



มหาวิทยาลัยราชภัฏนครปฐม



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Fundamentals of Geographic Information System



Chapter 5: Data Input & Georeferencing

Managing Geographic Data Efficiently



Learning Objectives

Explain Vector and Raster data types

Understand Coordinate Reference Systems (CRS)

Import spatial data into QGIS

Perform Georeferencing correctly

Evaluate spatial accuracy



Vector Data

Represents discrete features

Point – e.g., hospital, school

Line – e.g., roads, rivers

Polygon – e.g., district boundary

Common formats: Shapefile, GeoJSON, CSV



Raster Data

Represents continuous surfaces

Grid / Pixel-based structure

Used for satellite imagery

DEM, NDVI, rainfall analysis

Common format: GeoTIFF (.tif)



Coordinate Reference System (CRS)

Defines how spatial data is positioned on Earth

Ensures layers align correctly

Example: WGS84 (EPSG:4326)

Example: UTM Zone 47N / 48N (Thailand)



What is Georeferencing?

Process of assigning real-world coordinates

Used for scanned maps or images

Requires Ground Control Points (GCP)

Creates spatially accurate raster output



Georeferencing Steps in QGIS

Open Raster → Georeferencer

Add Ground Control Points (GCP)

Select Transformation (Polynomial 1)

Define CRS and Run

Check overlay accuracy



Lab Activity

Import Nakhon Pathom boundary shapefile

Set Project CRS to EPSG:4326

Add CSV with coordinate data

Georeference scanned map (min 4 GCPs)

Check overlay result



Assessment Criteria

Correct data import

Proper CRS configuration

Accurate GCP placement

Low RMS error

Clear explanation of concepts



Lab Overview

Part 1: Import Vector Data

Part 2: Import CSV Coordinate Data

Part 3: Set Project CRS

Part 4: Georeferencing Scanned Map

Part 5: Accuracy Check



Step 1: Import Shapefile

Open QGIS

Layer → Add Layer → Add Vector Layer

select .shp Nakhon Phathom

Click Add



Step 2: Check Layer CRS

Right-click the layer → Properties

Check **Source** → **Geometry**

Look at the **EPSG Code**

Record the **CRS** of the layer



Step 3: Set Project CRS

Look at the **bottom-right** corner of QGIS

Click **CRS**

Select **EPSG:4326 (WGS84)**

Click **OK**



Step 4: Import CSV with Coordinates

Layer → Add Layer → Add Delimited Text Layer

Select the **CSV** file

Choose **Geometry Definition** → **Coordinates X/Y**

Set the **CRS** to match the data



Step 5: Open Georeferencer

Raster → Georeferencer

Open the scanned map image (.jpg/.png)

Check that the image is clear before starting



Step 6: Add Ground Control Points (GCP)

Click **Add Point**

Select a location on the image

Enter the real coordinates from the **Map Canvas**

Add at least **4 points**



Step 7: Transformation Settings

Settings → Transformation Settings

Select **Polynomial 1 (Affine)**

Output Raster → **GeoTIFF**

Select **Target CRS (EPSG:4326)**



Step 8: Run Georeferencing

Click **Start Georeferencing**

Wait for the system to process

A new layer will be added to the **Map Canvas**



Step 9: Accuracy Check

Zoom in to check important points

Check the **RMS Error** value

If the RMS is high → add new **GCPs**

Save the results



Lab Submission

Take a screenshot of the QGIS screen

Show the **Layer Panel**

Display the **CRS value**

Submit the **GeoTIFF file** generated



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