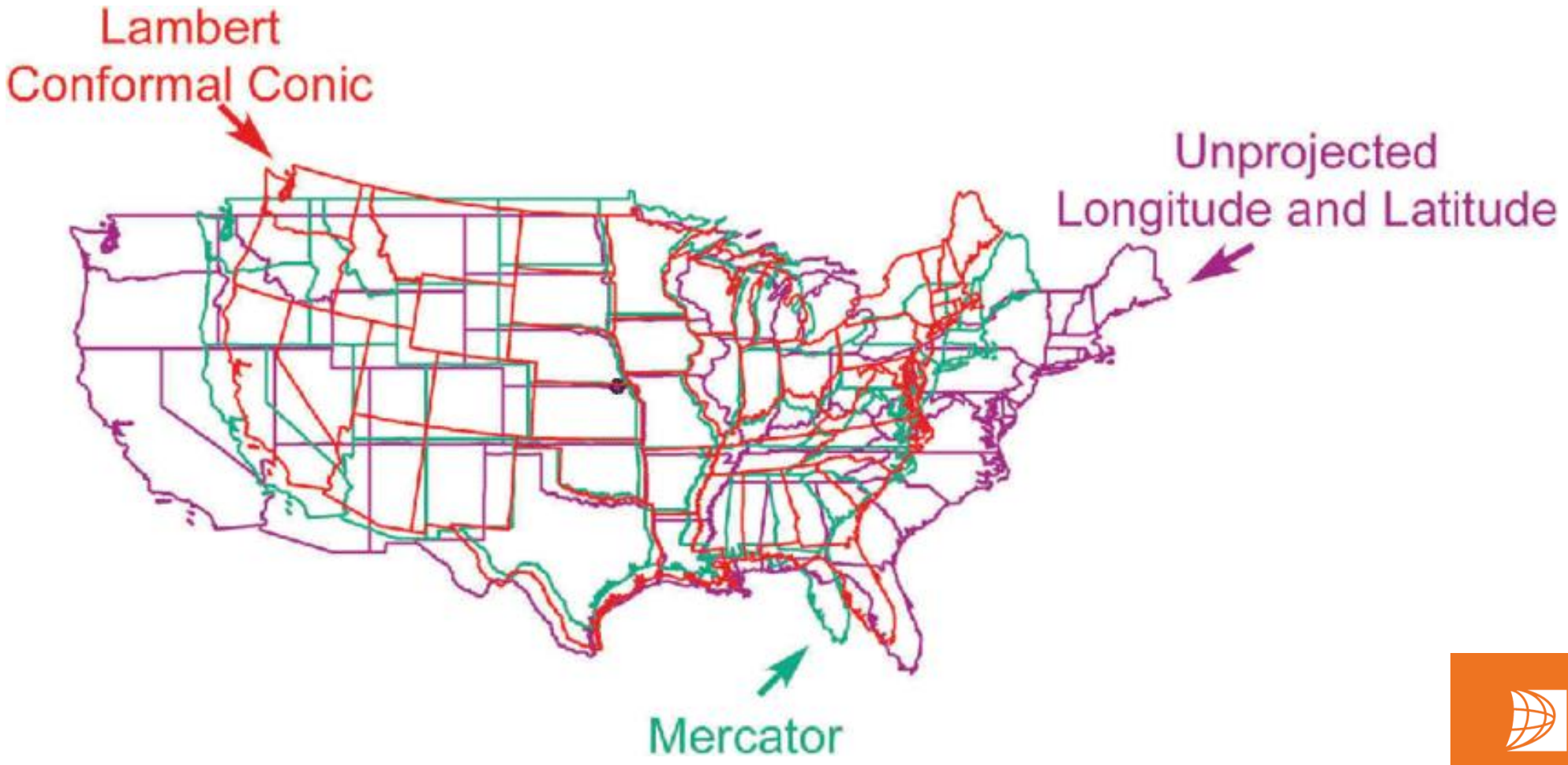
"Practice safe geography: always use a projection"



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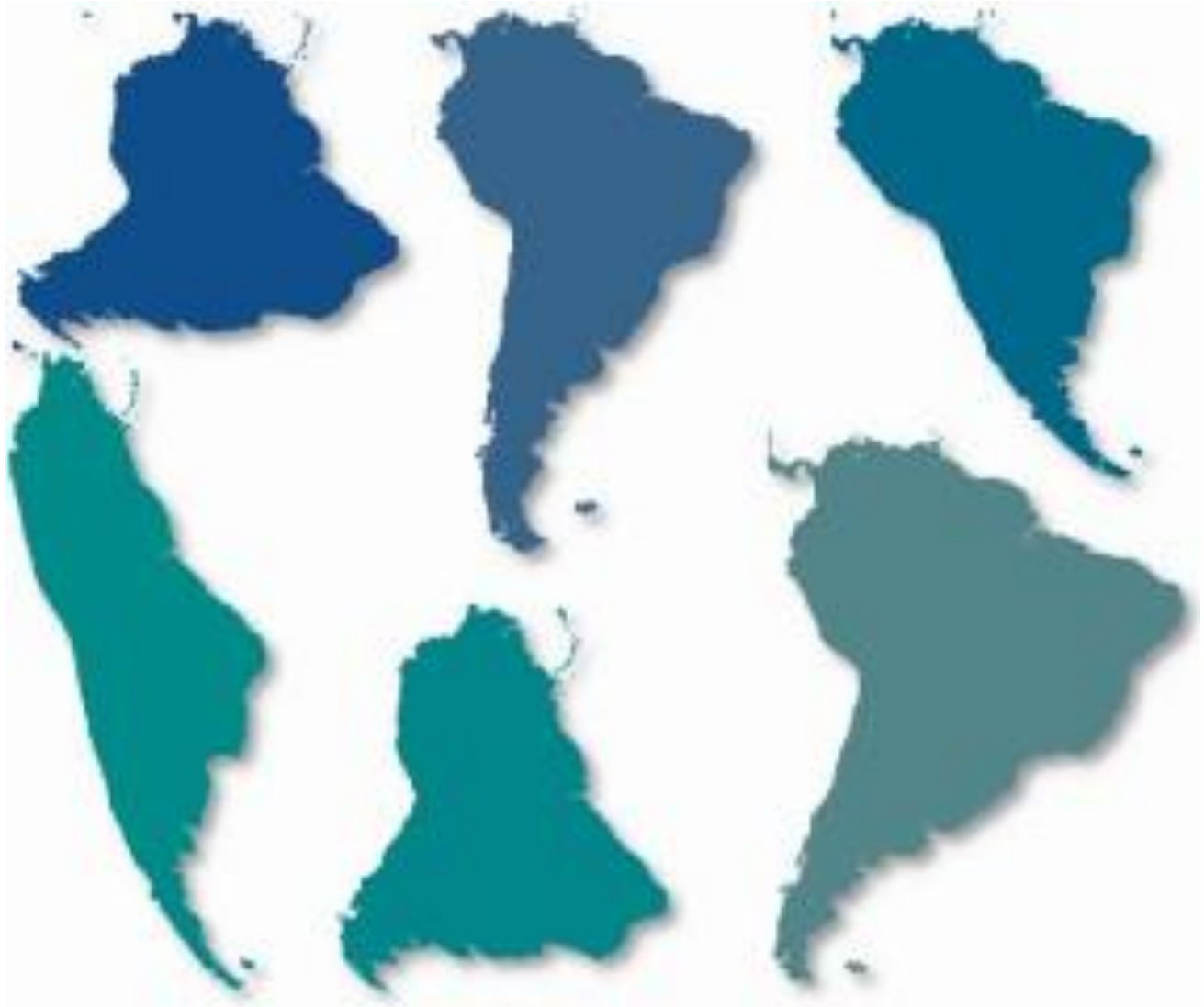

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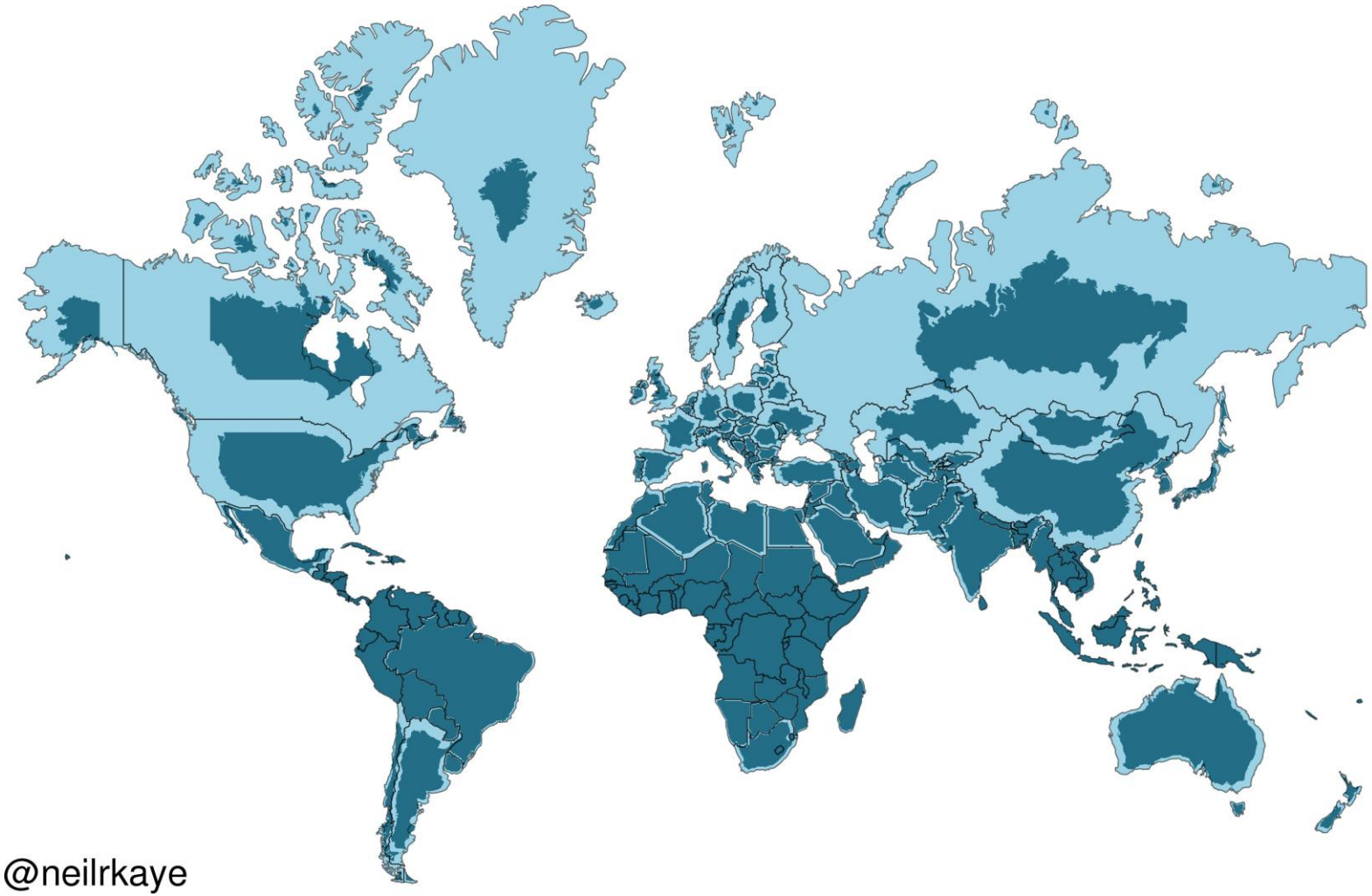
World Mercator projection with true country size added



@neilrkaye

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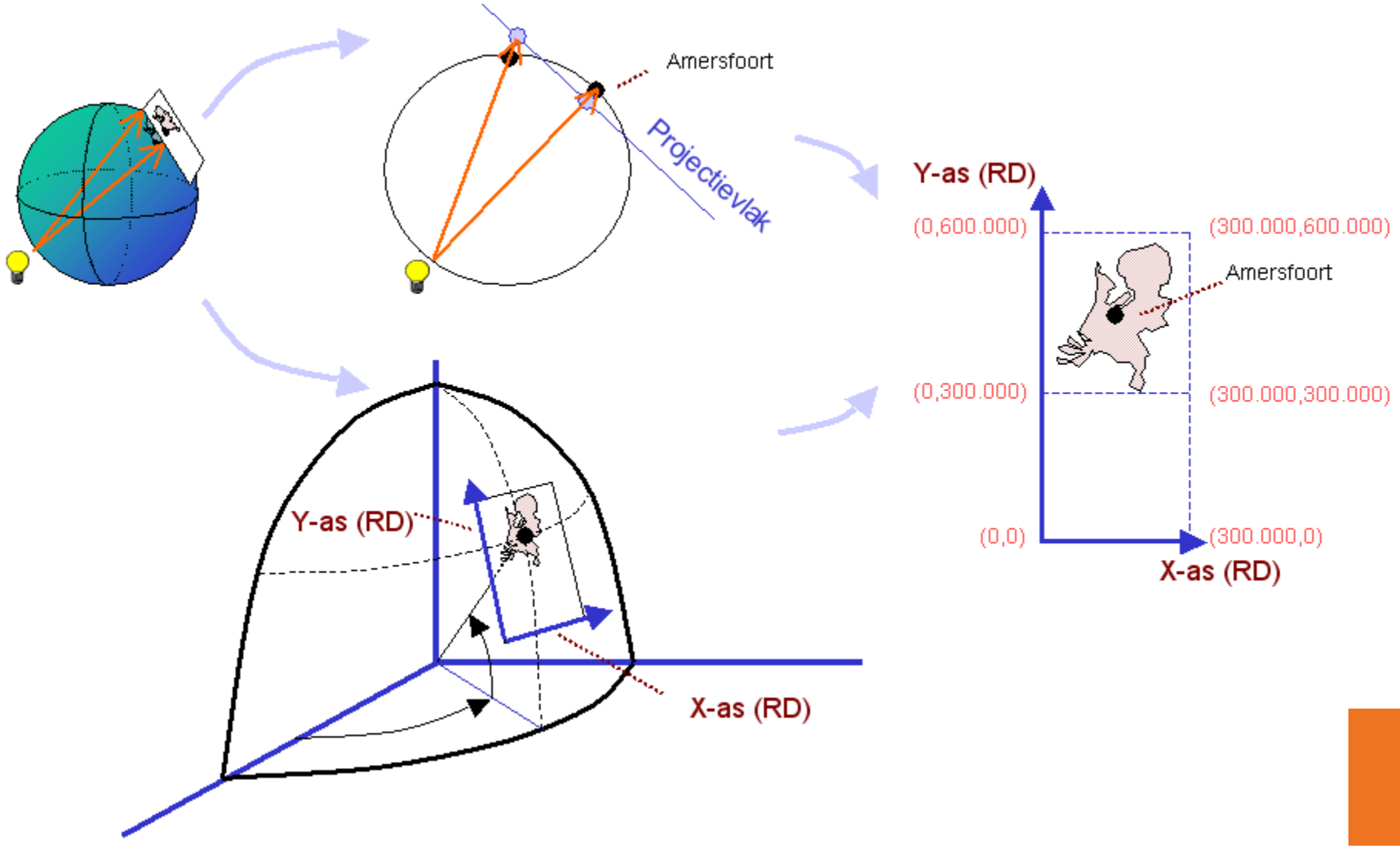
NIEUW NEDERLANDS COÖRDINATENSTELSEL:
AMERSFOORT RD NIEUW - EPSG 28992



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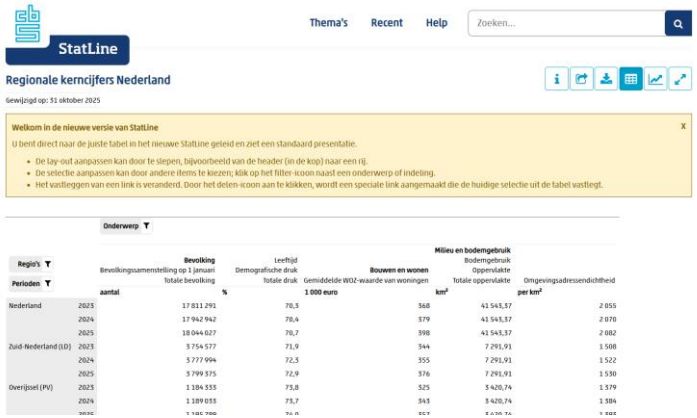
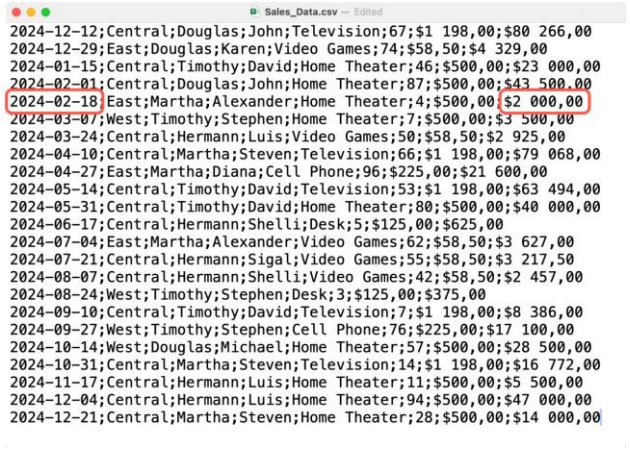
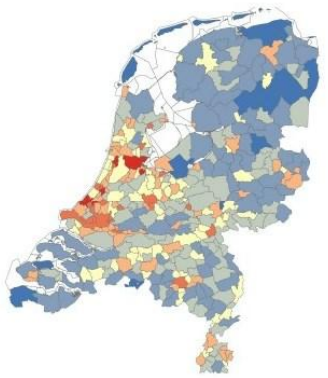
JOINING DATA







[12.4. Connecting and Editing Data Across Layers — QGIS Documentation documentation]

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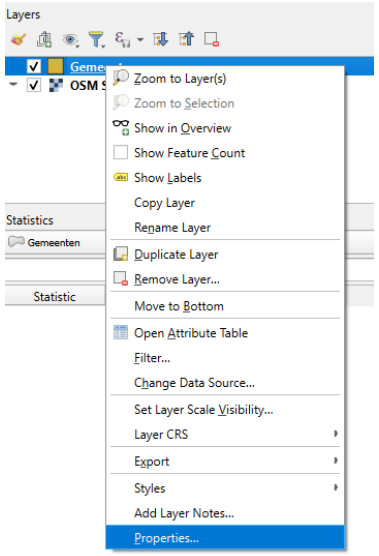
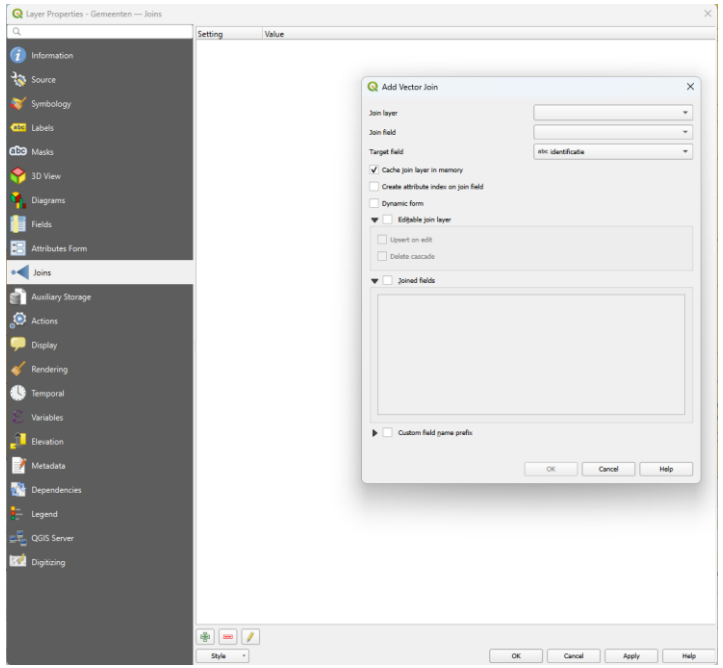
JOINING DATA

1. Go to the layer **Properties ▶** **Joins** tab
2. Click the Add new join button. The **Add vector join** dialog appears.
3. Select the **Join layer** you want to connect with the target vector layer
4. Specify the **Join field** (from the `join layer`) and the **Target field** (from the `target layer`). These are the fields that are used to find matching feature in both layers hence they should have values in common.
5. Press **OK** and a summary of selected parameters is added to the **Join** panel.





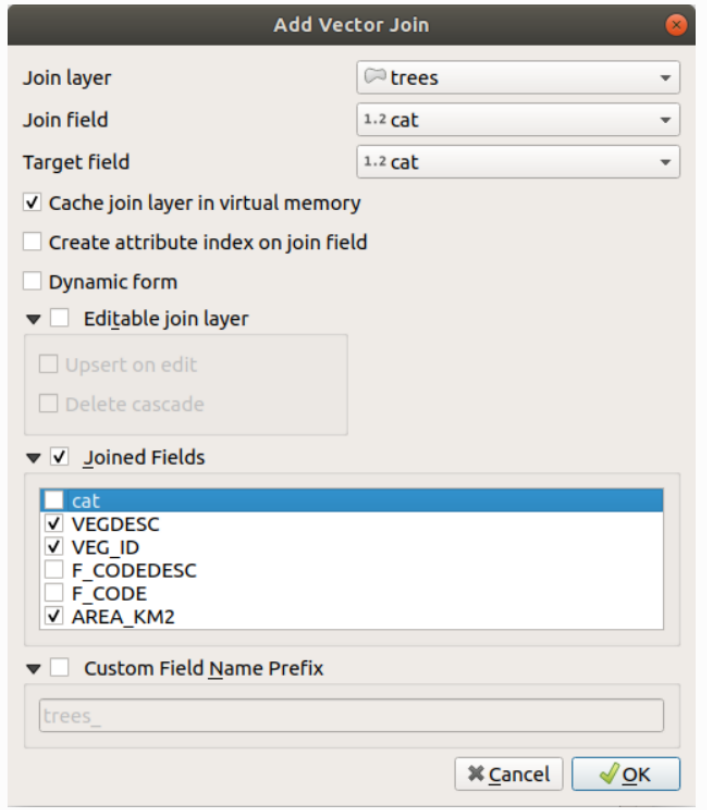


Fig. 12.105 *Join an attribute table to an existing vector layer*

[12.4. Connecting and Editing Data Across Layers — QGIS Documentation documentation]

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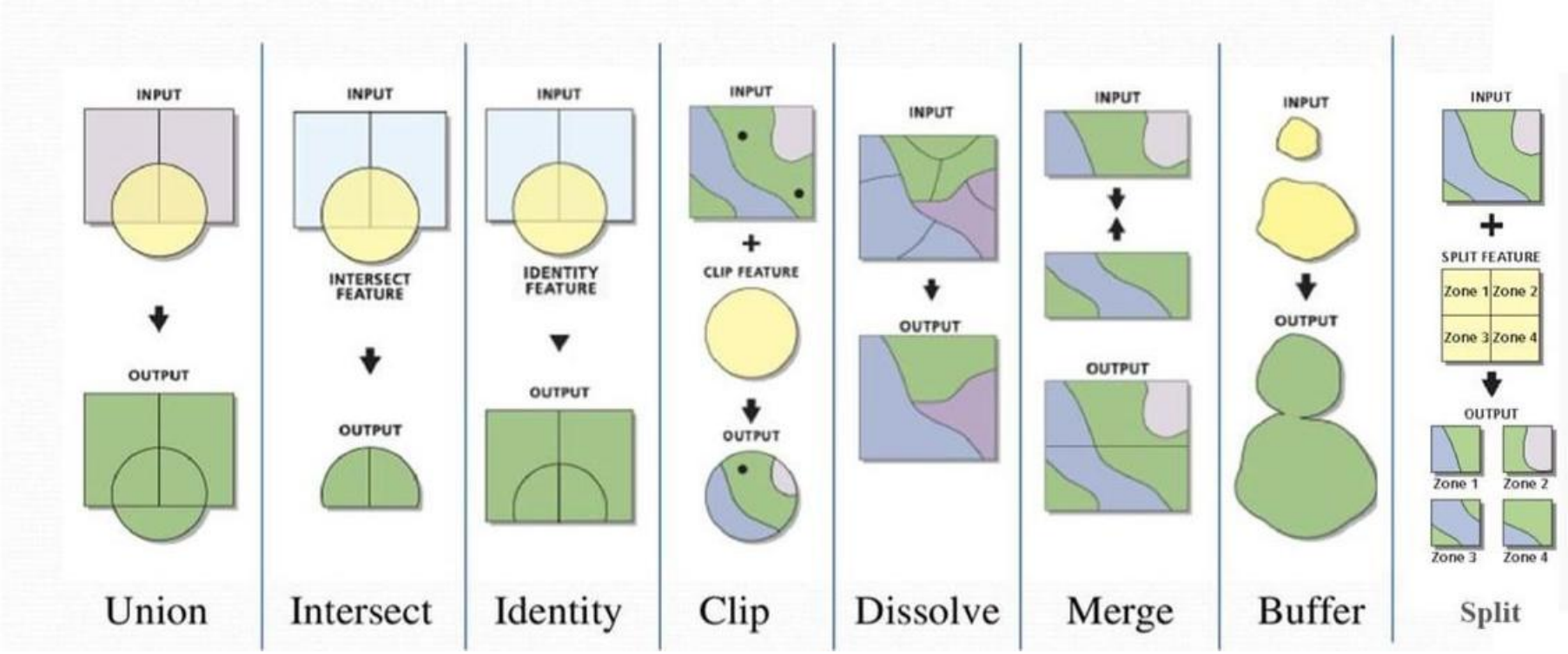
IMPORTANT CONSIDERATIONS JOINING DATA

- **Check matching values** - Ensure values to be joined match exactly in both datasets (e.g., "Amsterdam" in both, not "Amsterdam" vs "A'dam")
- **Watch for spaces in cells** - Remove leading/trailing spaces in CSV files, these are often invisible but disrupt the join
- **Case sensitivity** - Check that values are consistent in capitalization ("Nederland" vs "nederland" won't match)
- **Data type consistency** - Ensure join fields have the same data type. For example:
  - Postal code "1234AB" (text) vs 1234 (numeric)
  - Municipality code "GM0263" (text) vs 263 (numeric)
  - Province code "PV25" (text) vs 25 (numeric)
  - CBS code "GM0263" (text) vs "0263" (text)Pay special attention to codes starting with zeros!
- **Empty values and NULL** - Check how empty cells are handled; NULL is not the same as an empty string ""
- **Special characters** - Watch for accents, umlauts and other diacritical marks (é, ë, ñ) that may be encoded differently
- **Encoding issues** - Preferably use UTF-8 encoding for both files to prevent character problems
- **Duplicates in join field** - Check for duplicate values in the join field, this can produce unexpected results
- **Preview join results** - Always verify how many records successfully joined and investigate non-matched records

GEOPROCESSING



28.2.7. Vector geoprocessing — QGIS Documentation documentatie

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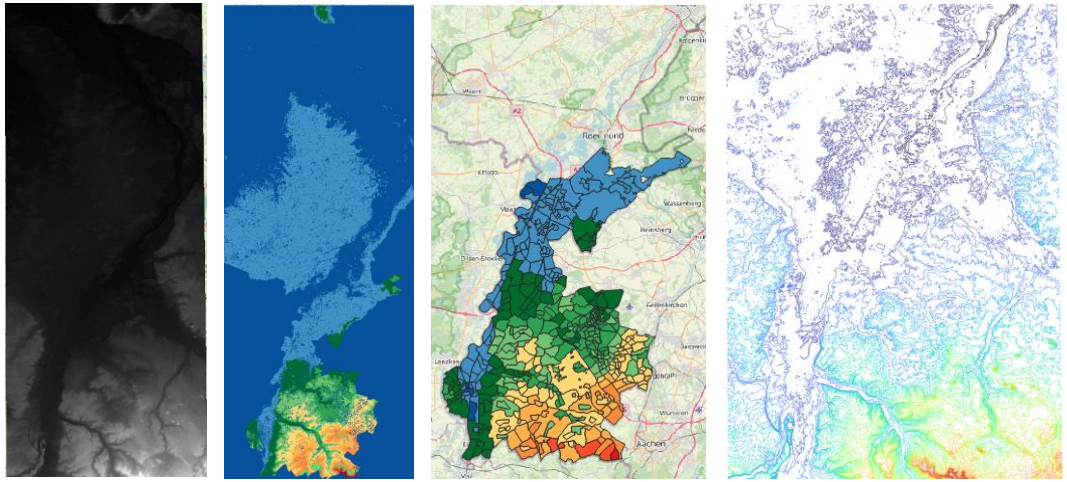
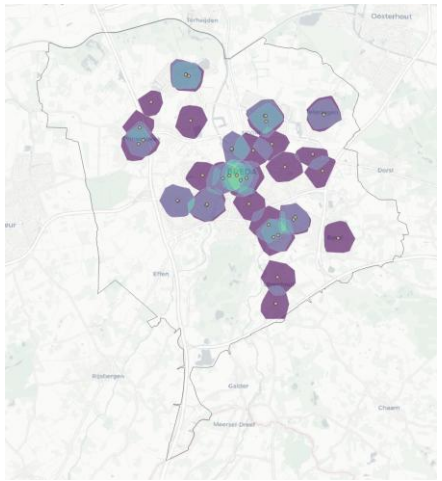
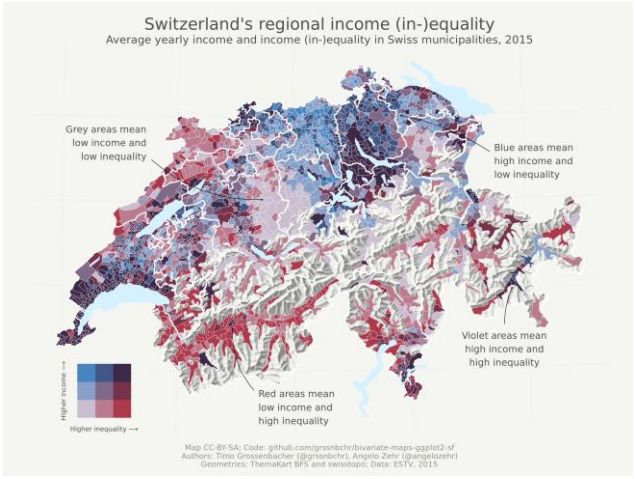
A FEW EXAMPLES OF WHAT THE STUDENTS LEARN



Analyse elevation map



Service area



Bivariate map

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Plugins

- OpenTopography DEM Downloader → Digital Elevation Model
- PDOK SERVICES PLUGIN → Largest data collection repository in the netherlands
- QUICKOSM→ Open Source data collection Open Street Map
- QUICKMAPSERVICES - Basic background maps

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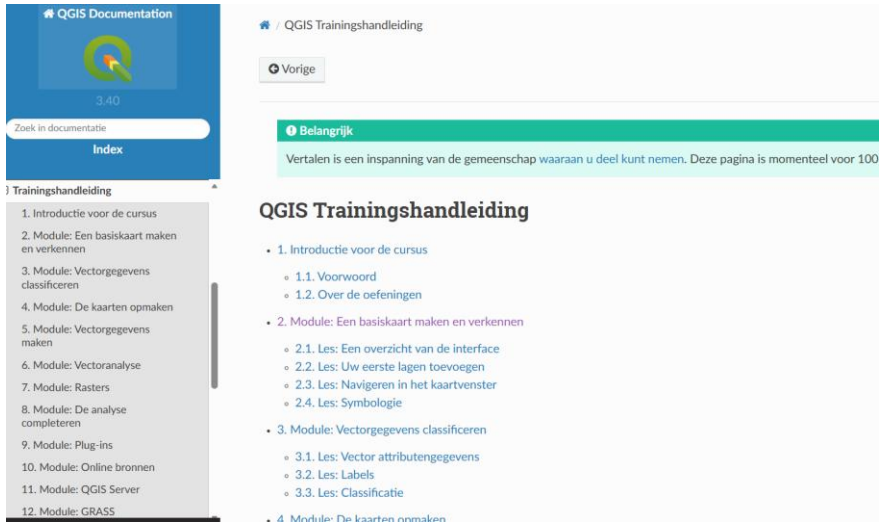
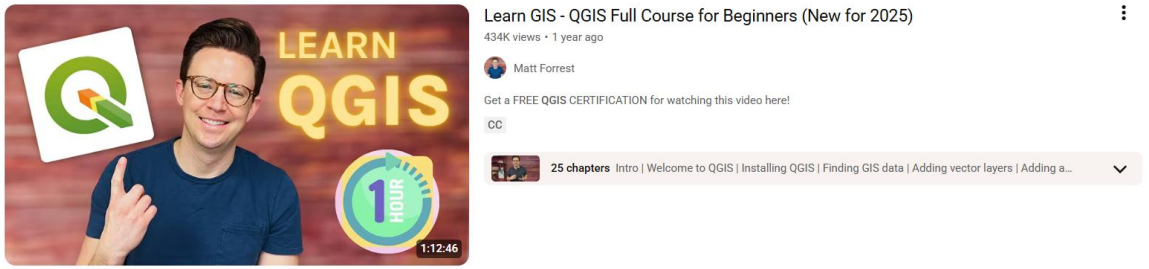
BACKGROUND INFORMATION



https://docs.qgis.org/3.40/nl/docs/training_manual/index.html



Learn GIS - QGIS Full Course for Beginners (New for 2025)

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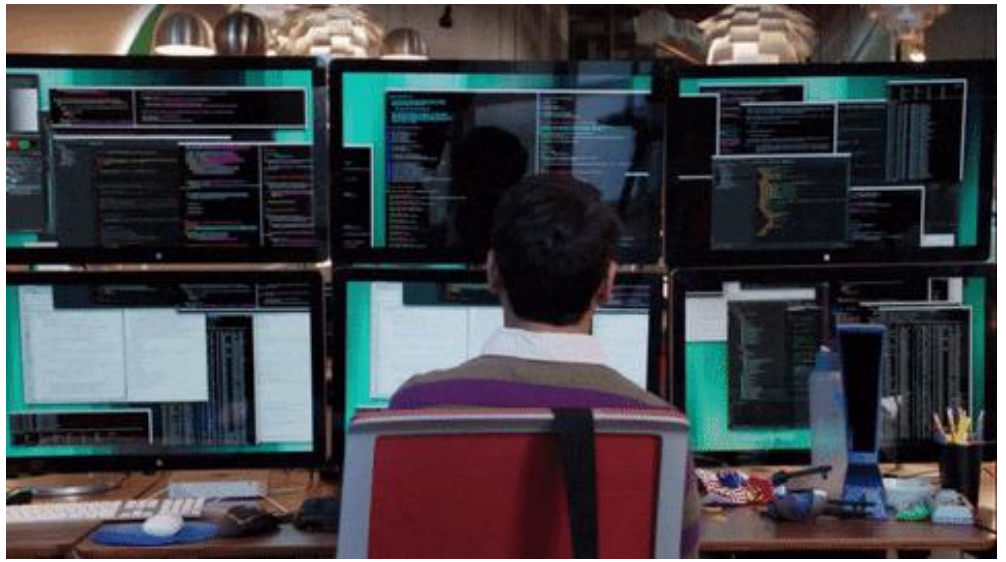
WATCHING TUTORIALS

LEARNING BY DOING



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QGIS Quick Manual

Basic GIS Training

This manual summarizes everything we practiced during the training:

- Adding PDOK Services
- Using QuickMapServices
- Selecting the correct CRS for the Netherlands
- Adding municipality (gemeente) boundaries
- Creating a map of Amsterdam with layout elements (legend, scale bar, north arrow)
- Exporting to PDF

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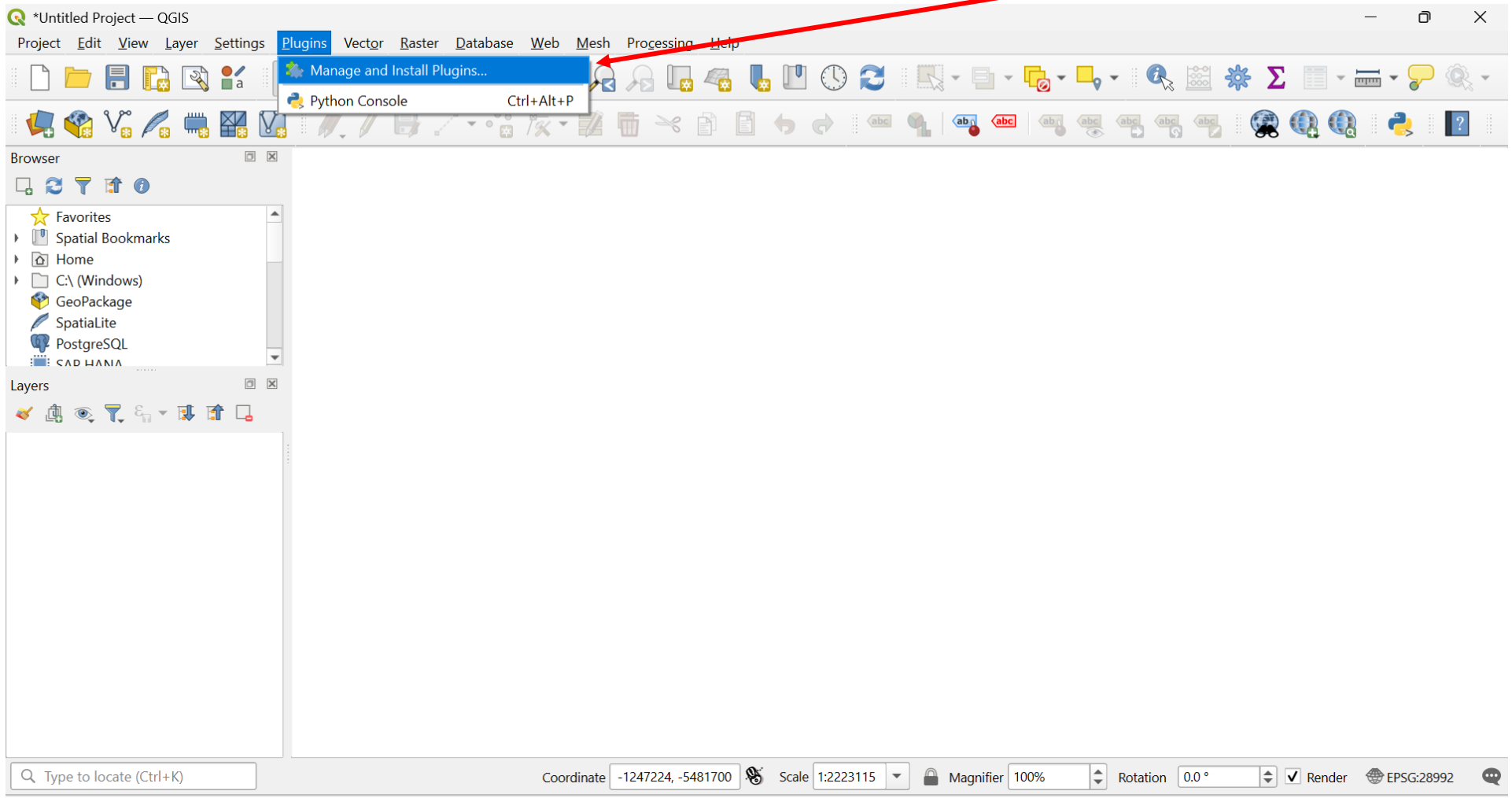
QGIS Quick Manual

Basic GIS Training

1. Add PDOK Services Plugin

In QGIS top menu → Plugins → Manage and Install Plugins



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Basic GIS Training

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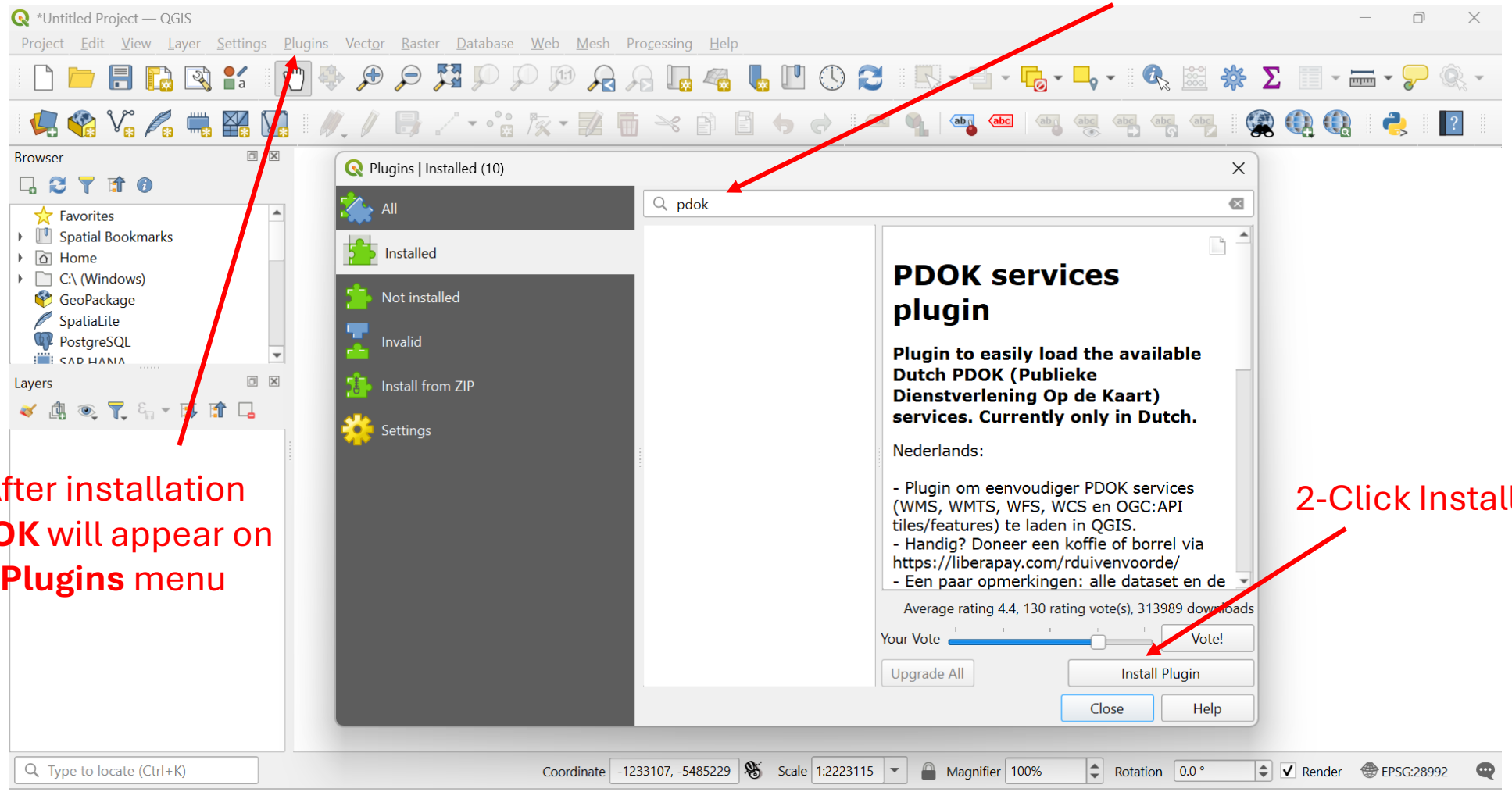

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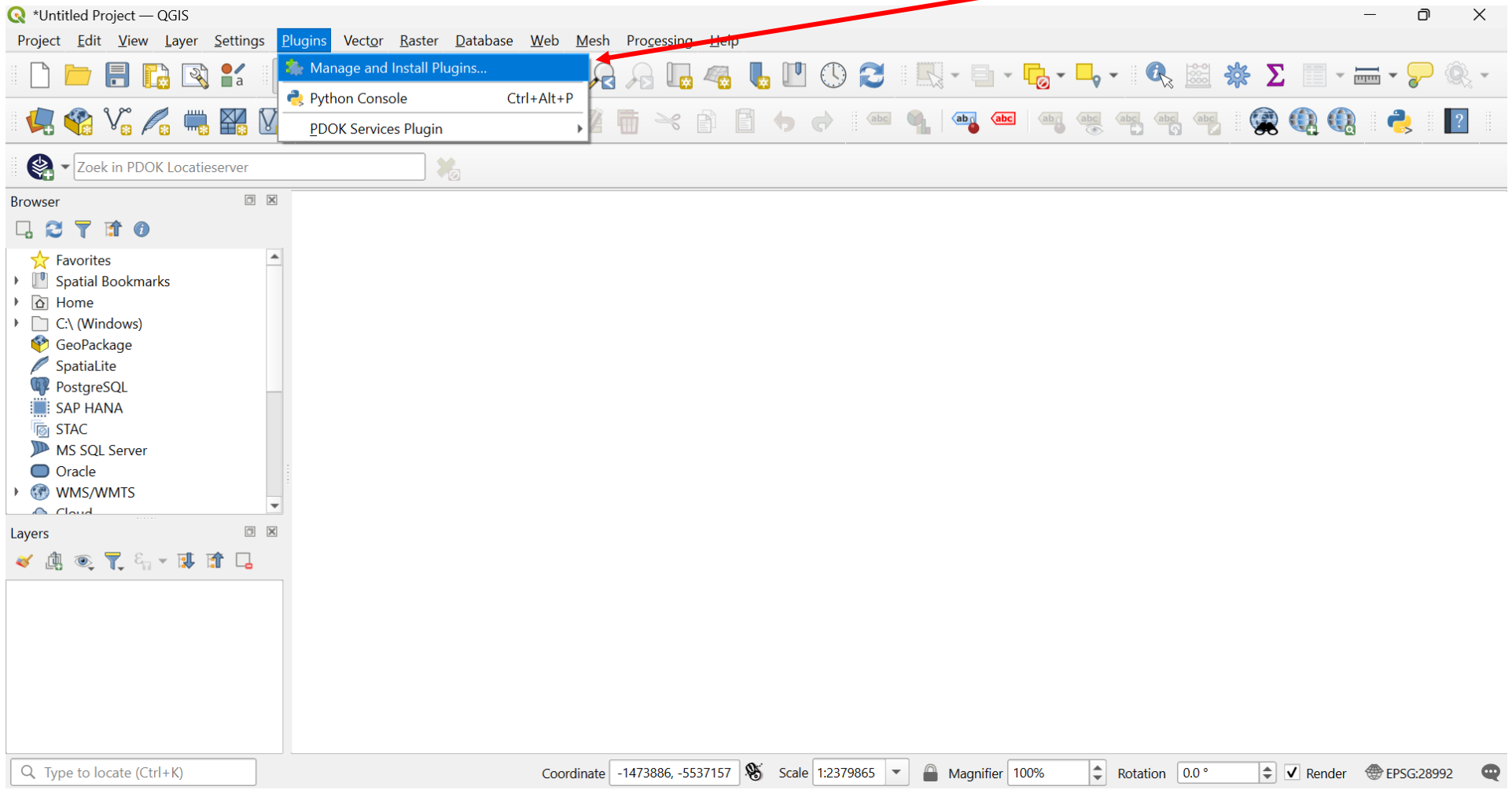
Basic GIS Training

2. Add Base Maps Using QuickMapServices

Plugins → Manage and Install Plugins



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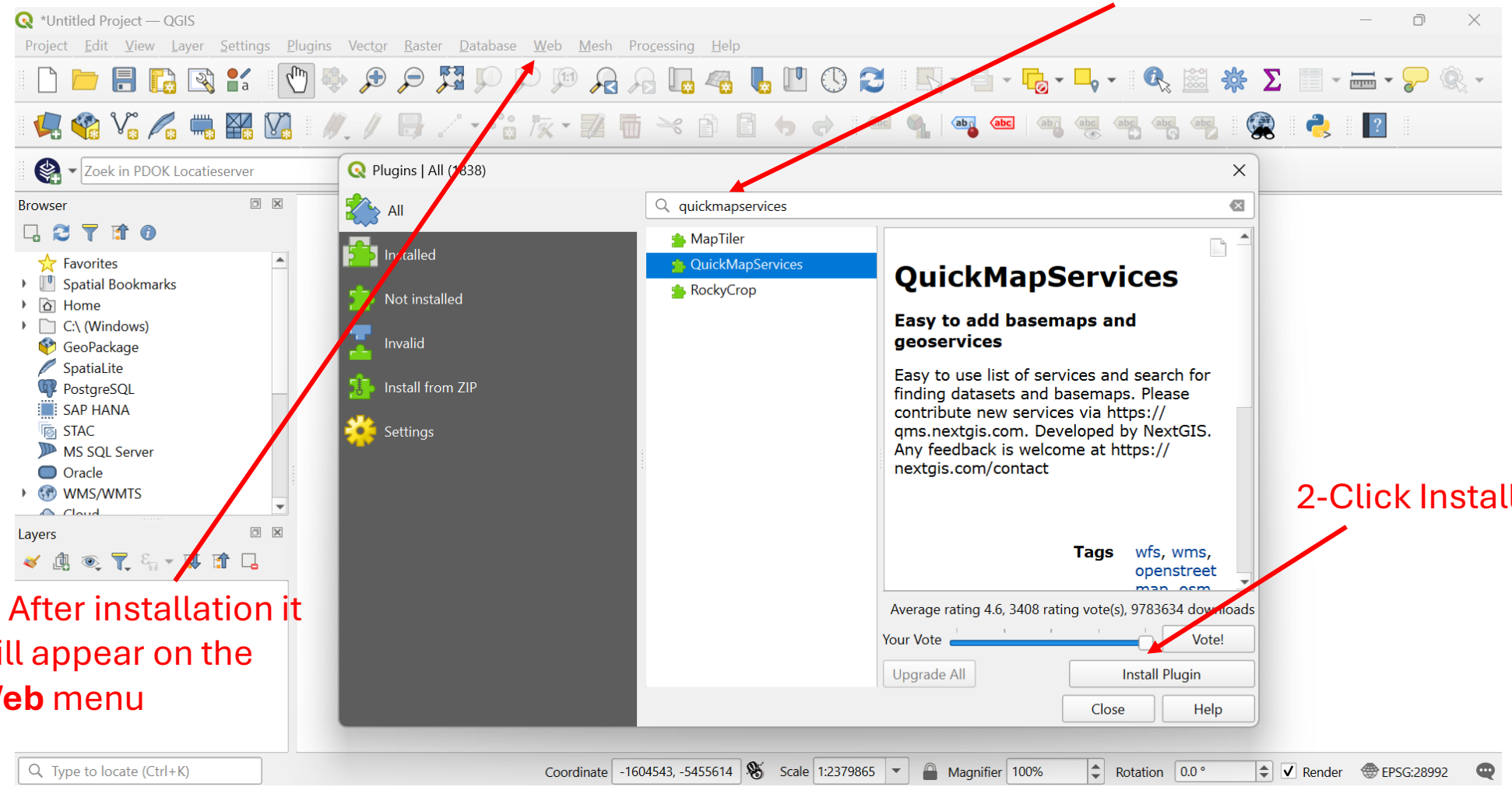

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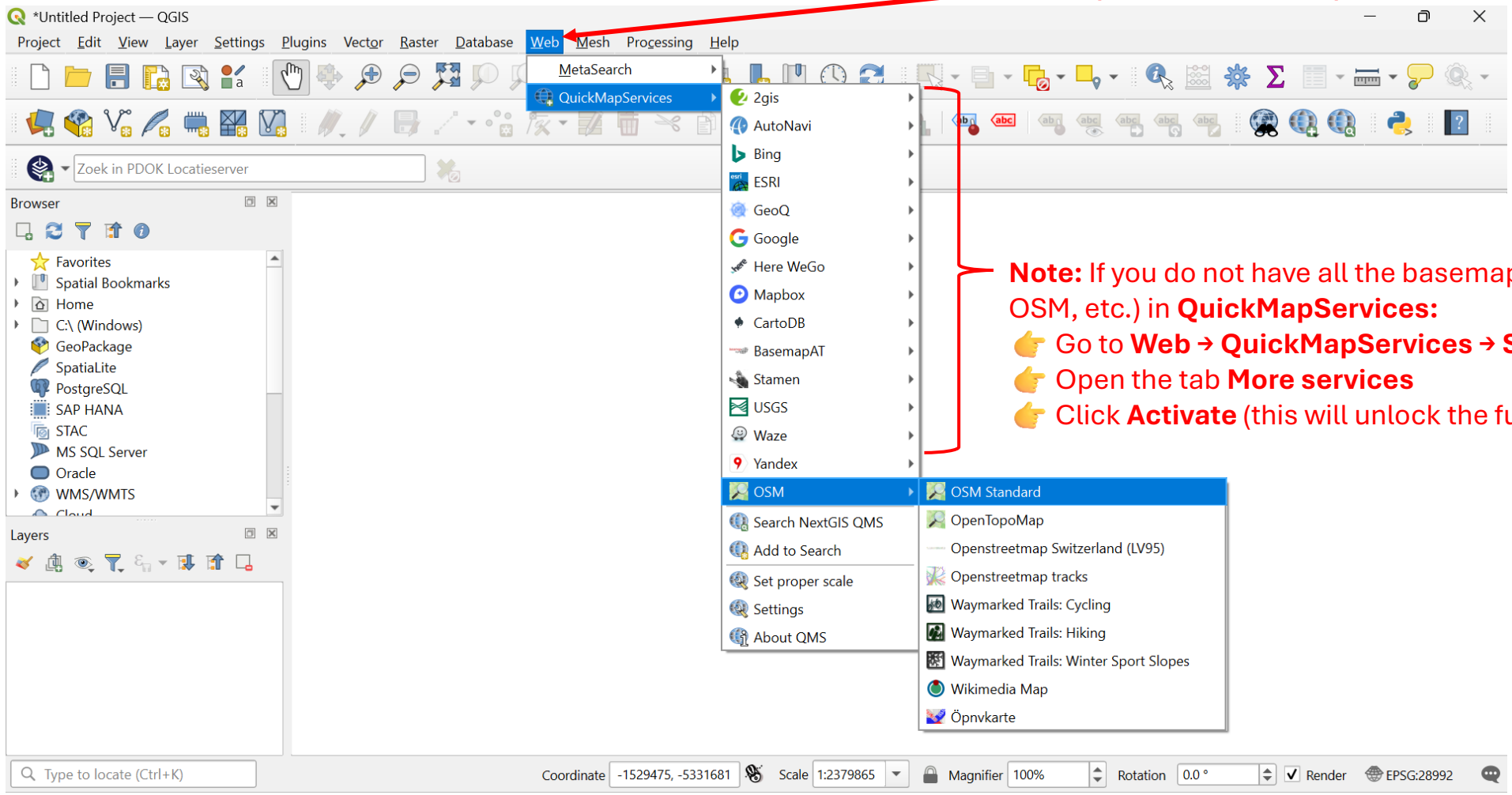
Basic GIS Training

3. Add Base Maps Using QuickMapServices

Then go to Web → QuickMapServices and pick a basemap:→ OSM Standard etc.



Note: If you do not have all the basemap options (Google, ESRI, OSM, etc.) in **QuickMapServices:**

👉 Go to **Web → QuickMapServices → Settings**

👉 Open the tab **More services**

👉 Click **Activate** (this will unlock the full list of services)

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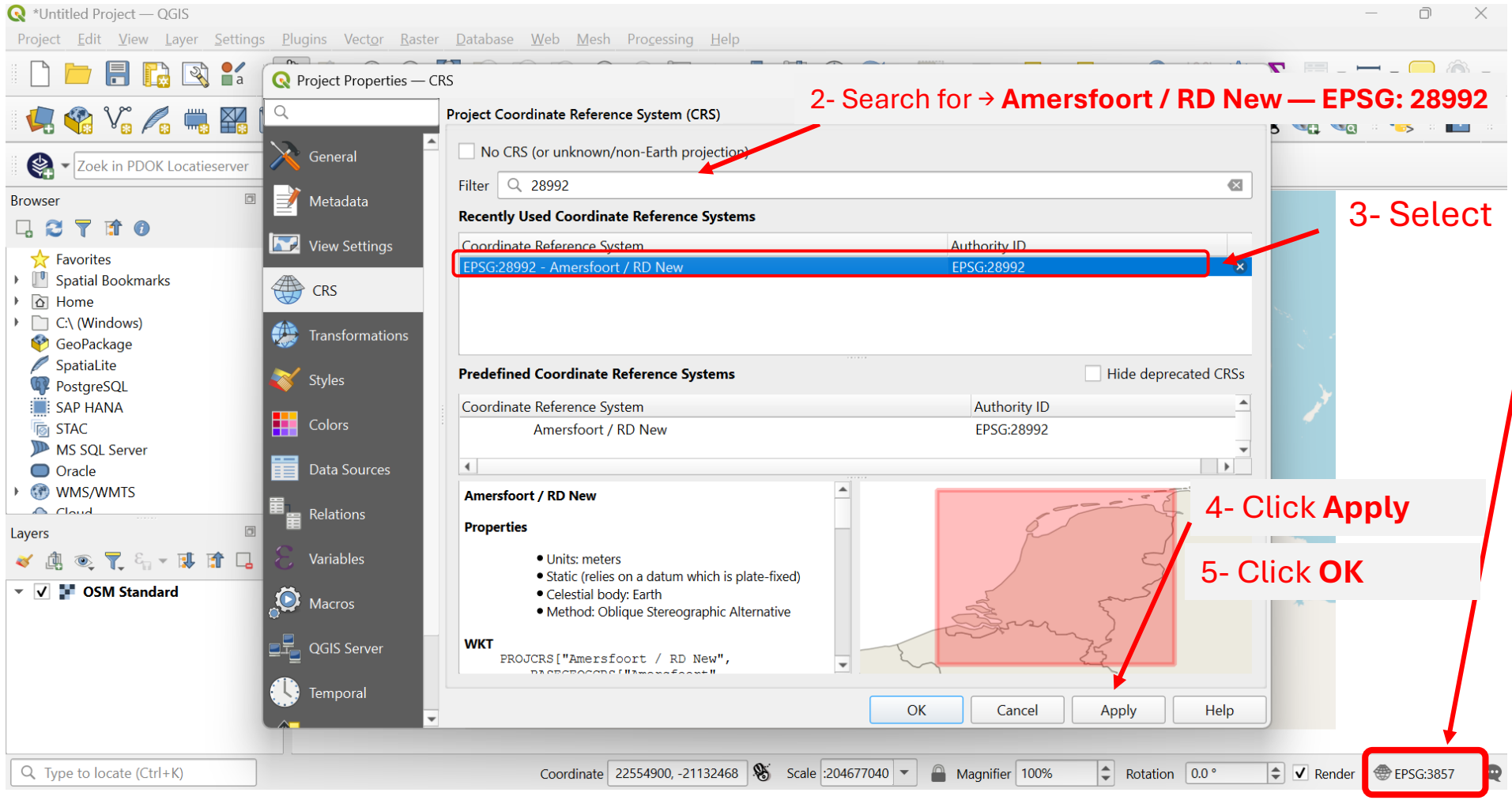
Basic GIS Training

3. Set the Correct CRS for the Netherlands



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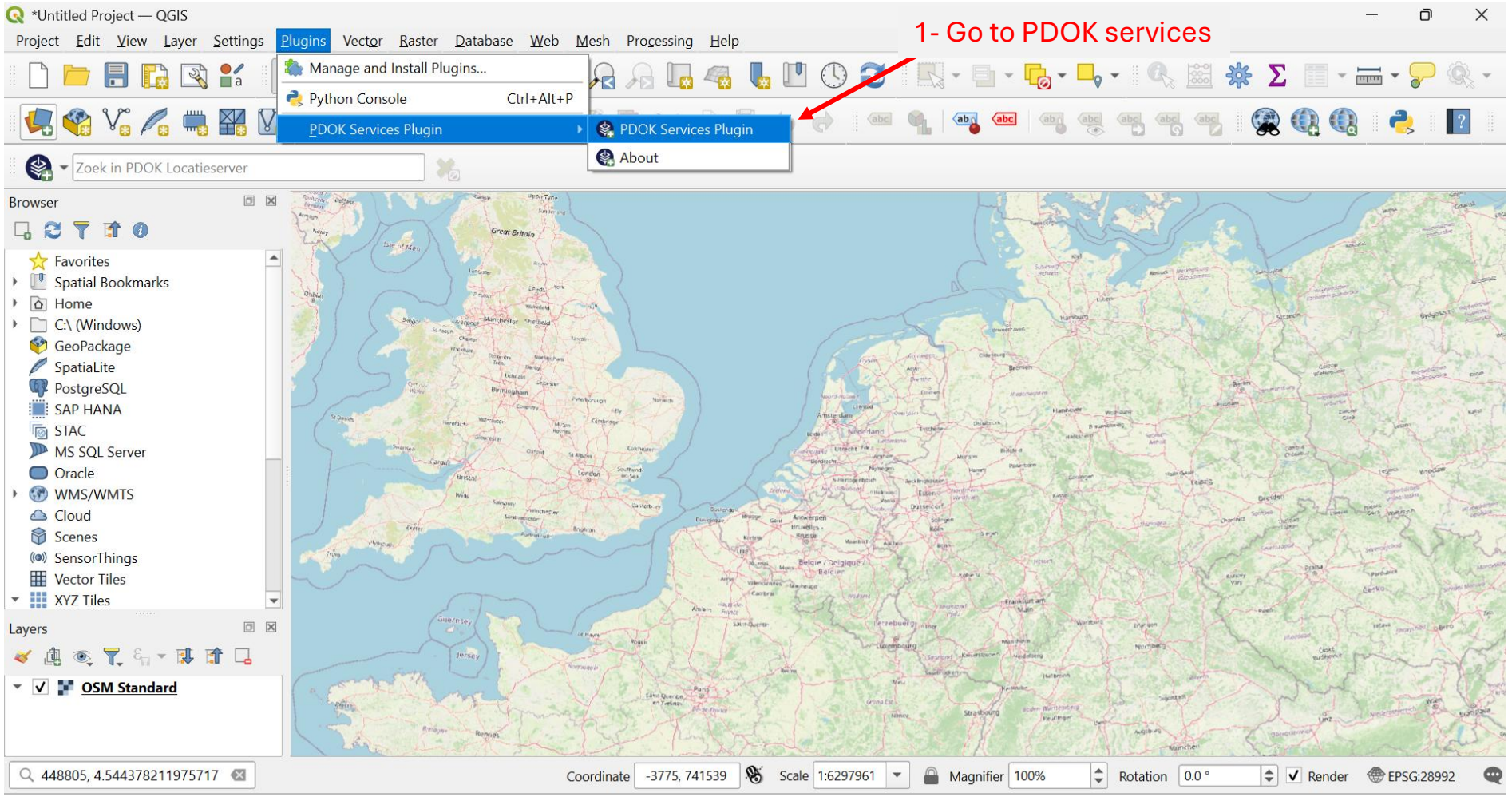
Basic GIS Training

4. Add the municipality boundaries layer



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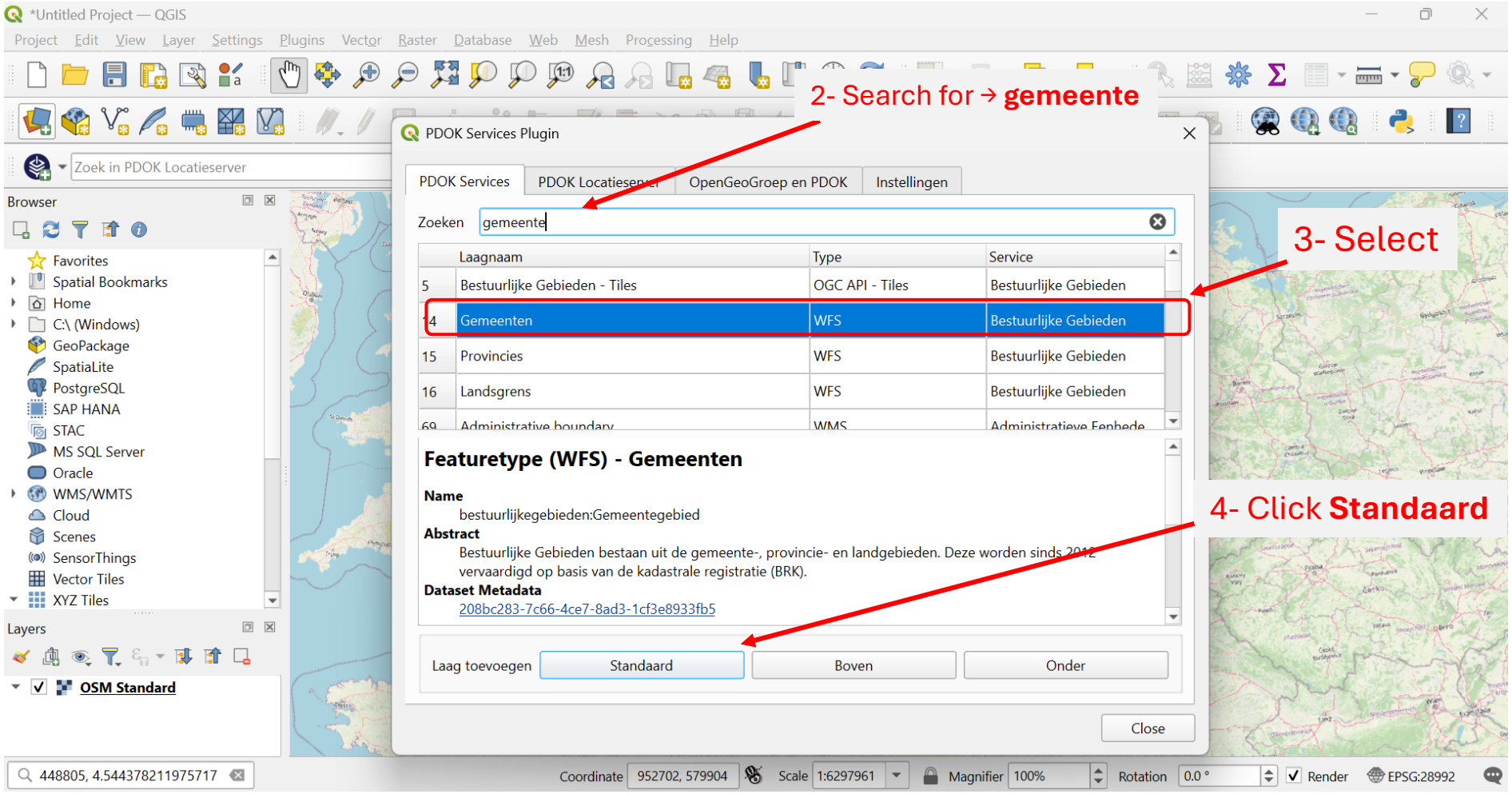

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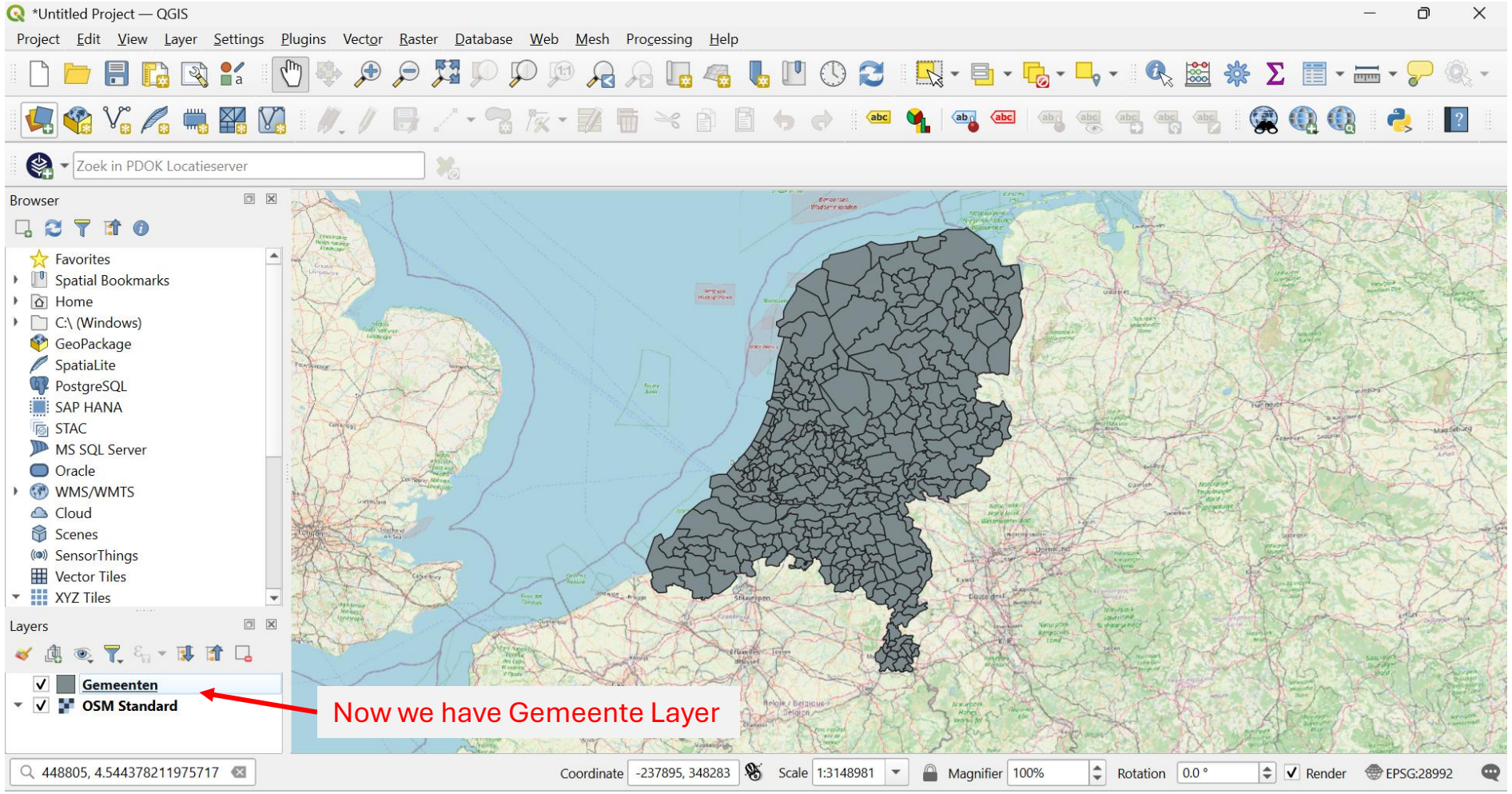

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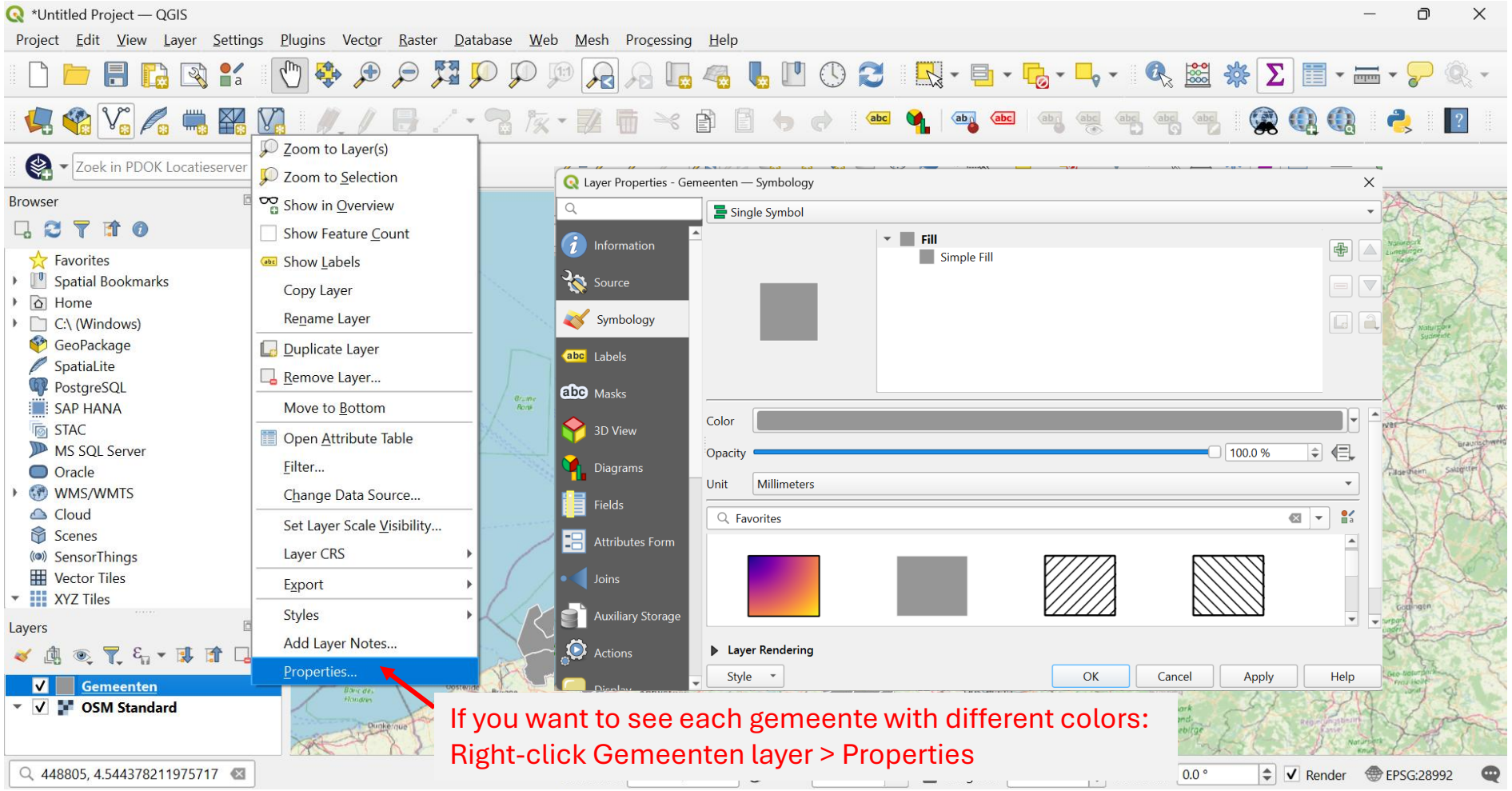

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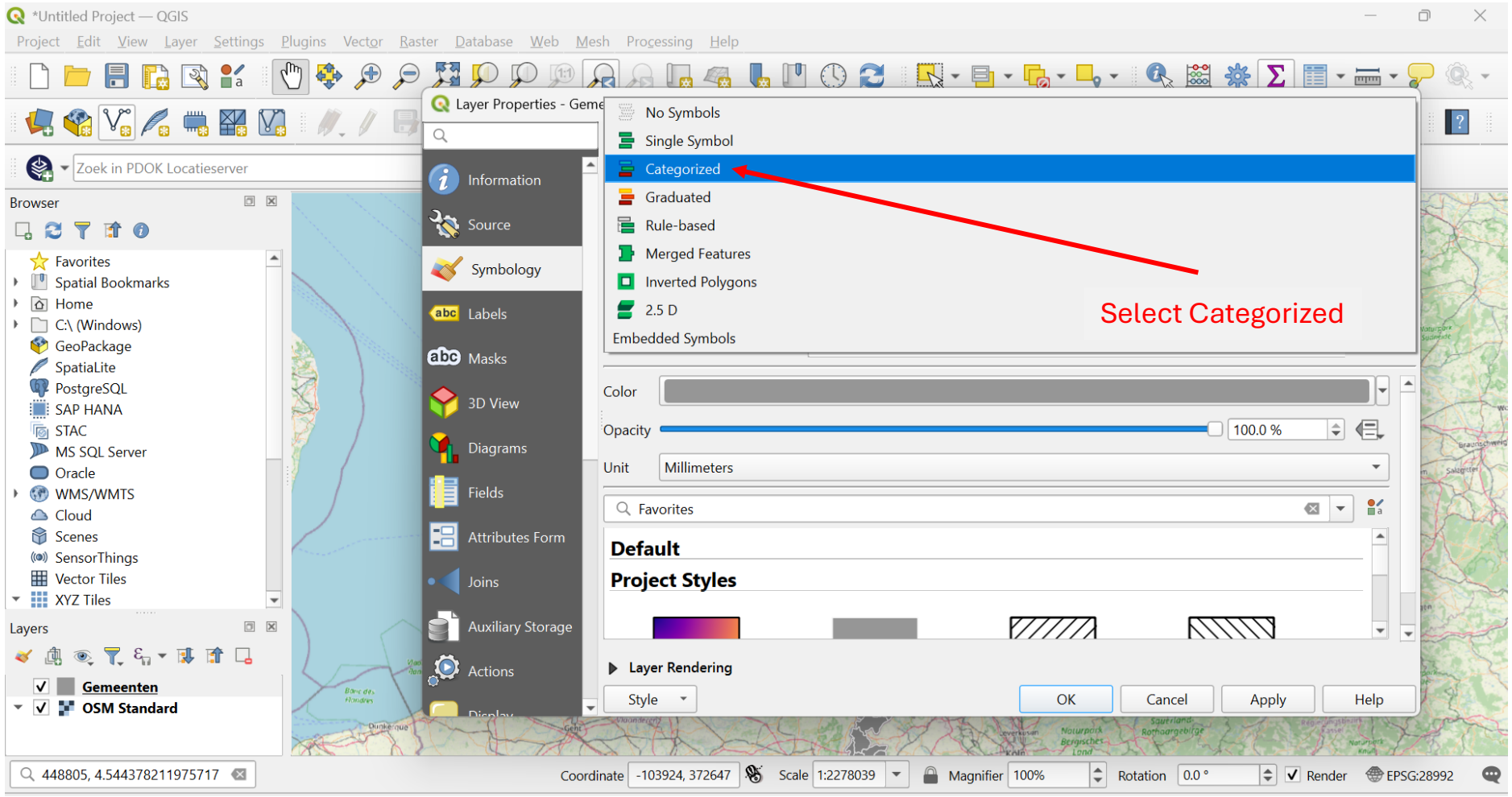

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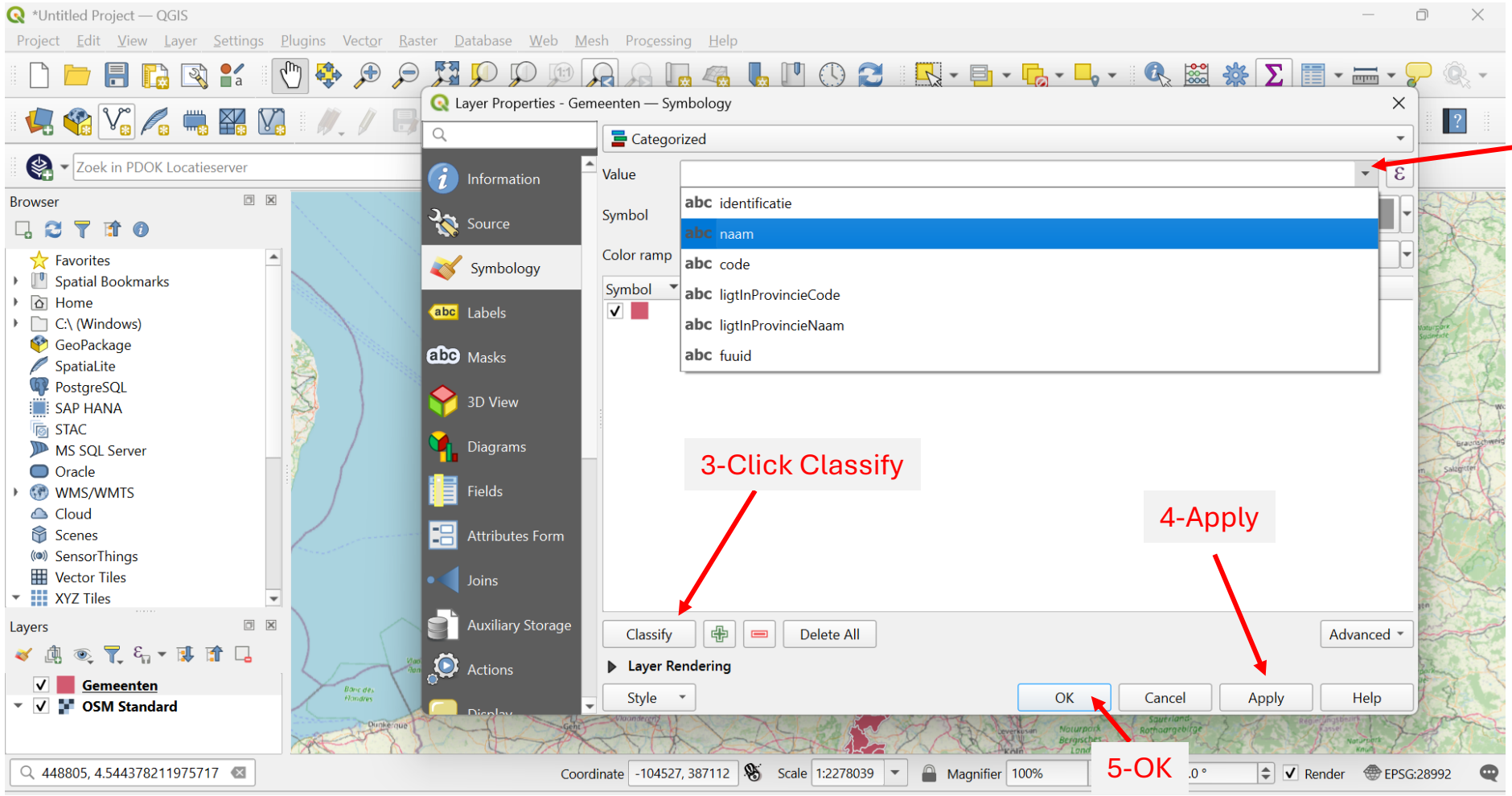

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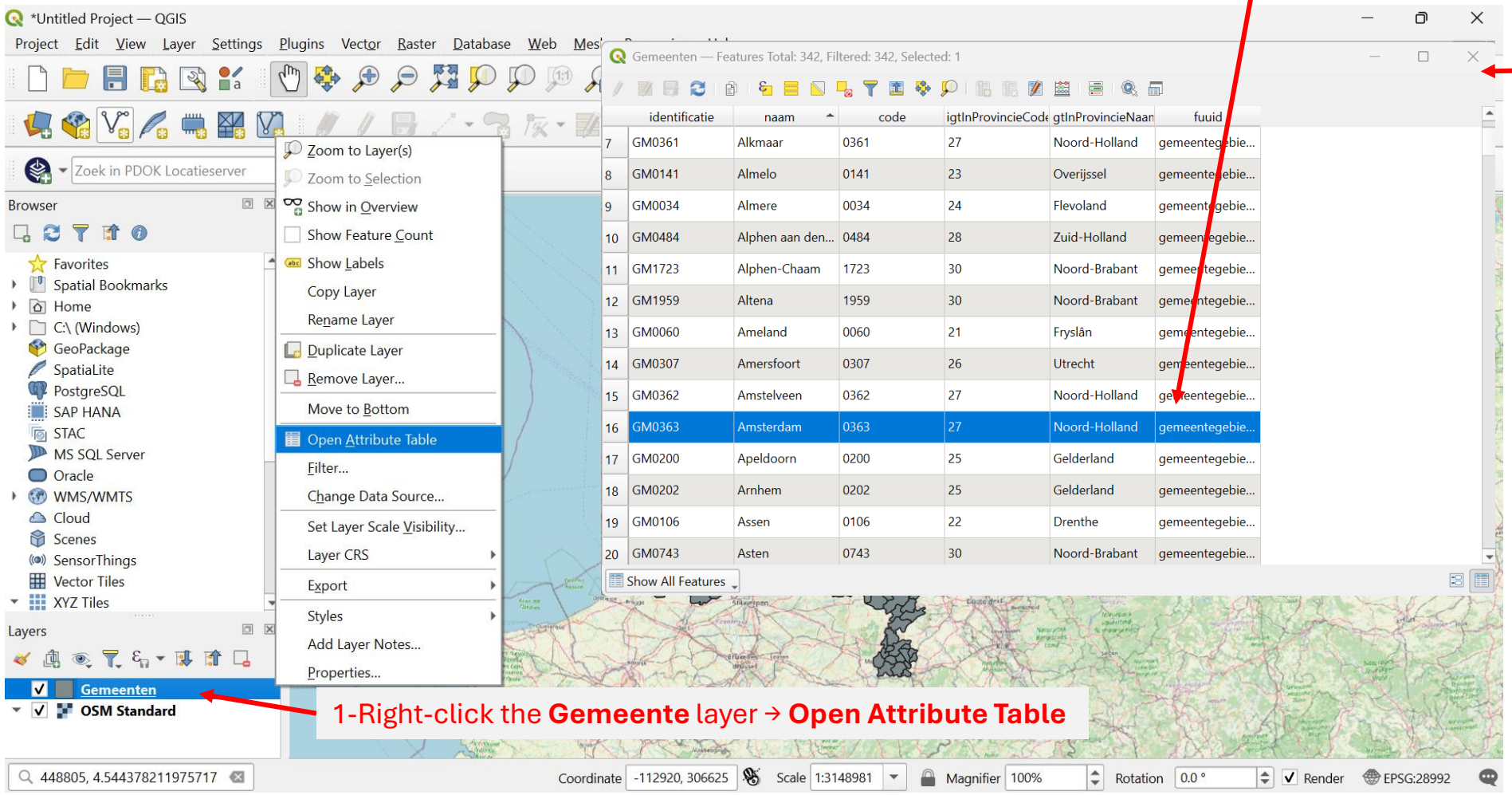
Basic GIS Training

4. Add the municipality boundaries layer

a-)“Cut out” Amsterdam → make a new layer



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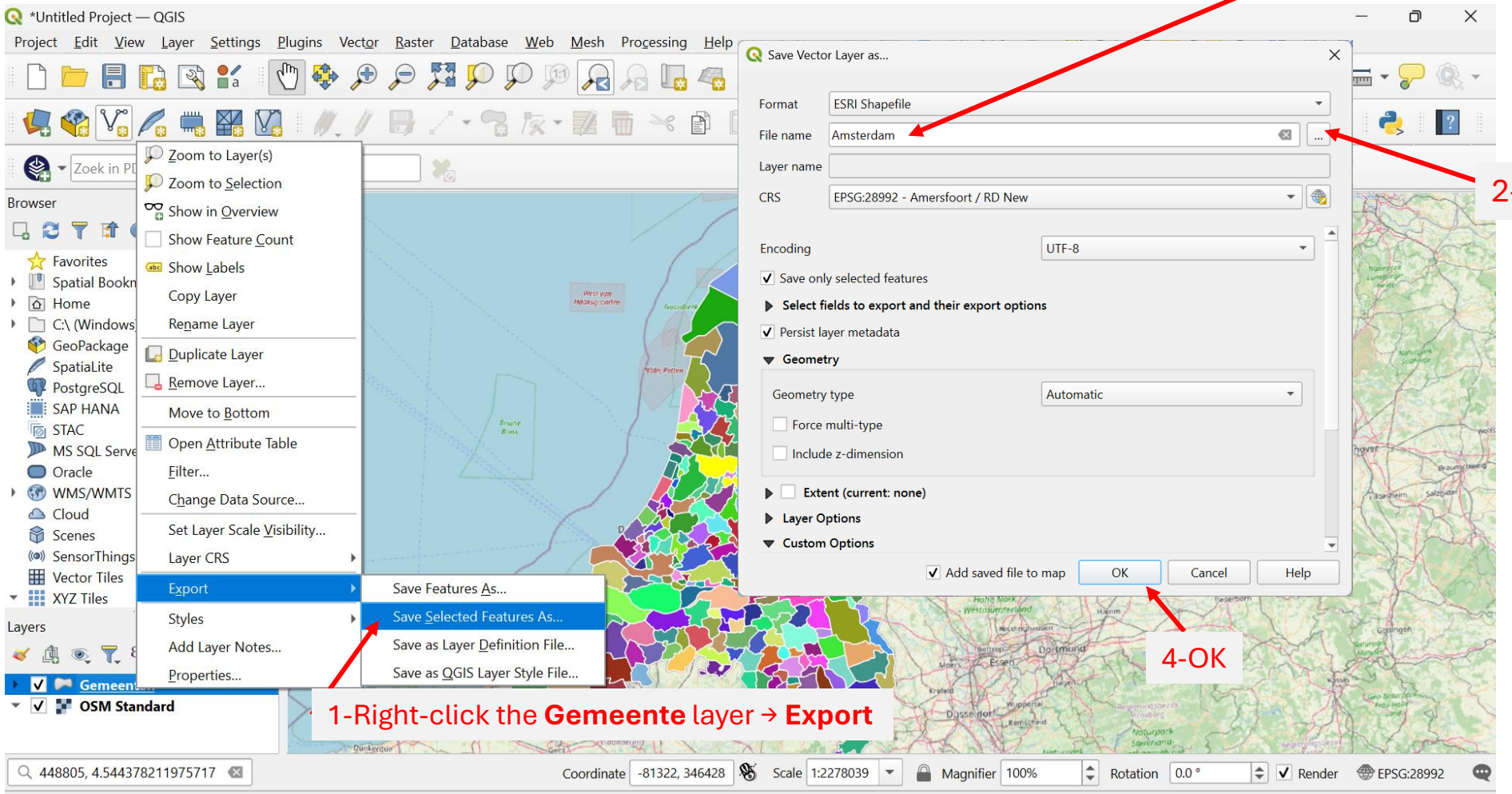
4. Add the municipality boundaries layer

a-)“Cut out” Amsterdam → make a new layer



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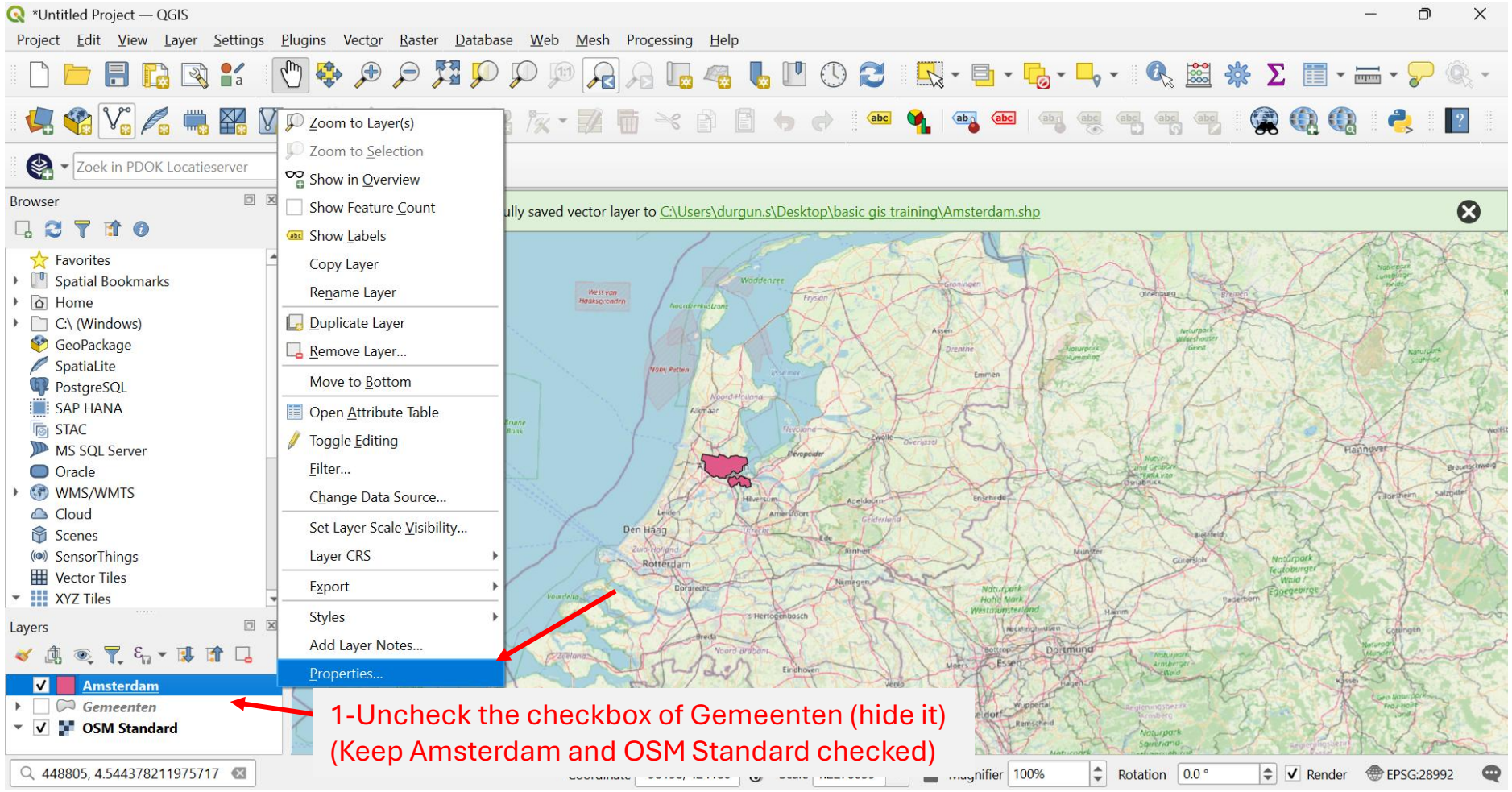
4. Add the municipality boundaries layer

a-)“Cut out” Amsterdam → make a new layer



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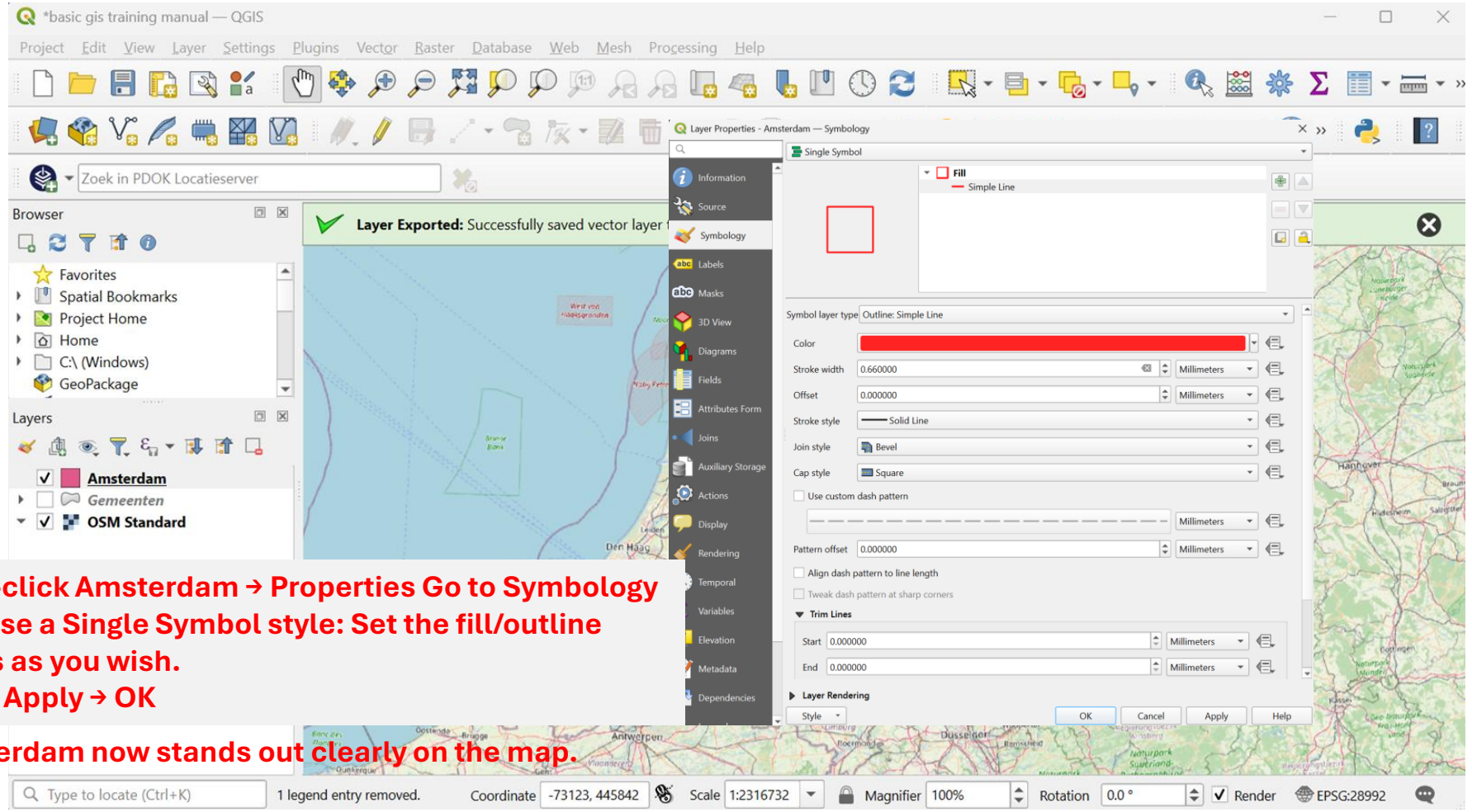
4. Add the municipality boundaries layer

b-) Give Amsterdam a clear style (optional but nice for the PDF)



1-Right-click Amsterdam → Properties Go to Symbology
2- Choose a Single Symbol style: Set the fill/outline settings as you wish.
3- Click Apply → OK

Amsterdam now stands out clearly on the map.

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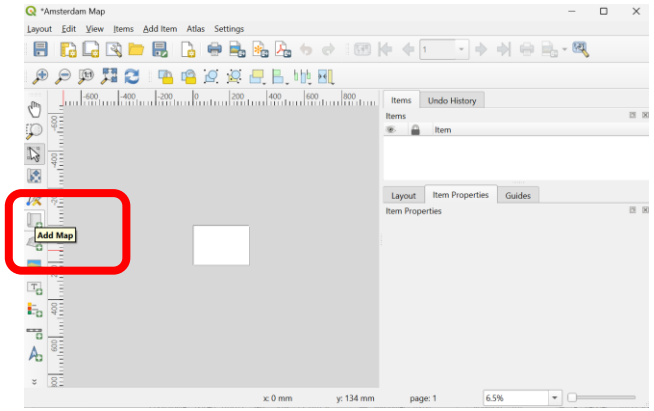
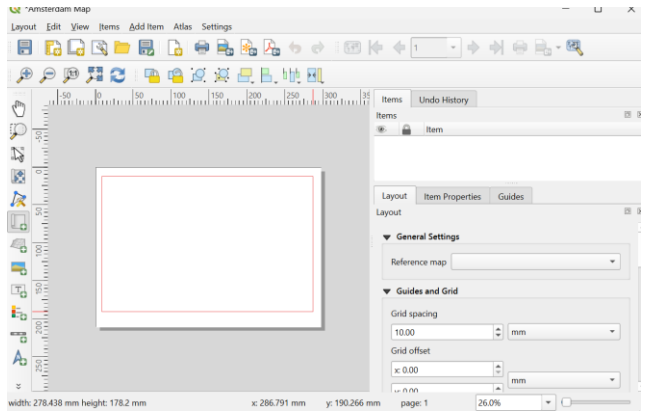
5. Create a map layout

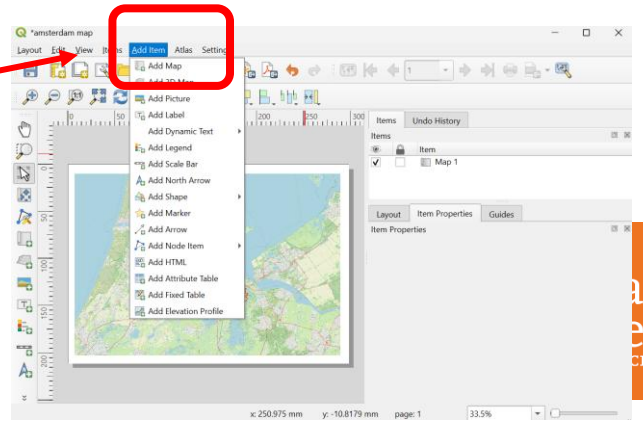
1. Top menu → **Project → New Print Layout…**
2. Give it a name, e.g. **Amsterdam_Map**, click **OK**
3. In the layout window toolbar, click **Add Map**



4. Drag a rectangle on the page where you want the map → the Amsterdam map appears inside



Note: Whatever you **see in the main QGIS window** is what will appear **inside the rectangle you draw in the Print Layout**.
So if the map looks zoomed out, too close, or shows extra layers you don't want:
> **first adjust the map view in the main QGIS window**
(zoom, move, turn layers on/off, change styling)
Then:
> **go to Print Layout and draw the rectangle again**
to capture the updated view.



Optional:

- You can add map elements to improve your layout:
  Title, scale bar, north arrow, legend etc. add as many as you like.
  All are available from **Add Item** in the Print Layout toolbar.

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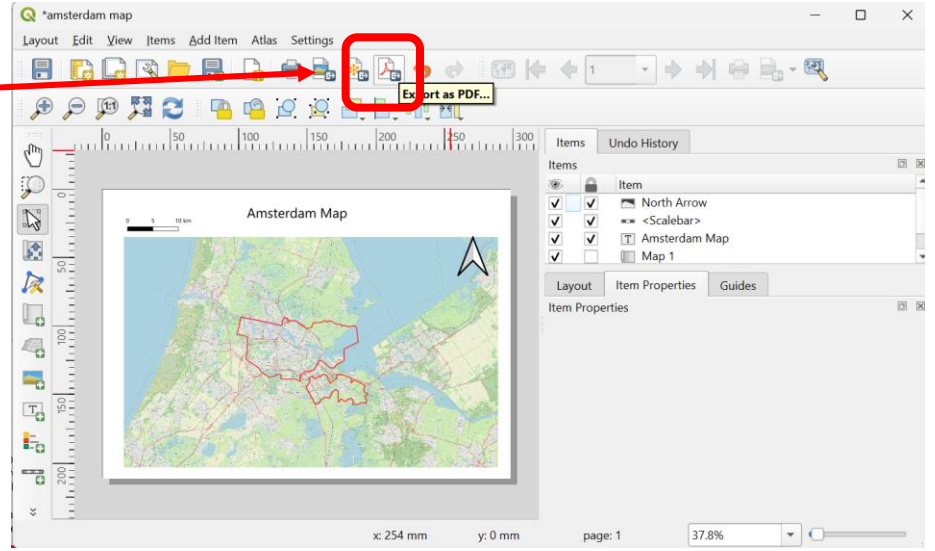
6. Export the map as PDF

1- In the layout window top menu → **Layout → Export as PDF...**



2- Choose a folder and file name, e.g. Amsterdam_Map.pdf

Click **Save**

Done!

You now have a **PDF map of Amsterdam** clipped from the Gemeenten layer.

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That's it for the first **Basic GIS Training**!

The best way to learn GIS is to **play around, explore, and experiment** so don't hesitate to try new tools, different datasets, and different visual styles.

If you have questions, want to discuss ideas, or want help with your own project,
our door is always open.

You are always welcome in the **Places & Flows Lab** 🧡

Let's keep learning, creating, and mapping together!

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