



**Miranda House
University of Delhi**

INSPIRE INTERNSHIP PROGRAMME 2024

**Innovation in Science Pursuits for Inspired Research
An Initiative of DST, Govt of India**

8-12 JULY 2024

**Remote Sensing:
Map Your Environment**

**Offered by:
Geography Department**



INSPIRE Department of Geography Georeferencing

AIM: To Georeference the map of Uttarakhand using QGIS software.

Geo referencing is the process of assigning real- world coordinate to each pixel of the raster. Mainly times these coordinates are obtained by doing field survey – collecting coordinate with a GPS device for few easily identifiable features in the image or map.

TYPES OF THE GEO REFERENCING

- **Map Registration**

It is the process in which before map digitalizing the map register into real coordinates. It helps in digitalizing features directly into geographic spaces.

- **Rectification**

It is a transformation process use to project two or more images into a common image plan. It is used in geographical information system to merge images taken from multiple prospective into a common mass coordinate system. It is also known as image rectification.

- **Ortho Rectification**

It is the process of removing internal or external distortion to assign more accurate coordinates to the final images. The main goal of ortho rectification is to create a final product whereby every pixel in the image is depict as it works view at Nadar point.

- **Geo Rectification**

It is a process of taking an image of a map and referencing it to a special grid so that the image of the map can be used as a layer in other maps so that the image of the map can be used for associating points of interest with a special grid.

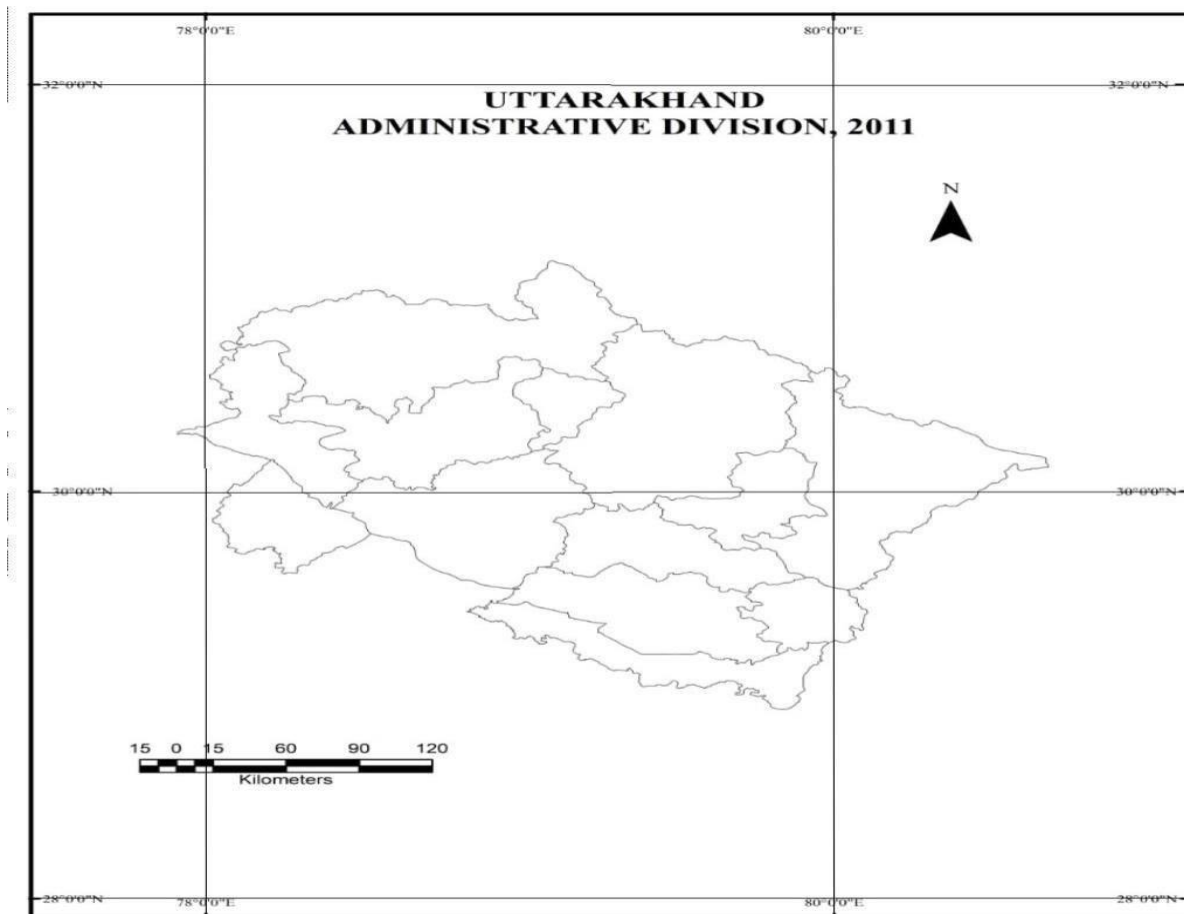
KEY POINTS

- **CRS:** Coordinate Reference System define that with the help of coordinates hoe and dimensional projected map in GIS is related to real place on the Earth.
- **WGS:** World Geodetic Survey. This is started from 1984. It is a standard US Department of Defence definition of global reference system foe geospatial information. It is also the reference for GPS.
- **Datum:** Datum is the reference system from which spatial measurements are made. It is a set of reference points on the Earth surface against which position measurements are made. Datum can be horizontal and vertical.
- **GCP:** Ground Control Points is a location on the Earth surface with known coordinates on both earth and map.
- **Transformation Setting:** Method by which we can match source and destination GCP.

- **Resampling Method:** When we transform the database i.e., we convert it from one projection to another or change the cell geometric transformation may happen. Resampling method may rectify any changes that might occur.
- **Residual Error:** Residual is the error between where the point ended up as opposed to the actual location that was specified. Residuals should always be less than 1.
- **Polynomial 1:** It is a type through which distortions can be corrected which occurred during transformation. For polygon 1 at least 4 GCP coordinates are compulsory.
- **Polynomial 2:** In this 7 points are requires.
- **Polynomial 3:** In this 14 points are requires.

DATA SOURCE

That map will be using geo referencing is lat long map of Uttarakhand downloads it from Map of India .This map is better than any other map because the pixel quality of this map is



good as compared to other map. This map has been downloaded from the secondary data source.

METHODOLOGY:

Steps involved:

Step 1: Open the Workspace in QGIS and go to that Raster column on the Menu Toolbar. Then click on the Georeferencer.

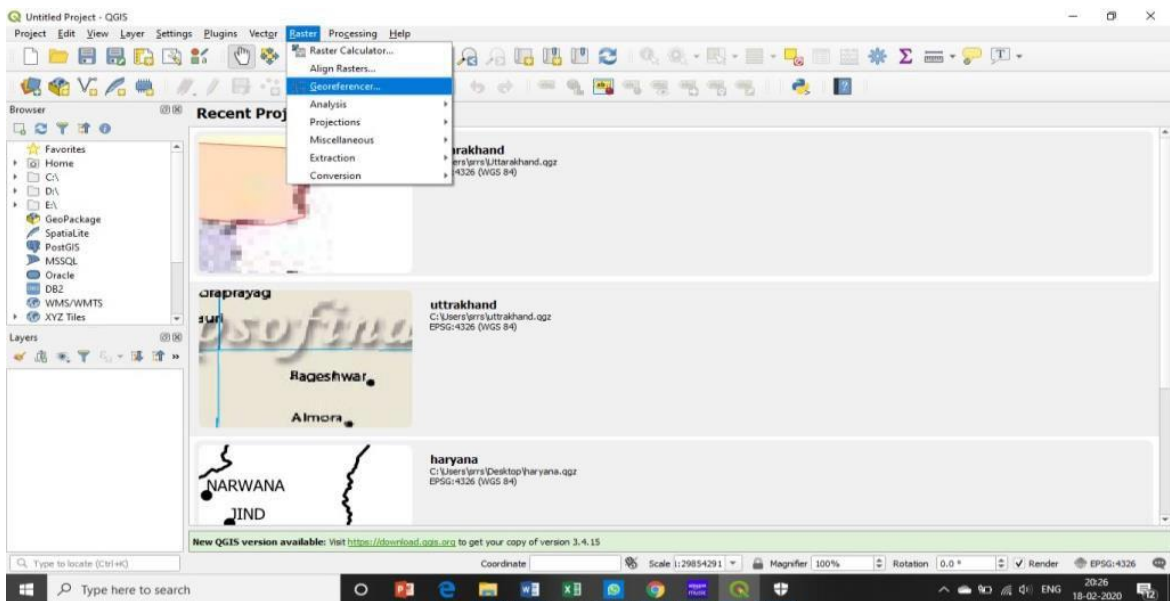


Figure 1: Step 1 QGIS Workspace

Step 2: The plugin window of Georeferencer will appear which is divided into 2 sections. The top section where the raster will be displayed and the bottom section where a table showing our GCPs will appear.

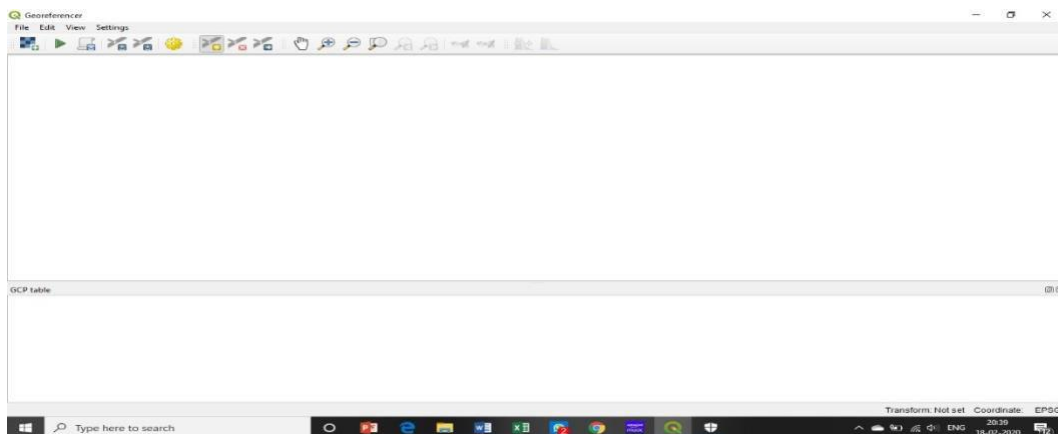


Figure 2: Step 2, Georeferencer Window

Step 3: Now open JPG image of the scanned map. For this, go to File ▶ Open Raster. Browse to the downloaded image of the scanned map and click Open.

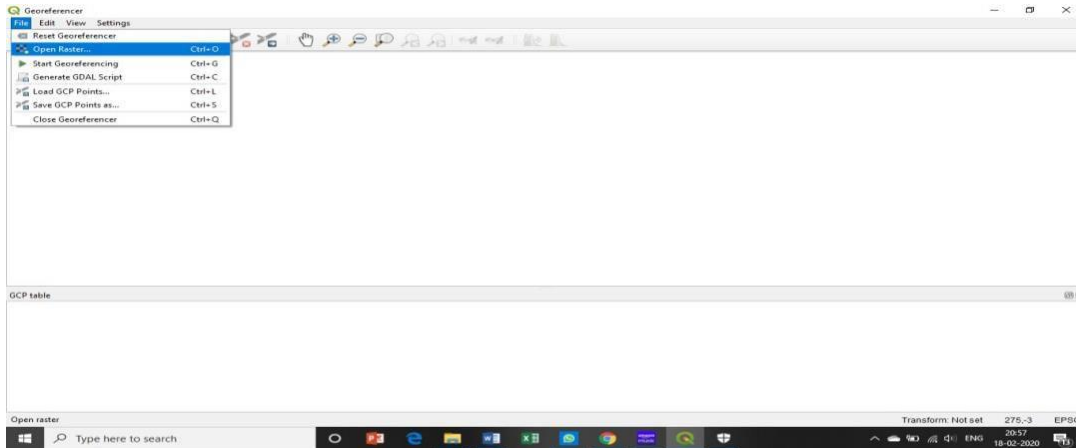


Figure 3: Step 3

Step 4: After that a new window opens with title saying coordinate reference system selector then select WGS 84 with authority I'd EPSG:4326 and click ok

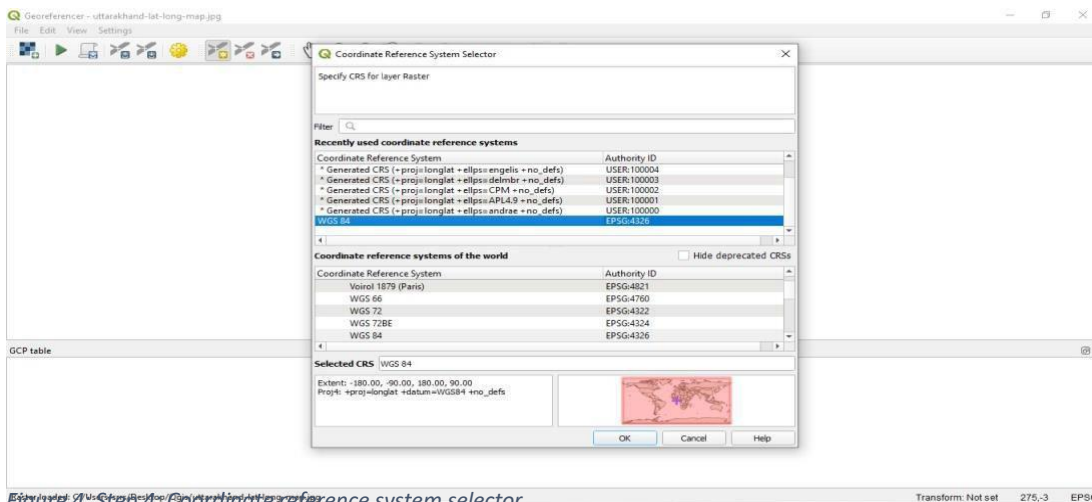
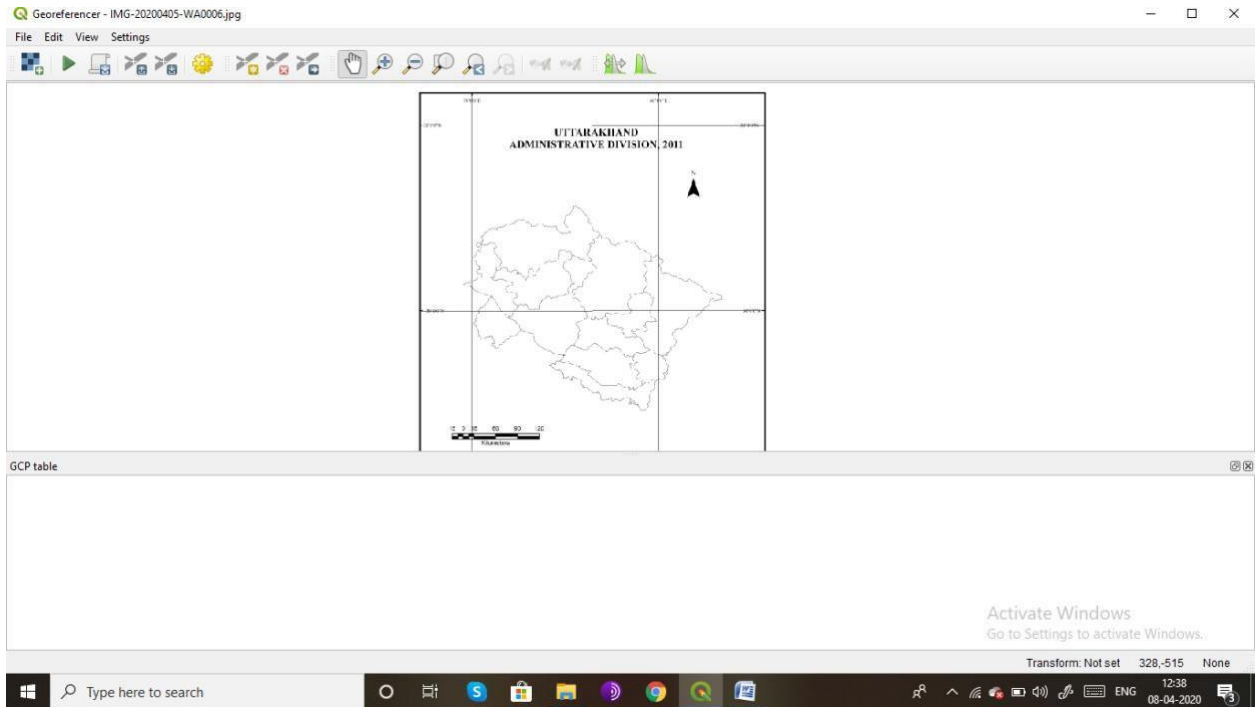


Figure 4: Step 4; Coordinate reference system selector

Step 5: Now we will see the image loaded on the top section of the Georeferencer window.



Step 6: Now we need to assign coordinates to some points on this map. We can see coordinate grid with markings. Using this grid, we can determine the X and Y coordinates of the points where the grids intersect. Click on Add Point in the toolbar.

Step7: A pop-up window appears asking to enter the coordinates. Remember that X=longitude and Y=latitude. Click OK.

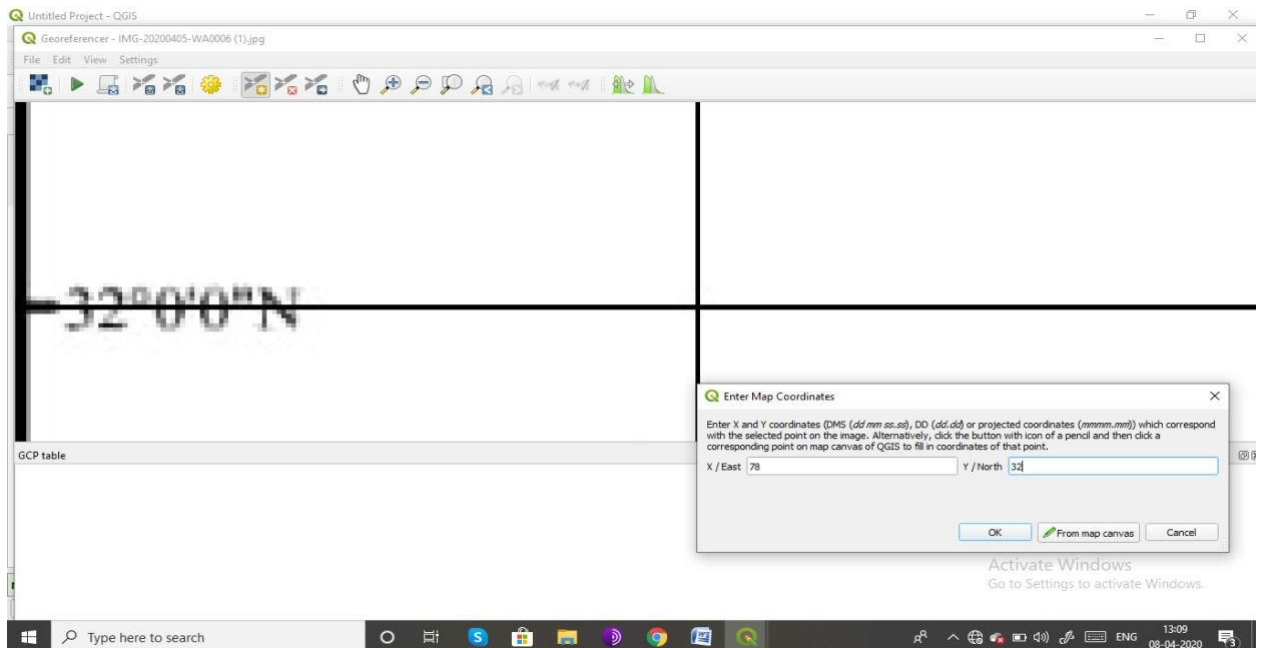


Figure 7: Step7; Map coordinate dialog box

Step 8: We will Notice that the GCP table now has a row with details of our first GCP.

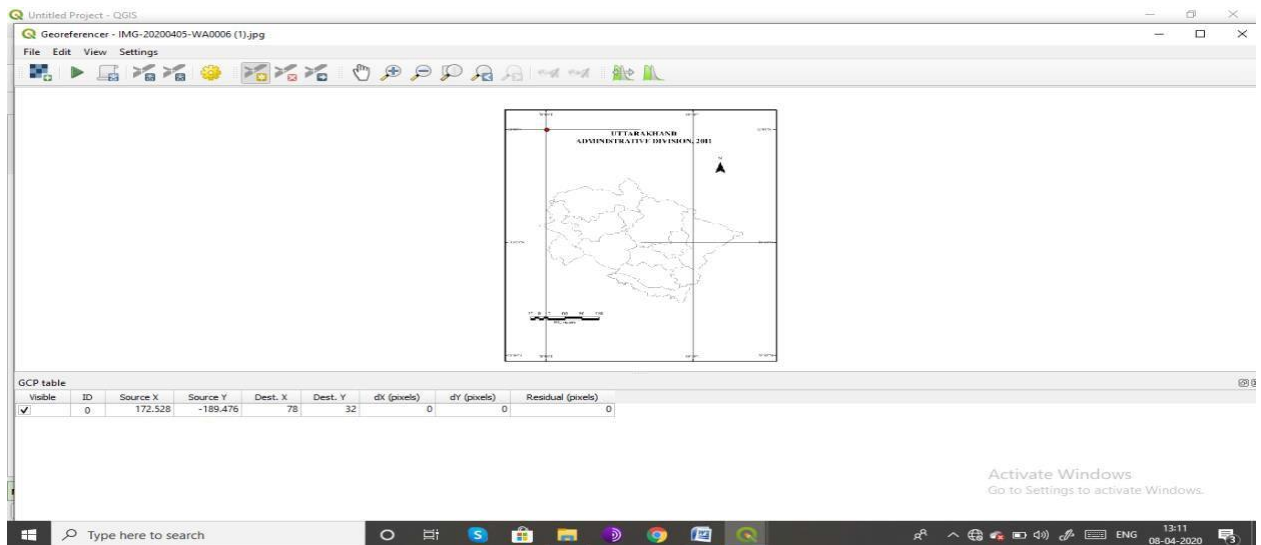


Figure 8: Step8; GCP points

Step 9: Similarly, add at least 4 GCPs covering the entire image. The more points we have, the more accurate our image is registered to the target coordinates.

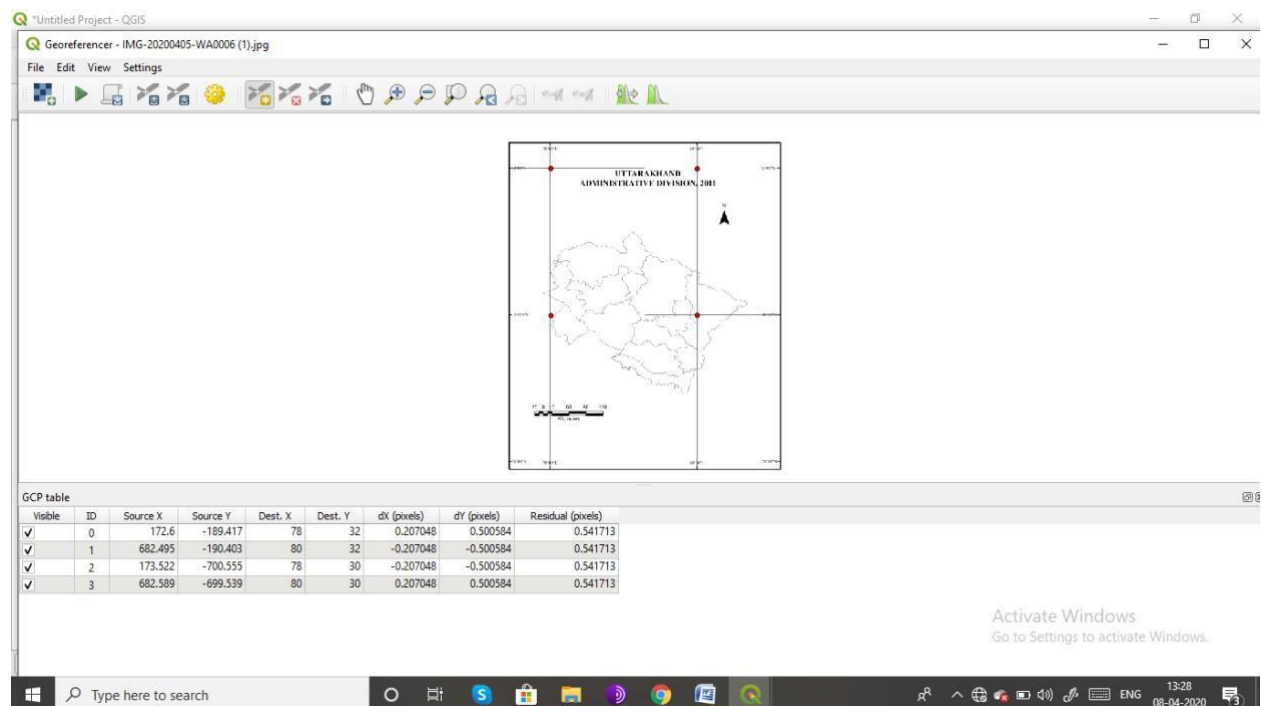


Figure 9: Step9; GCP Table

Step 10: Once you have enough points, (4 in this case) go to Settings -> Transformation settings.

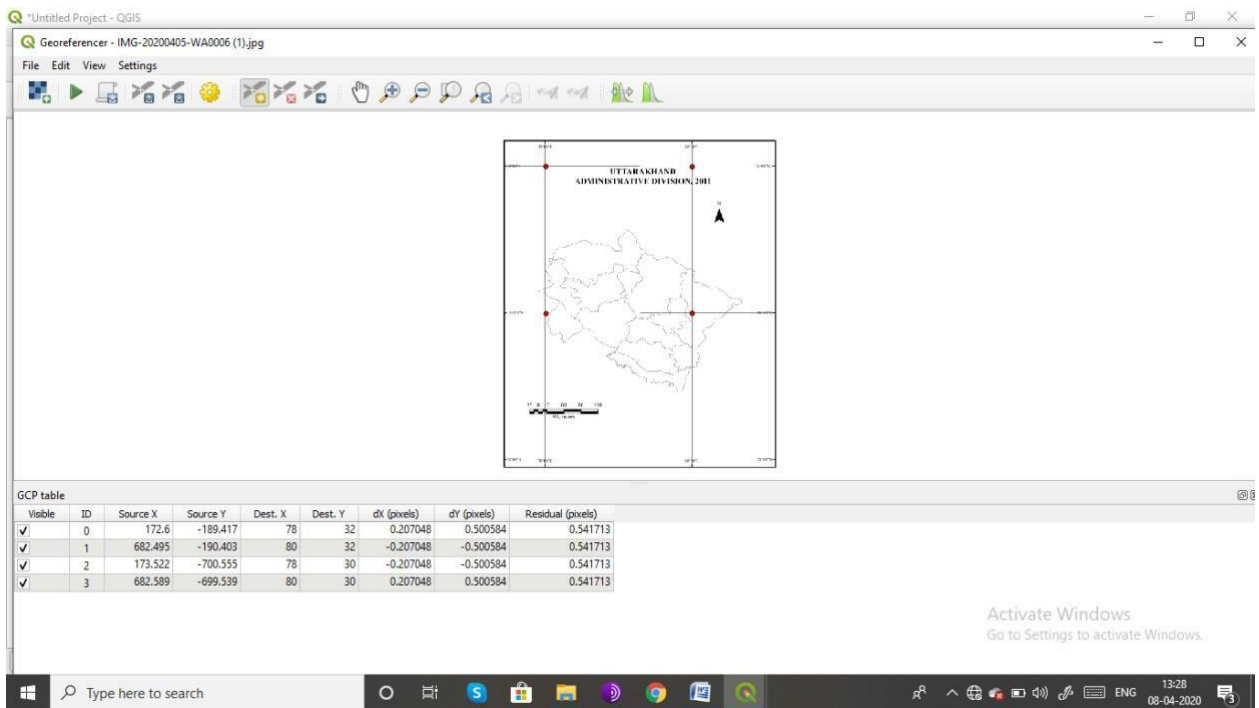


Figure 10: Step10 ; GCP Table

Step 11: In the Transformation setting dialogue box set transformation type as polynomial 1, resampling method as nearest neighbor, Target SRS as WGS 84, Output raster as the file where you want to save your modified map and at last mark the unchecked load in QGIS when done check box as checked. Now click on Ok

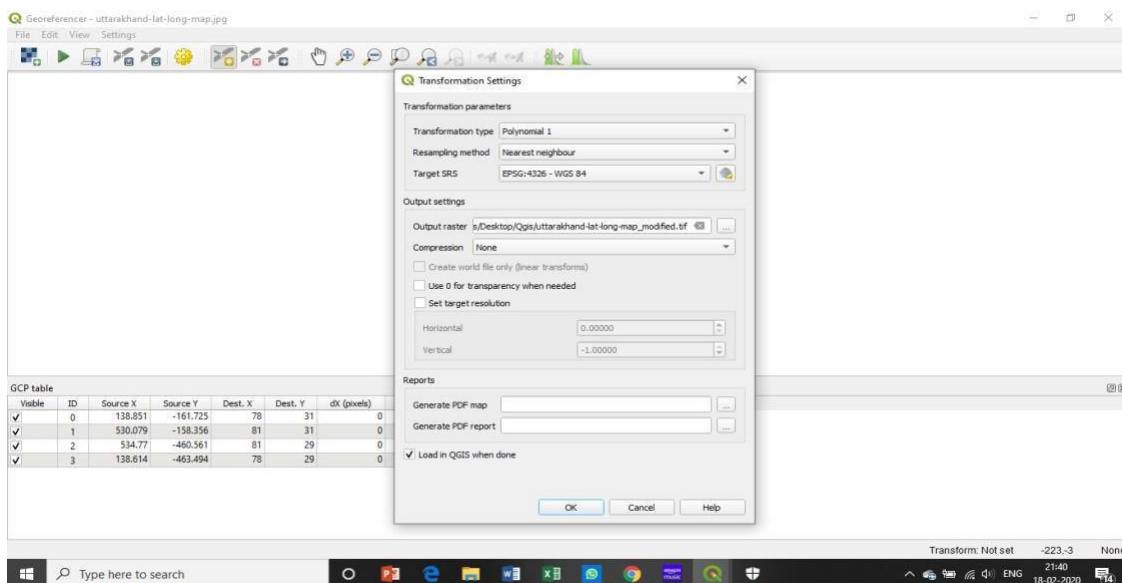


Figure 11: Step 11; Transformation Settings Dialogue Box

Step 12: After this if any residuals are there then go to move GCP point option from the tool bar and bring the residual pixels less than zero in the GCP table.

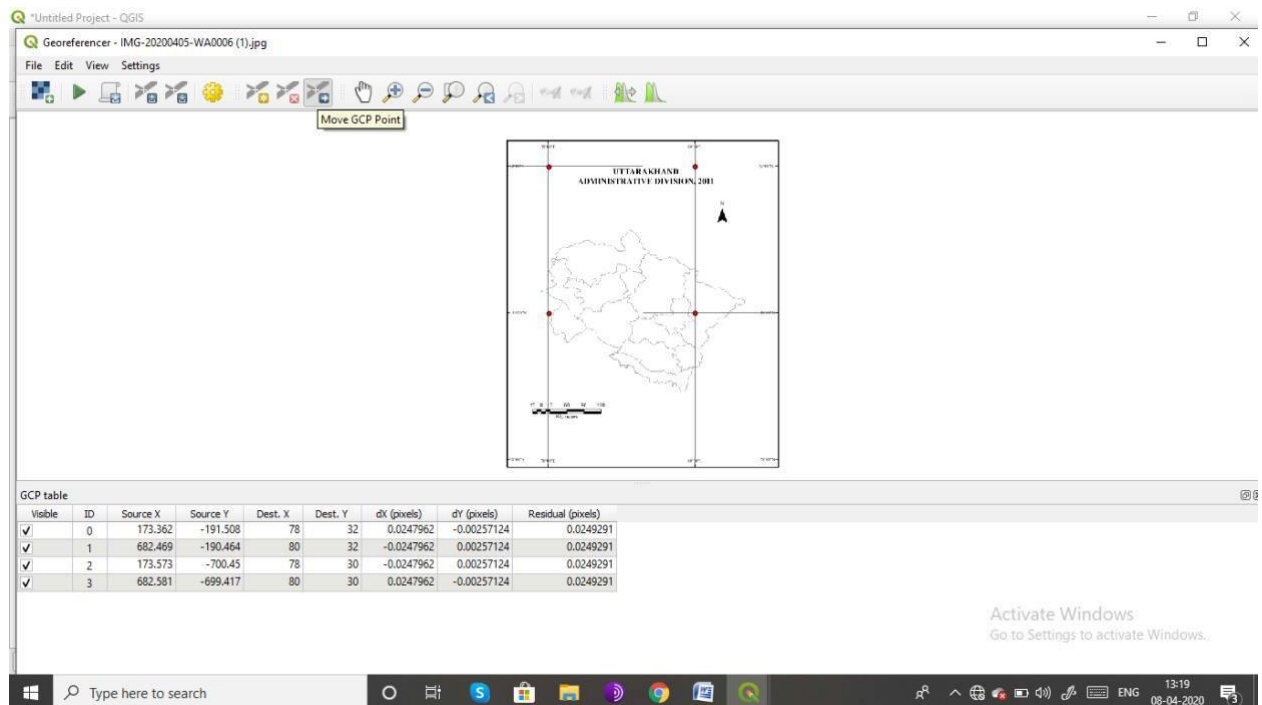


Figure 12: Step 12; Residual Pixels

Step 13: Now click the start referencing button from the toolbar.

Step 14: once the process is complete we will see the Geo-referenced image of the map loaded in our QGIS canvas

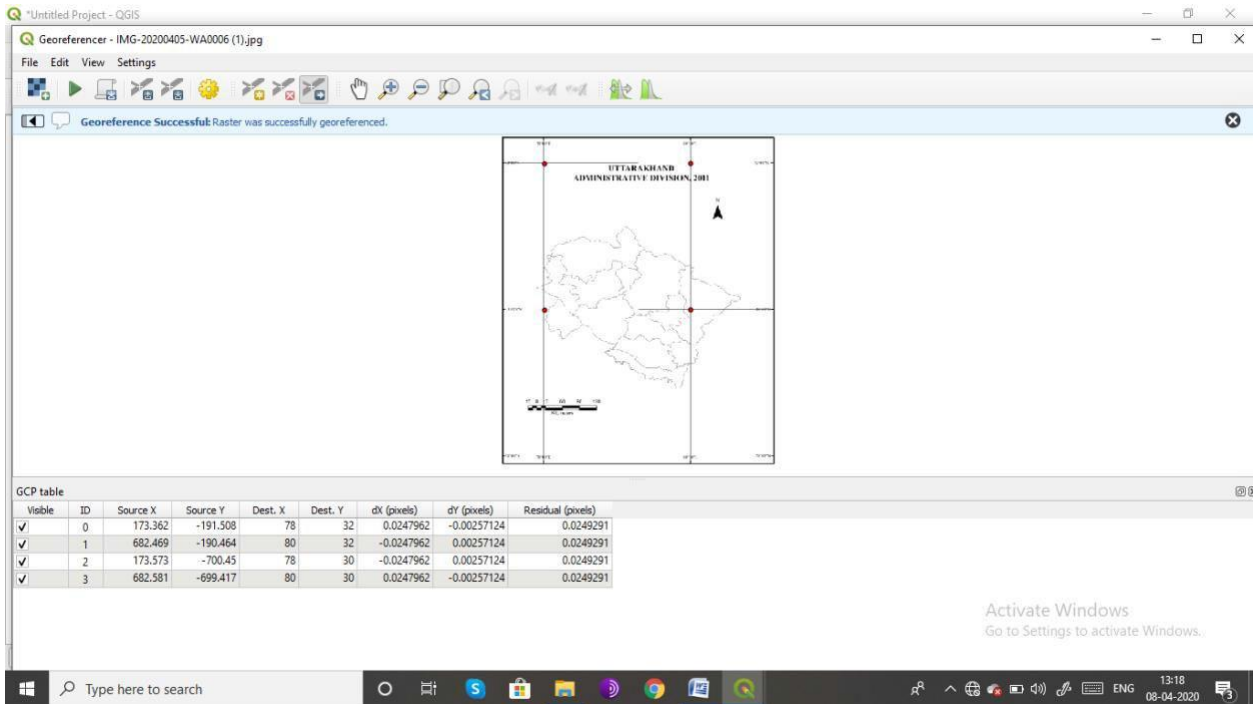
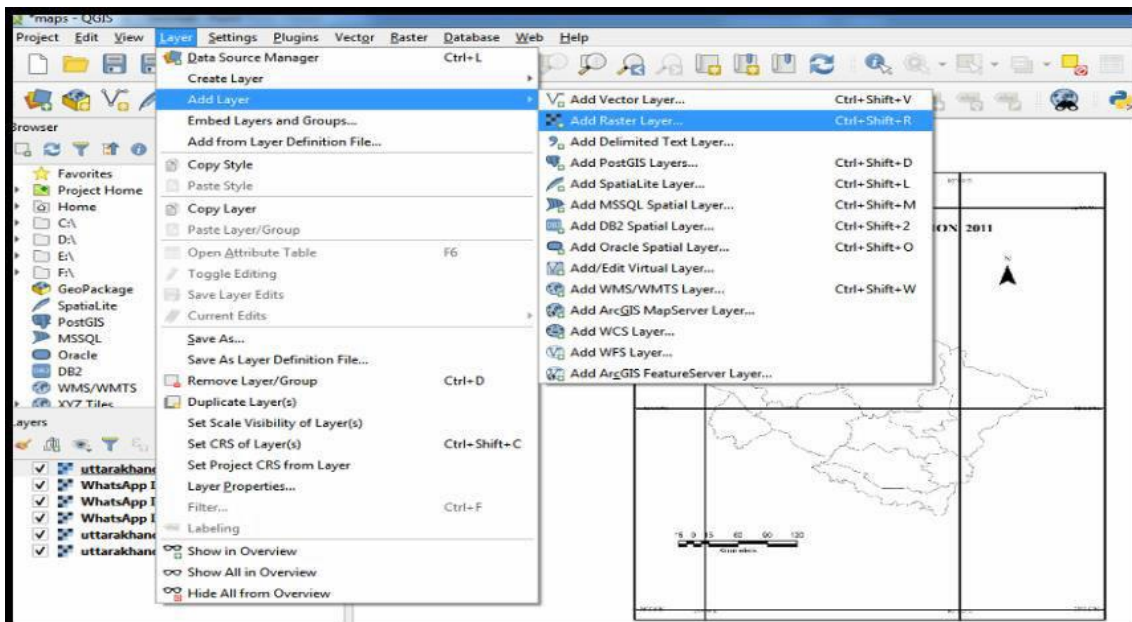


Figure 13: Georeferenced Image

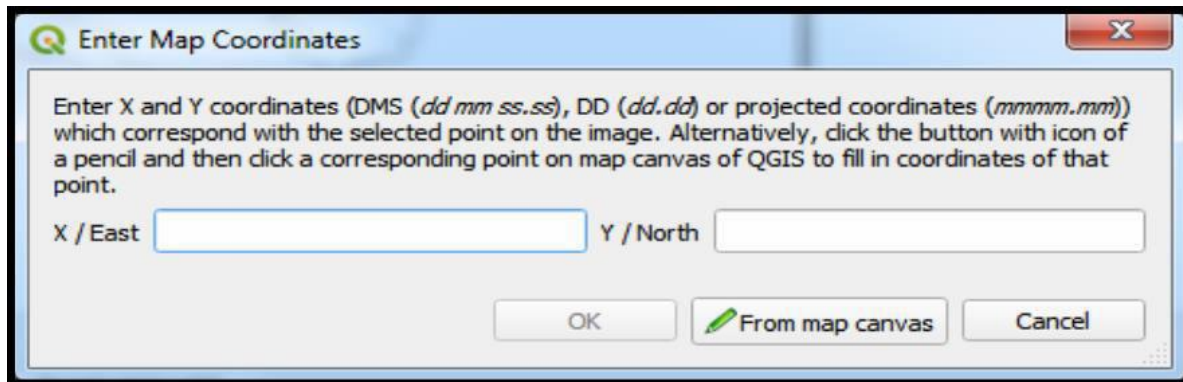
Map to Map Geo Referencing

- 1) Open the QGIS software version 3.4
- 2) Click on Layer Add Layer Add Raster Data.

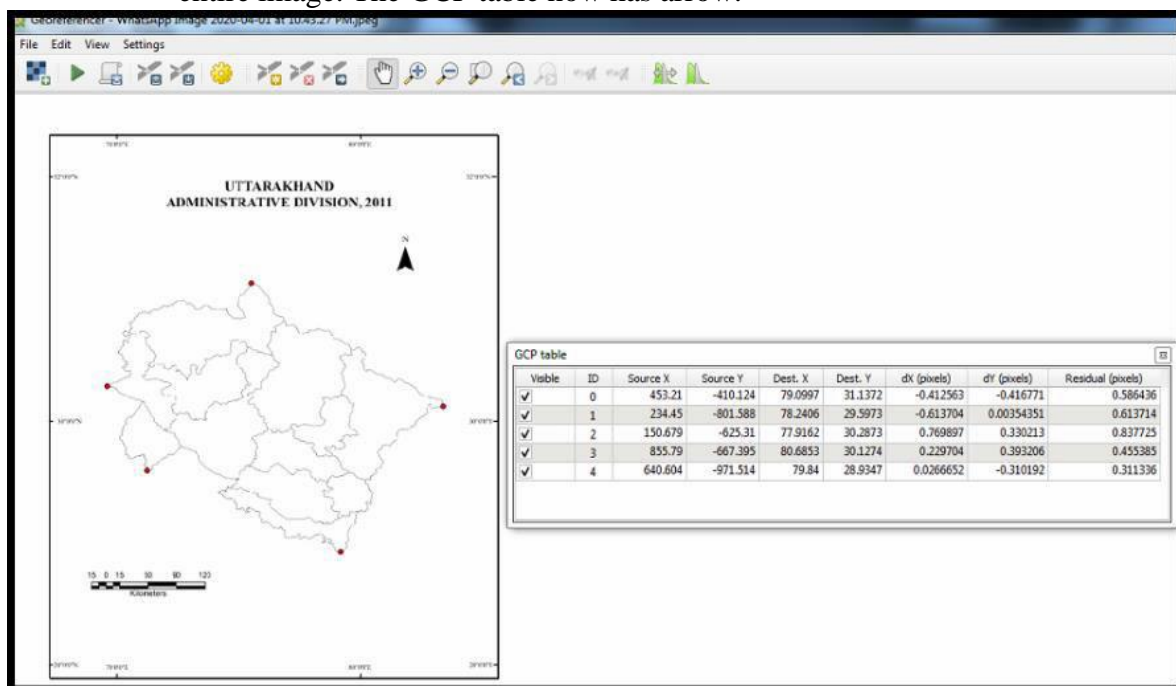


- 3) Now Browser and Select the Modified Map after this click on add and close. Again, click on the Raster Geo-reference to open the Plugin window. The Plugin window is divided into two sections. In the top

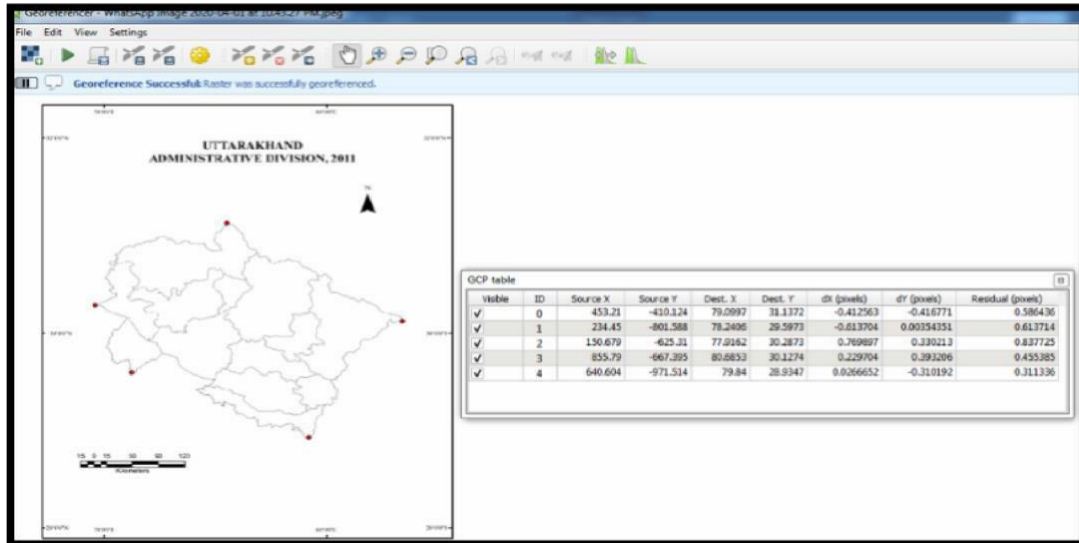
section raster is displayed and the bottom section where a GCPs table appear. Open the JPG image, choose the CRS and assign the X and Y coordinates. Then click on from the Map Canvas.



- 4) After this the modified map will open determine the X and Y coordinates bring entire image. The GCP table now has arrow.



4. Once you have enough points, go to the setting Transformation setting, In the transformation setting dialog window appears in which choice of multiple parameters. Back in the Geo-Referencer window, go to File Start Geo-Referencing. Once the process finishes we will see the Geo-Referenced layer in QGIS.



Exercise: Georeference the map of Delhi using the same technical steps.