Mapping Tourists Centers in Pune city using Geospatial Technology

Using Quantum GIS and Google Earth

Tutorial ID: IGET_CT_002

Mapping Tourist centers of Pune city using geospatial technology

Objective: To identify the tourist places in Pune city and map them using different typologies.

Software: Google Earth, Quantum GIS

Level: Advanced

Time required: 2 Hour

Prerequisites and Geospatial Skills:

1. Quantum GIS should be installed on the computer and basic knowledge of interface
2. Google Earth should be installed and Basic knowledge about the its interface
3. Should have completed all the GIS and RS tutorials from the dst-iget portal.

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Reading:

Introduction:

Pune is the seventh largest city in India and second largest city in Maharashtra after Mumbai. Pune Municipal Corporation (PMC) jurisdiction extends up to an area of 243.84 sq. km. housing 2.54 million populace within 144 wards. Referred as 'Detroit of India', the city has experienced a long standing urban tradition: first as an historical center of pre-colonial urbanism, then as an important military center during British rule, after independence as a rapidly growing contemporary industrial center, and today identified as a growing metropolis. Pune, also known as an 'Oxford of India', houses six Universities with about 600 functional higher education centers catering to an estimated 5 lakh student population. Additionally, Pune is popularly nicknamed as 'Queen of Deccan', 'Pensioners Paradise', 'Cultural Capital of Maharashtra', 'Cyber City' etc. owing to its location, pleasant climate, historical importance, vibrant culture and upcoming IT-BT centers.

Location: Situated on leeward site of Deccan Plateau (Sanhyadri Hills/Western Ghats) between 18º 32' North latitude and 72 º 51' East longitudes, Pune is well connected by road, rail and air network with almost all the important cities within Maharashtra and India. The city is located at the confluence of Mula and Mutha rivers (plains of Bhima and Nira River basin) at a height of 560 m above Mean Sea Level (MSL) and characterized by vast stretches of undulating plains inter spread by low and medium ranges of hills.

In this tutorial we will see how we can demarcate these highly important places in the city of Pune using geospatial technology. We will first list down the tourist places in Pune, then divide them in proper typologies (e.g. Historical, Institutional) and then create meaningful maps out of this dataset.

I. Listing of tourist's places in Pune city.

1. We can take help of different tourism website available online to list down the places in Pune city like Maharashtra tourism, Trip advisor etc.
2. The final list of tourist places listed for this exercise are as follows:

Pashan Lake	Bharati Vidyapeeth	Chatushrungi Temple
Dadusheth Ganapati	Savitribai Phule Pune University	Chhatrapati Sambhaji Park
Shaniwar Wada	Furgusson college	Janglimaharaj Temple
Saras Baug	MIT college	Pataleshwar Caves
Lal Mahal	Sinhagad Institute Wadgaon	Bund Garden
Peshwe Park	TMV Pune	Tribal Research Center
Kelkar Museum	Parvati Hill	St. Merys Church
Vishram Baug Wada	Shinde Chhatri	Race Course
Empress Garden	Rajiv Gandhi Zoo Park	Ohel David Church
Agakhan Palace	Balgandharv Rangmandir	Yerawada Prison
Raj Bhawan	Mahatma Phule Wada	Kasba Ganpati
SNDT University	Deccan College	Osho International
Katraj Jain Temple	PMC Building	National War Memorial
Hadapsar Airport	Agriculture College	Deccan Gymkhana Ground
SP College	St. Teresa Church	Dr. Babasaheb Ambedkar Sanskritik Bhavan
Dr. Ambedkar College	Mula-Mutha Bird sanctuary	

Now we have already listed down the tourist places, now we will move on to the next step of dividing these tourist places in different categories based on its importance. You can add few more if interested.

II. Identifying different typologies and dividing the list in these typologies.

If we see the list above, we can broadly classify them in four major groups.

a. Historical --- Places of historical importance
b. Institutional -– Old Educational buildings
c. Religious – Religion places
d. Other – include Zoo, Museums, Gardens etc.

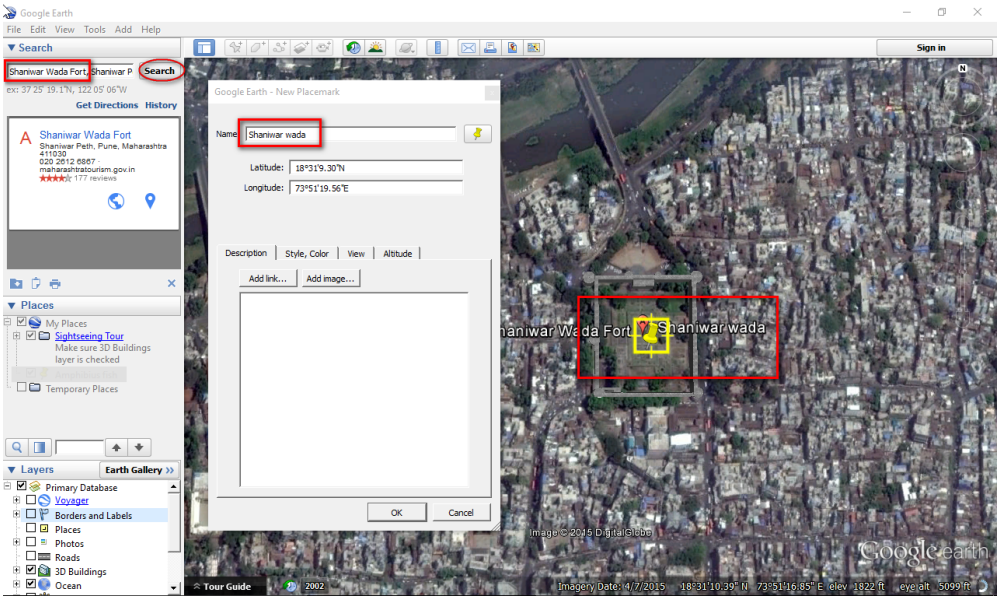
Now we will divide the places above in the categories that we have finalized

Historical	Institutional	Religious	Others
Shaniwar Wada	Raj Bhawan	Dadusheth Ganapati	Pashan Lake
Lal Mahal	SNDT University	St. Teresa Church	Saras Baug
VishramBaug Wada	Hadapsar Airport	Chatushrungi Temple	Kelkar Museum
Agakhan Palace	SP College	Janglimaharaj Temple	Peshwe Park
Shinde Chhatri	Dr. Ambedkar College	St. Merys Church	Rajiv Gandhi Zoo Park
Parvati Hill	Agriculture College	Ohel David Church	Empress Garden
Pataleshwar Caves	Deccan College	Katraj Jain Temple	Bund Garden
Tribal Research Center	Savitribai Phule Pune University	Kasba Ganpati	Race Course
National War Memorial	Sinhagad Institute Wadgaon		Deccan Gymkhana Ground
Balgandharv Rangmandir	TMV Pune		Mula-Mutha Bird sanctuary
Mahatma Phule Wada	Dr. Babasaheb Ambedkar Sanskritik Bhavan		Chhatrapati Sambhaji Park
	PMC Building		
	Furgusson college		
	Bharati Vidyapeeth		
	Yerawada Prison		
	Osho International		
	MIT college		

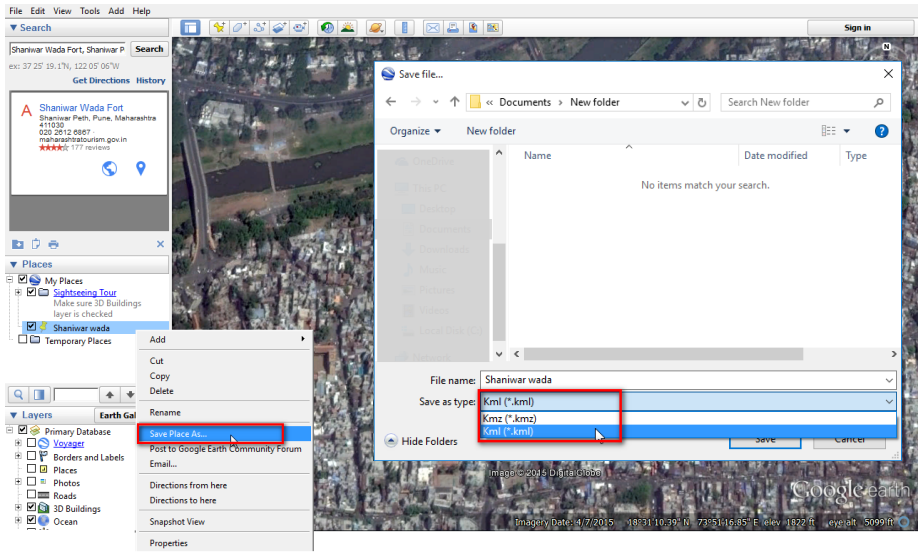
III. Creating database for these places using Geospatial technology.

Since we have already categorized the tourist places, now we will move on with actually plotting it on Google Earth. We will follow the same procedure as explained in IGET_MP_001.

1. We will search for individual places on Google Earth and mark it using placemark tool and name it accordingly and save it in one folder.



2. Save the file as '.kml' file



3. Repeat this process for all the listed tourist places.
4. Also mark the Main bus stops and railway station (Swarget bus stand, Pune railway station)

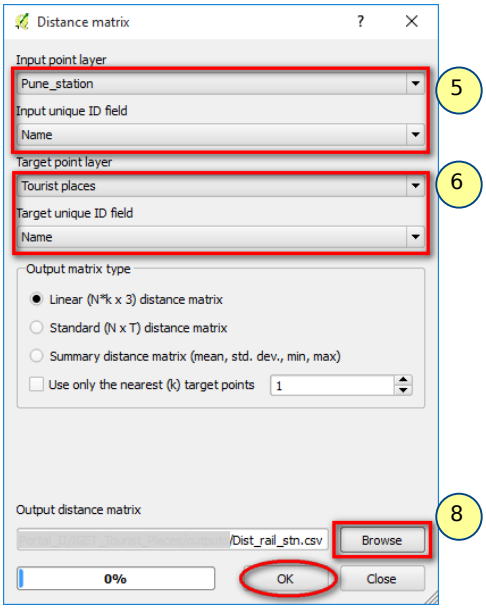
IV. Adding attributes to the collected data

We will find out the shortest route and the distance from each tourist place to the main bus stand and the railway station. There are two ways of calculating distances between the two points. One is Euclidean distance (As the crow flies) and second the actual distance. To calculate **Euclidean distance** we only need two points and the '**Distance matrix'** will calculate the distances between the two points. For calculating actual distances on ground we will need the road layer, which will give exact route from one point to another.

In this tutorial we will consider both the cases.

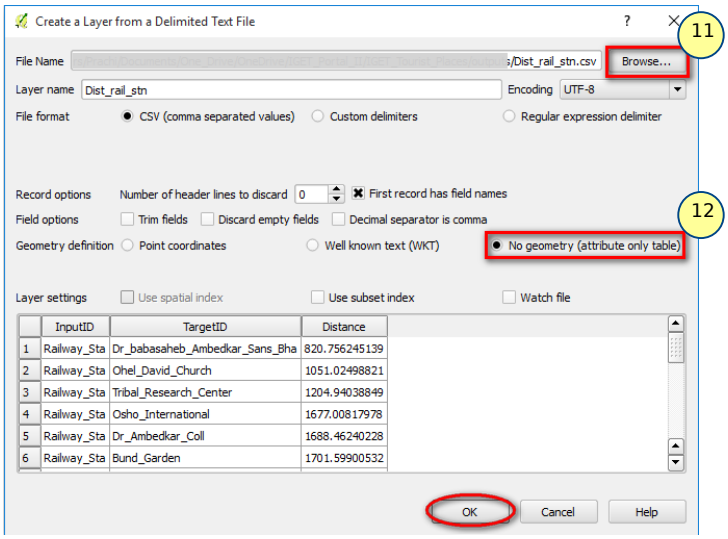
A. Calculating Euclidean Distances between the points.

1. Before we actually proceed with the shortest path we will convert the tourist's places which we have saved as '.kml' to '.shp' so that the calculations are easier.
2. Open the '.kml' file → right click and 'Save As' and select it as 'Esri shapefile' → click 'OK' once you have saved all your files in appropriate folders, open all the shapefiles and remove all kml layers in QGIS map window.
3. Project all the layers in projected coordinate system, in this case we will convert the shapefiles into UTM 43N. (Please refer IGET_GIS_002 for projecting the layers).
4. (If you want skip first three sections and directly want to continue from here then use the data provided with this tutorial 'Tourist_Places')
5. Goto ***Menu → Vector → Analysis tools → Distance matrix.***
6. A new window will open up. Firstly we will find out distances from Pune station to evry tourist place. So give the '**Input point layer'** as '**Pune_Station'** and keep '**Input unique ID field**' as '**Name**'

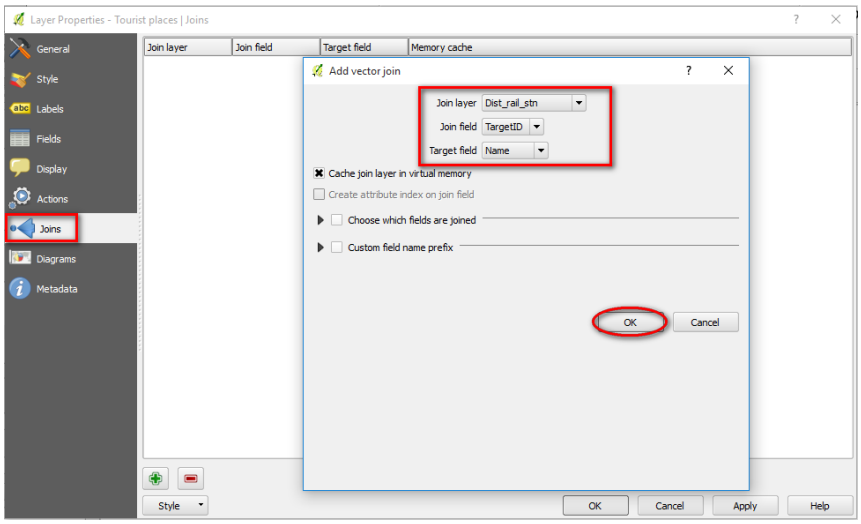


7. Next select the '**Target point layer'** as '**Tourist places'** and **'Target unique ID field'** as **'Name'**
8. Let the output matrix type be default as linear distance matrix.

9. Save the **'Output distance matrix'** in appropriate folder in your local disk using **'Browse'**
10. Click **'OK'** and the the distance matrix file will be saved as .csv file.
11. Now we will load this file in map canvas and then join it with the attribute of tourist places. To load the file navigate to **Menu → Layer → Add Layer → Add delimited text layer.**
12. The new window will open up. Browse through your folders and select the previously saved .csv file.
13. Next Select **'No geometry (attribute only table)'** from Geometry definition. And click **'OK'**

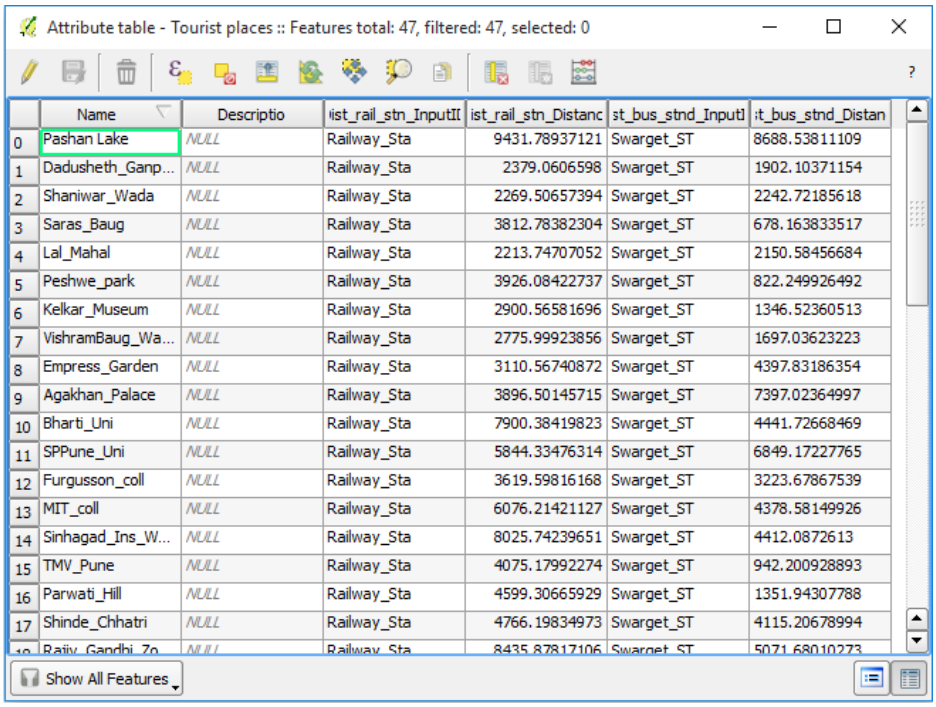


14. Table is now added to table of content list. Now we will join this table with Tourist places shapefile using **'Name'** as an unique ID.
15. Goto properties of Tourist places → Join → Give Unique Id → click OK. (Refer the screen shot for further reference).



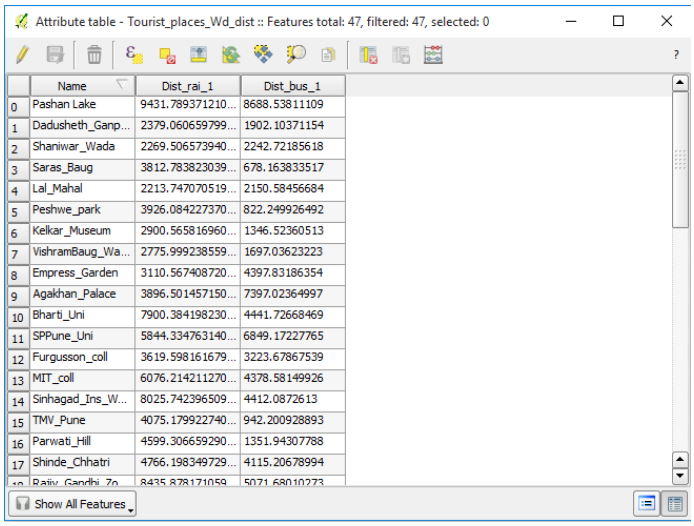
16. Open the attribute table of Tourist places layer and check if all the attributes are added to the table.

17. Repeat the same procedure for calculating distance between swarget_Bus_stand and the Tourist places.
18. Once both the distances are calculated, the attribute table of Tourist places should be as shown in the screen shot below.



	Name	Descriptio	ist_rail_stn_InputII	ist_rail_stn_Distanc	st_bus_stnd_Inputl	:t_bus_stnd_Distan
0	Pashan Lake	NULL	Railway_Sta	9431.78937121	Swarget_ST	8688.53811109
1	Dadusheth_Ganp...	NULL	Railway_Sta	2379.0606598	Swarget_ST	1902.10371154
2	Shaniwar_Wada	NULL	Railway_Sta	2269.50657394	Swarget_ST	2242.72185618
3	Saras_Baug	NULL	Railway_Sta	3812.78382304	Swarget_ST	678.163833517
4	Lal_Mahal	NULL	Railway_Sta	2213.74707052	Swarget_ST	2150.58456684
5	Peshwe_park	NULL	Railway_Sta	3926.08422737	Swarget_ST	822.249926492
6	Kelkar_Museum	NULL	Railway_Sta	2900.56581696	Swarget_ST	1346.52360513
7	VishramBaug_Wa...	NULL	Railway_Sta	2775.99923856	Swarget_ST	1697.03623223
8	Empress_Garden	NULL	Railway_Sta	3110.56740872	Swarget_ST	4397.83186354
9	Agakhan_Palace	NULL	Railway_Sta	3896.50145715	Swarget_ST	7397.02364997
10	Bharti_Uni	NULL	Railway_Sta	7900.38419823	Swarget_ST	4441.72668469
11	SPPune_Uni	NULL	Railway_Sta	5844.33476314	Swarget_ST	6849.17227765
12	Furgusson_coll	NULL	Railway_Sta	3619.59816168	Swarget_ST	3223.67867539
13	MIT_coll	NULL	Railway_Sta	6076.21421127	Swarget_ST	4378.58149926
14	Sinhagad_Ins_W...	NULL	Railway_Sta	8025.74239651	Swarget_ST	4412.0872613
15	TMV_Pune	NULL	Railway_Sta	4075.17992274	Swarget_ST	942.200928893
16	Parwati_Hill	NULL	Railway_Sta	4599.30665929	Swarget_ST	1351.94307788
17	Shinde_Chhatri	NULL	Railway_Sta	4766.19834973	Swarget_ST	4115.20678994
18	Rajiv_Gandhi_Zo...	NULL	Railway_Sta	8435.87817106	Swarget_ST	5071.68010273

19. The join which we have performed on the layer is virtual join, so we will save this layer as shapefile to keep all the joint records.
20. We can delete the attribute which are not required. So keep only the field ‘Name’ ‘Dist_rail_1’ and ‘Dist_bus_1’. Attribute table will look as follows:



	Name	Dist_rai_1	Dist_bus_1
0	Pashan Lake	9431.789371210...	8688.53811109
1	Dadusheth_Ganp...	2379.060659799...	1902.10371154
2	Shaniwar_Wada	2269.506573940...	2242.72185618
3	Saras_Baug	3812.783823039...	678.163833517
4	Lal_Mahal	2213.747070519...	2150.58456684
5	Peshwe_park	3926.084227370...	822.249926492
6	Kelkar_Museum	2900.565816960...	1346.52360513
7	VishramBaug_Wa...	2775.999238559...	1697.03623223
8	Empress_Garden	3110.567408720...	4397.83186354
9	Agakhan_Palace	3896.501457150...	7397.02364997
10	Bharti_Uni	7900.384198230...	4441.72668469
11	SPPune_Uni	5844.334763140...	6849.17227765
12	Furgusson_coll	3619.598161679...	3223.67867539
13	MIT_coll	6076.214211270...	4378.58149926
14	Sinhagad_Ins_W...	8025.742396509...	4412.0872613
15	TMV_Pune	4075.179922740...	942.200928893
16	Parwati_Hill	4599.306659290...	1351.94307788
17	Shinde_Chhatri	4766.198349729...	4115.20678994
18	Rajiv_Gandhi_Zo...	8435.878171059...	5071.68010273

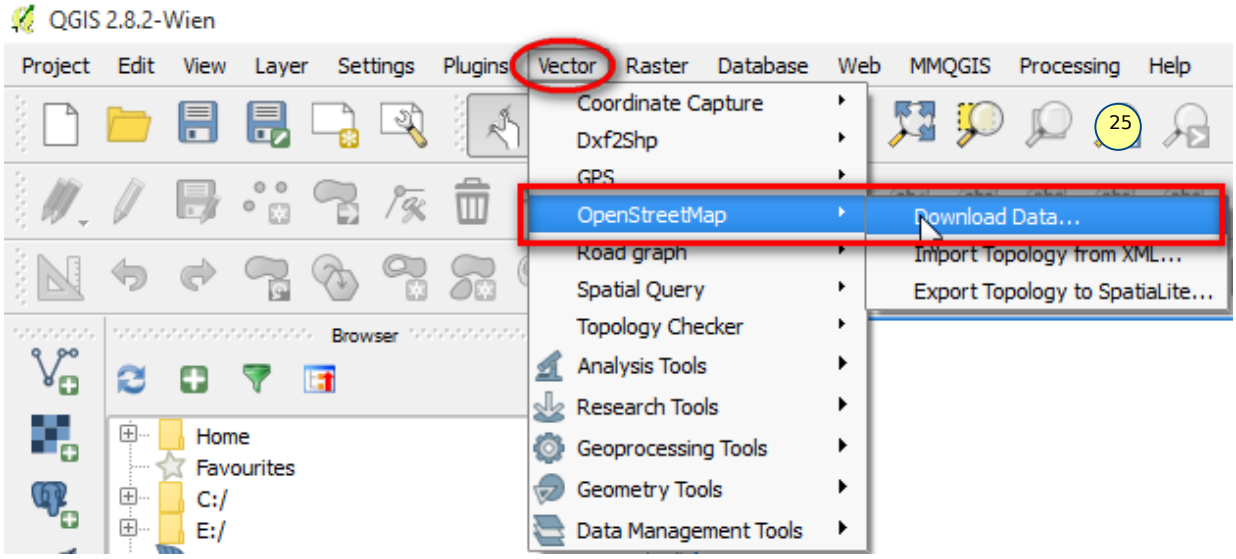
21. Now we have got distance between individual tourist places and the major public transport places. The distances calculated are in meters as the layer was in projected coordinate system.

B. Calculating Actual distances between the points

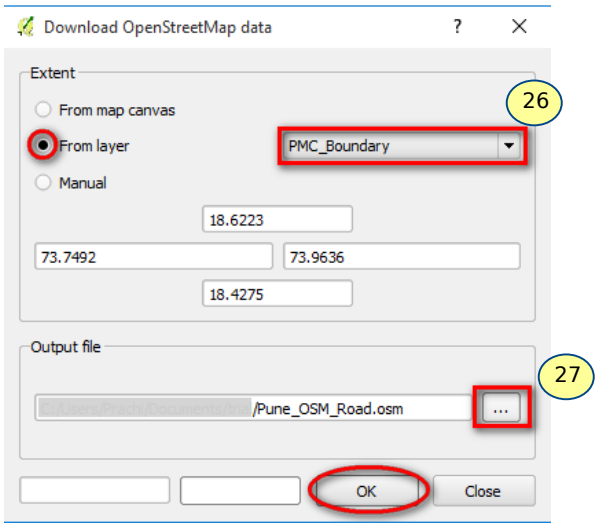
22. To find out shortest path between certain points we need road layer. And best possible road network available for use is 'Open Street Map'. We can download this network using QGIS.
23. Open the Pune PMC boundary in QGIS map interface from the given data set.
24. Goto Plugins and install '**OpenStreetMap'** plugin using search tool.

Note: To download any plugin from QGIS respesotery you will need internet connection. For more on how to connect your QGIS to internet and how to install plugins please refer 'IGET_GIS_001'

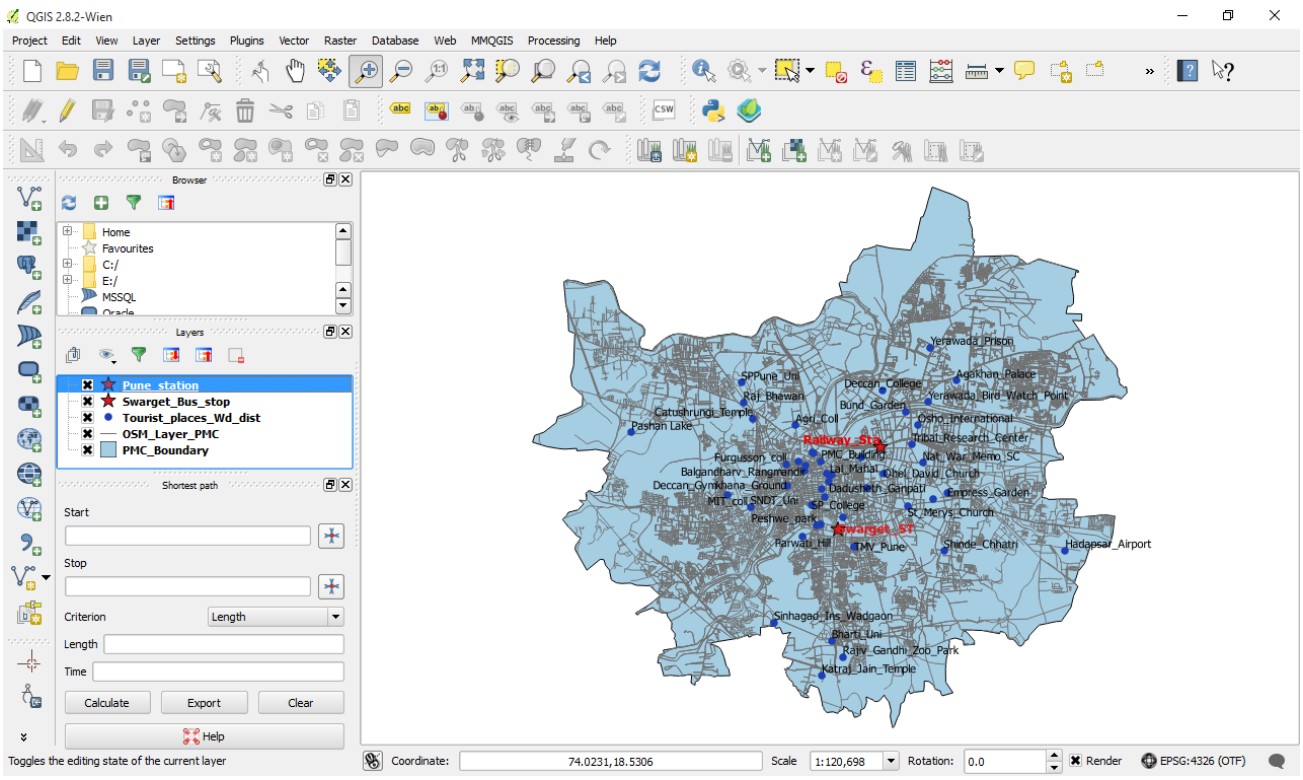
25. Once you install this plugin, it will be listed under '**Vector**' tab of Menu bar.
26. Navigate to '**Vector**' → '**OpenStreetMap**' → **'Download Data…'**



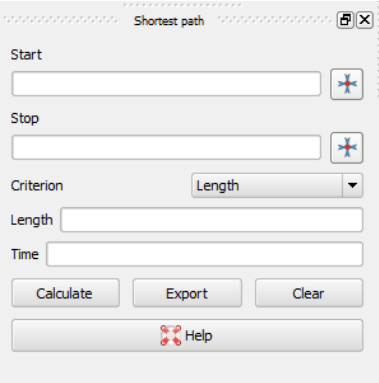
27. The new window will open up. Select Extent **'From Layer'** and select **'PMC_Boundary'** as the layer.
28. Save the output in appropriate folder with appropriate layer name and click '**OK**'



29. Depending on the internet speed it will take 5-10min for the download. Wait till the time layer is downloaded.
30. Save the downloaded .osm layer as shapefile (Only save polyline file and can exclude other downloaded files)
31. Demarcate the Public transport places with different symbol for better and easy understanding. Also label the feature for easier identification.



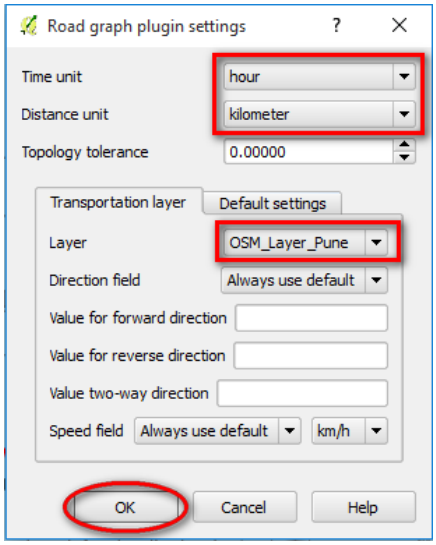
32. Now we will move on with finding the shortest distance from each point to railway station and the Swarget bus stand. Make sure that the 'Road graph plugin' is installed in your QGIS version. If not then install it from plugin manager.
33. The interface of installed plugin will look like the image below.



34. So this tool can be used to find the shortest path between the two required points. We will see how we can calculate this path and even export this route for further reference.

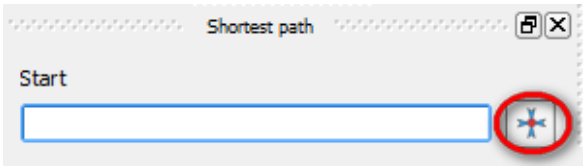
Note: *We have to have the shapefiles in projected coordinate systems for calculating distances.*

35. Before we actually calculate the routes we will do Road graph plugin setting and then proceed with route calculation.
36. Navigate to **Menu → Vector → Road Graph → Settings**
37. Set the **'Time unit'** as **'hour'** and **'Distance unit'** as **'Kilometer'.** We can change these units as per our convenience and requirements.
38. In '**Transportation layer'** tab select **'layer'** as '**OSM_Layer_Pune'**



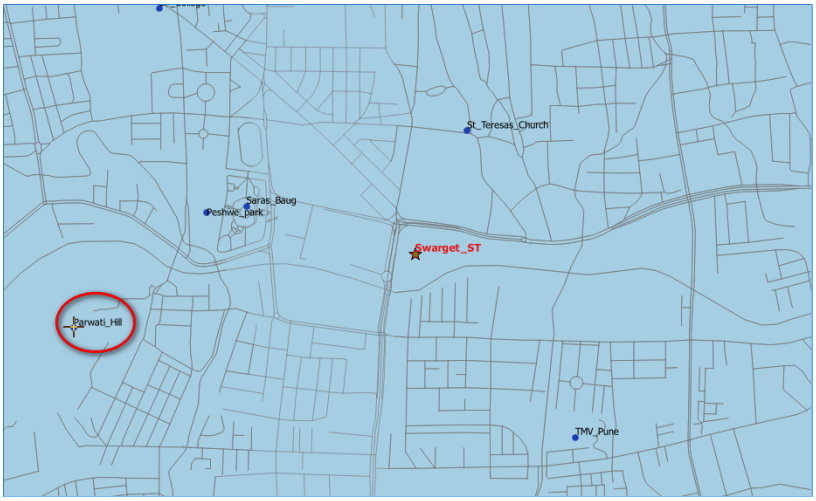
39. Click 'OK' and your plugin is ready to be used for calculating distances and routes.
40. Now we will find out distance between individual tourist place and the public transport station.

41. In shortest path window click on button  next to Start option



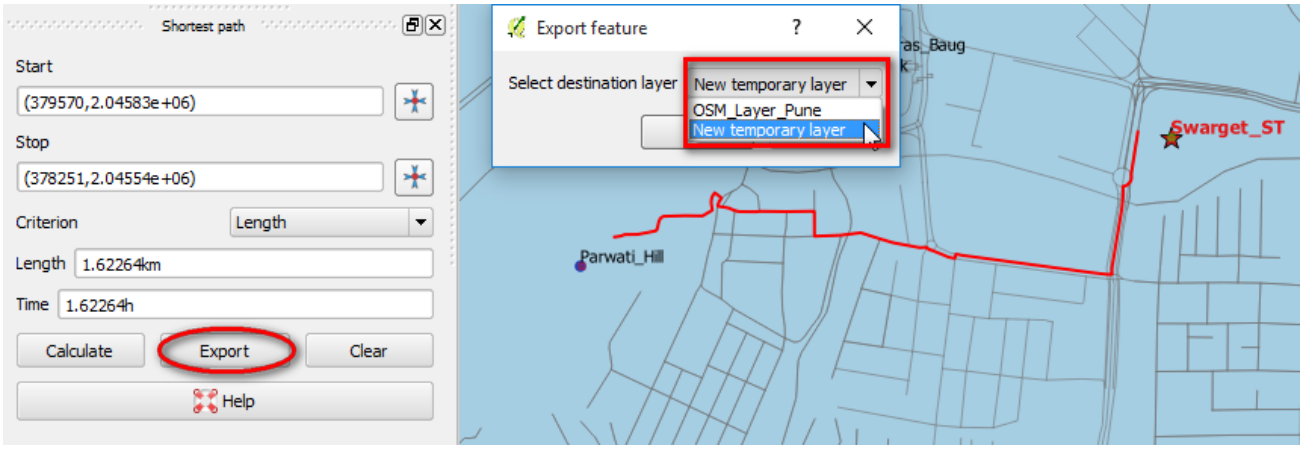
42. Zoom in to navigate to the Swarget bus stand point on the map canvas and click on that point. So that the Shortest Path tool considerers Swarget as the start point.

43. Now similarly we will select end point. Firstly we will consider the closest place eg. Parwati_Hill.



44. Click on **‘Calculate’** and visualize the shortest path in the map canvas.

45. We can also export this route for future analysis, if required.
46. Click on **'Export'** and save this route as **'New temporary layer'**



47. You can save this layer as shapefile if required.
48. Similarly compute the shortest routes from swarget to all the tourist places and from Pune_station to all the tourist places. Export it and save it as shapefie.
49. Prepare a map showing all the Tourist places and corresponding shortest possible paths connecting them to major public transport stations in Pune.

Task:

1. Create a map of all the tourist places within 5km area around Swarget and Pune station.
2. Generate the shortest path between Rajiv_Gandhi_Zoo_Park and Agakhan_Palace.