# Quantum Geographic Information System (QGIS) for Mapping of Study Areas

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## Abstract

Quantum Geographic Information System (QGIS) is a popular and user-friendly open-source software, licensed under General Public License (GNU) and works on cross-platforms like Windows, Linux, Mac and Android versions. It is one of the most commercial Geographic Information System (GIS) software developed for capturing, editing, displaying and analyzing spatial data. QGIS performs different types of spatial analysis such as terrain analysis, hydrological analysis, thematic mapping, land cover mapping *etc*. by employing vector and raster data. The current article focused on how QGIS can be used and ways to get base maps using DIVA-GIS and the Quick Map Services tool (QMS) for georeferencing the area under study.

## Introduction

A Geographic Information System (GIS) is capable of capturing, storing, editing, managing, displaying, analyzing and sharing data that is spatially referenced to the earth. Visual presentations like maps, charts, blueprints and graphs are a productive method of disseminating information. The mapping and geospatial analysis improve the efficacious of planning and GIS-related research. Quantum Geographic Information System (QGIS) is free, open-source software that allows users to create, edit, visualize, analyze and publish geospatial information (Sandhya, 2020). The reliable and constantly updated plug-ins in QGIS makes the users for wide access. The downloaded plug-ins may use to accomplish a specific task. A multiplatform software (QGIS) works on several computing platforms and permits spatial data to analyze, edit, compose, export the graphical maps. Soil classification mapping (Apriyono *et al*., 2018), forecasting of land use changes (Kamaraj and Rangarajan, 2022) and thematic mapping using QGIS (Vinod *et al*., 2022) were the common application of QGIS in agriculture. It can be efficiently integrated with other open-source GIS packages such as Post-GIS, GRASS GIS, and Map Server. It also supports spatial data like raster and vector data.

## Vector Data

A collection of lines or coordinates of points that can form a shape is referred to as a polygon. Vector data is stored as point, line or polygon features, location and geometry of the study area. The commonly used vector data file for geospatial analysis is known as a shape file. It may be states, districts, agricultural lands, rivers, lakes *etc*. Each vector data file has attribute tables that will provide information about the uploaded data that can be edited on QGIS. The vector data file name extensions in QGIS include .shp, .shz and .dbf.

# Raster Data

Raster data is used in GIS when the information is continuous across an area and cannot easily be divided into vector features. Generally, raster data is a grid of regularly sized pixels that display enough information. The spatial resolution of raster data is determined by the image pixels and the raster images have one or more bands that provide multiple features about the same area. The most common ways to obtain raster data are aerial photography and satellite imagery (Roy *et al.*, 2022).

# DIVA-GIS: Base Maps

A base map is the underlying reference map or layer used to orient the uploaded data. Those layers help to exhibit the geographic datasets. DIVA-GIS is an open-source software utilized for downloading the data used for geographic data analysis. It may be administrative boundaries, inland waters, roads, railroads, altitude, land cover, the population density of the country *etc*.

# Quick Map Services Tool

Quick map service (QSM) is an example of an open data project which is driven by mapper communities around the world to maintain data about roads, buildings, public transport especially railways and much more (Figure 1 & 2).
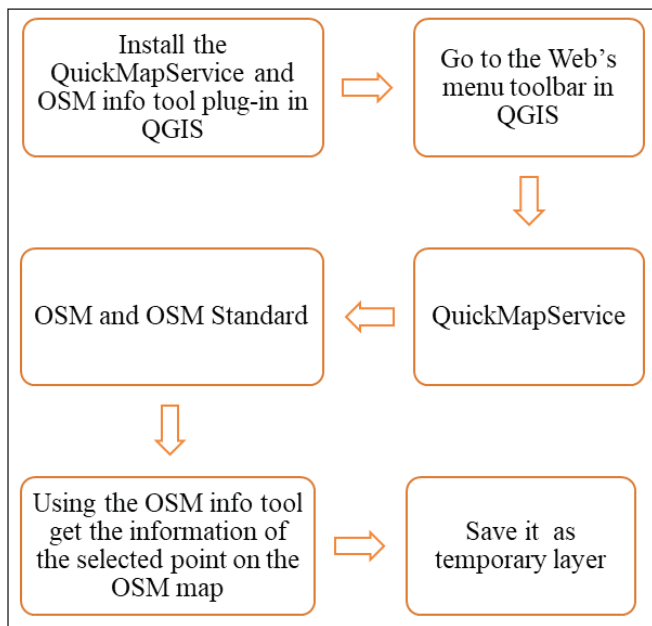


Figure 1: Steps to develop base map using QMS tool

# Coordinate Reference System (CRS)

In general, map projections portray the surface of the earth or a portion of the earth on a flat piece of paper or screen. The projections may transform the earth from its spherical shape (3D) to a planar shape (2D). Similarly, the Coordinate Reference System (CRS) defines how the two-dimensional projected map in GIS relates to real places on the earth. Once a base map or layer is uploaded, automatically CRS (WGS84) is assigned by windows. In QGIS software, WGS84 (Geographic coordinated system) is the default projection or CRS.
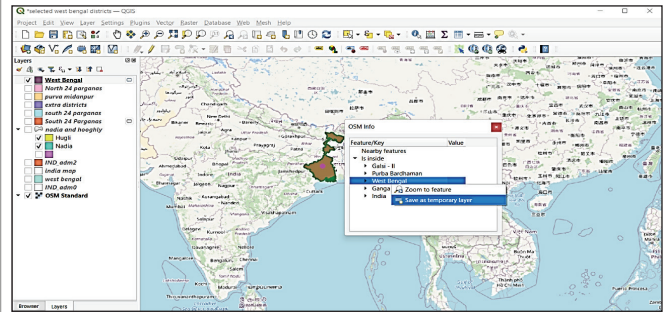


Figure 2: Creating base map using QSM tool

# Applications

QGIS is a powerful GIS mapping software that integrates to publish geospatial information in the field of remote sensing. It can be employed for,

1. Thematic mapping of the study area.

2. Mapping soil moisture and soil type.

3. Land cover classification and mapping.

4. Drought area surveillance.

5. Pest prediction: predicting the pest attacks especially locusts and rodents from the available spatial data sets of agricultural lands.

# Conclusion

Mapping creates the foundation for visualization. Quick Map Services is the extensively used plug-in in QGIS to get the web mapping services and retrieve the data. It helps the process of digitizing study locations, storing the geometries and creating a spatial data set. QGIS is a unique tool that provides a competent and effective platform to design thematic mapping and to analyze geospatial data.

# References

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