EXERCISE 13 ATTRIBUTE QUERY

Structure

13.1 INTRODUCTION

You have practised to digitise and create vector layers and to store attribute data as vector features in previous exercises. Let us now learn to carry out spatial analysis on GIS datasets. One of the first things while carrying out spatial analysis is to visualise and explore the datasets that can be done through query. Spatial analysis allows to solve specific problems which are used to support important decisions, using the capabilities of hardware, software and data. This exercise introduces you to the methods of attribute queries that allows you to examine general trends in the data.

Objectives

After working through this exercise, you should be able to:

- perform simple attribute query; and
- carry out complex attribute query;

13.2 REQUIREMENTS

To carry out this exercise, you need to have the following:

- a computer with QGIS installed in it, and
- internet connection for downloading data to be used in this exercise.

13.3 IMPORTANCE OF QUERY

The fundamental purpose of any GIS is to allow retrieval of desired information, which is achieved through the process of query. Queries can be categorised into spatial and non-spatial (attribute) query. Spatial query includes queries made on the spatial properties of the geographic object such as location, distance, etc. Non-spatial (attribute) query refers to the characteristics of any feature or phenomenon which are stored in form of a table in GIS database with a unique identifier key.

Both types of queries can be further sub-divided into a simple or a complex query depending upon the number of parameters used. If a query is made to search using just one parameter then it is called a *simple query* and if a query is made to search using more than one parameter i.e. two or more criteria then it is called a *complex query*.

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Query is important for visualising and exploring nature of data as it allows you to identify, select, and find features and also to examine general trends in the data and understand relationship between datasets without altering the data.

13.4 STEPS TO PERFORM ATTRIBUTE QUERY

You may note that when you perform a query then the particular type of data will be processed by that query. In this exercise, you will familiarise with attribute queries. Let us discuss the process of each of the type of query briefly here.

13.4.1 Simple Attribute Query

Query can be performed on a layer based on its attributes. In QGIS, simple query can be done with the attribute table. As you know attribute table displays features of a selected layer. Each row in the table represents one map feature with its attributes shown in several columns. The following example explains you a simple attribute query:

1. Download a sample point shape file showing places of the World from the link - **www.naturalearthdata.com/downloads/10m-cultural-vectors/** from the Natural Earth dataset for **Populated Places (2.68 MB) version 5.1.2**. Then extract the shape file from the zip archive and save it on the hard disk.
2. Open QGIS. Select ***Layer → Add layer → Add Vector Layer***. Add the source dataset by browsing and selecting the extracted shape file from the hard disk. Click on *Open* button and click on *Add* button to load the layer on QGIS canvas. The layer appears as shown in Fig. 13.1.

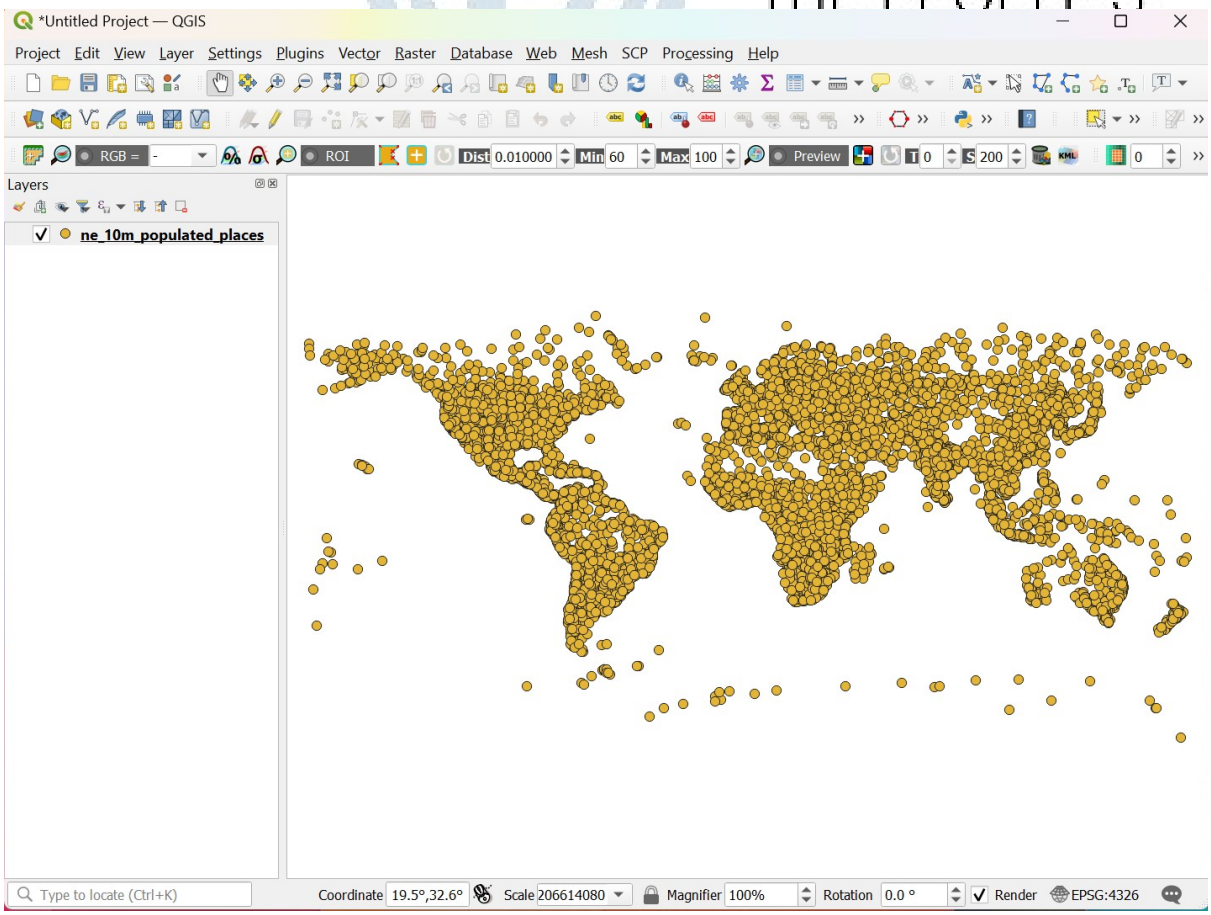

Fig. 13.1: QGIS showing point vector data

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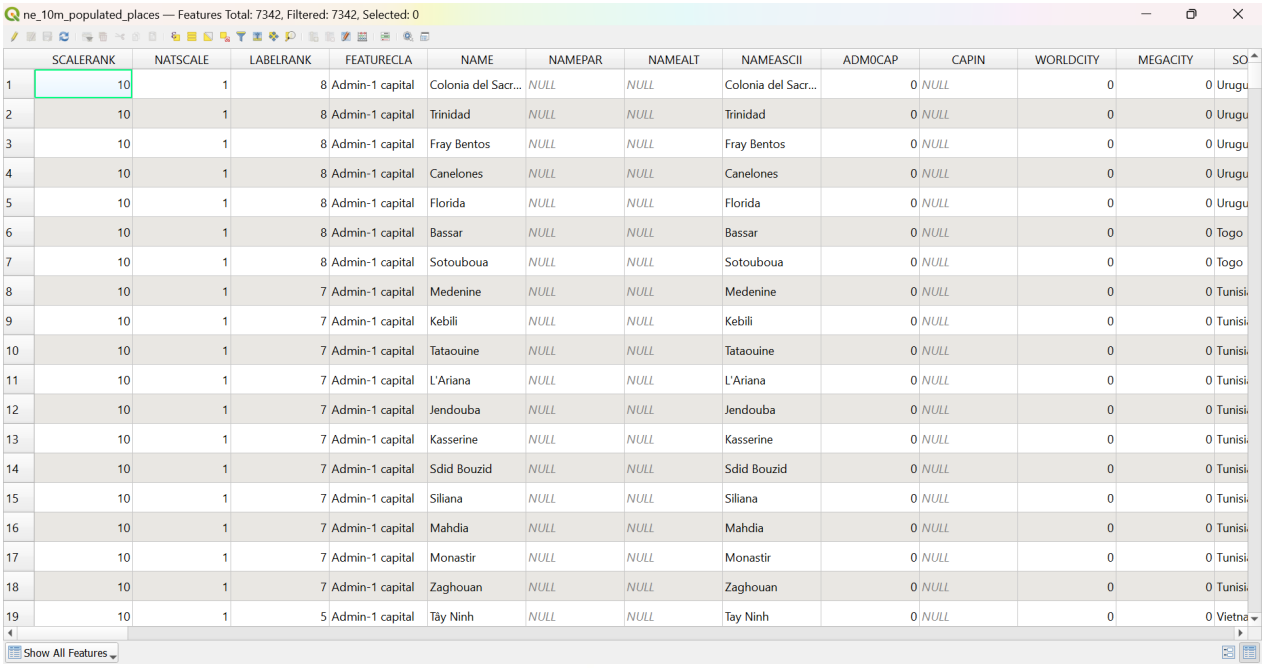
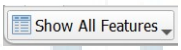
3. Right-click on the *layer name* (ne_10m_populated_places) and select *Open Attribute Table* which opens the attribute table as shown in Fig. 13.2.

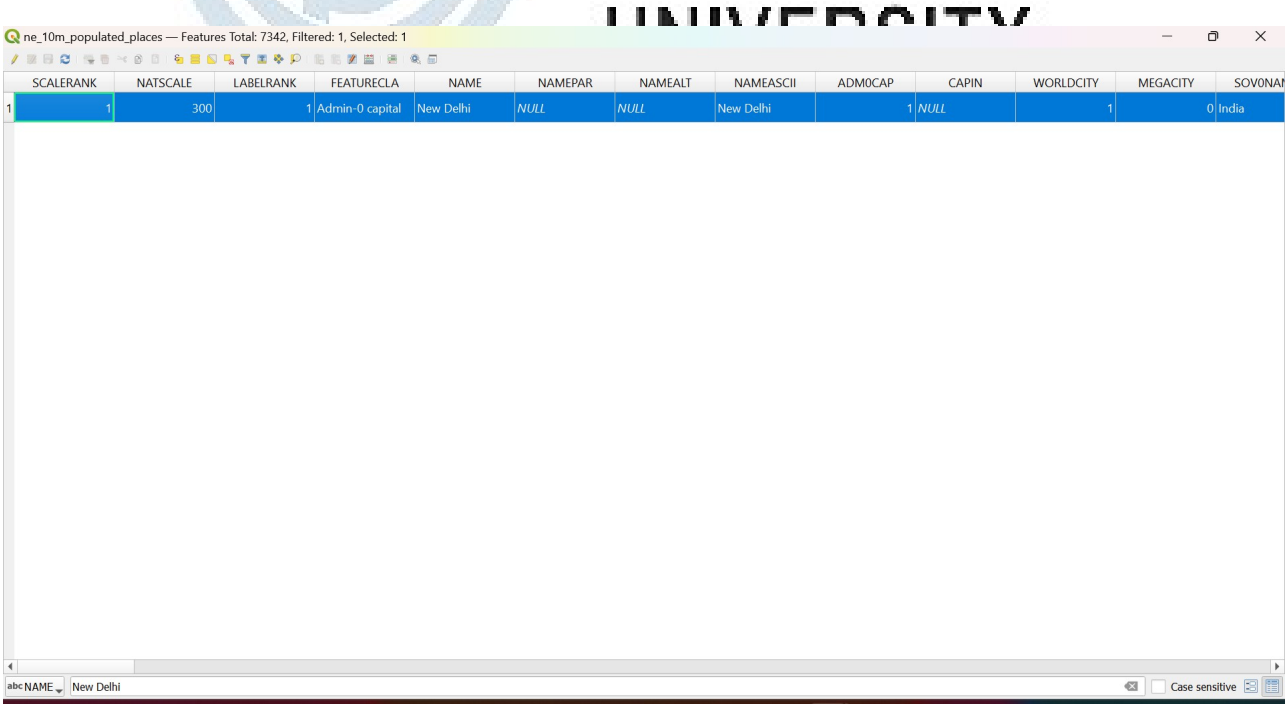


	SCALERANK	NATSCALE	LABELRANK	FEATURECLA	NAME	NAMEPAR	NAMEALT	NAMEASCII	ADM0CAP	CAPIN	WORLDCITY	MEGACITY	SO
1	10	1	8	Admin-1 capital	Colonia del Sacr...	NULL	NULL	Colonia del Sacr...	0	NULL	0	0	Urugu
2	10	1	8	Admin-1 capital	Trinidad	NULL	NULL	Trinidad	0	NULL	0	0	Urugu
3	10	1	8	Admin-1 capital	Fray Bentos	NULL	NULL	Fray Bentos	0	NULL	0	0	Urugu
4	10	1	8	Admin-1 capital	Canelones	NULL	NULL	Canelones	0	NULL	0	0	Urugu
5	10	1	8	Admin-1 capital	Florida	NULL	NULL	Florida	0	NULL	0	0	Urugu
6	10	1	8	Admin-1 capital	Bassar	NULL	NULL	Bassar	0	NULL	0	0	Togo
7	10	1	8	Admin-1 capital	Sotouboua	NULL	NULL	Sotouboua	0	NULL	0	0	Togo
8	10	1	7	Admin-1 capital	Medenine	NULL	NULL	Medenine	0	NULL	0	0	Tunisi
9	10	1	7	Admin-1 capital	Kebili	NULL	NULL	Kebili	0	NULL	0	0	Tunisi
10	10	1	7	Admin-1 capital	Tataouine	NULL	NULL	Tataouine	0	NULL	0	0	Tunisi
11	10	1	7	Admin-1 capital	L'Ariana	NULL	NULL	L'Ariana	0	NULL	0	0	Tunisi
12	10	1	7	Admin-1 capital	Jendouba	NULL	NULL	Jendouba	0	NULL	0	0	Tunisi
13	10	1	7	Admin-1 capital	Kasserine	NULL	NULL	Kasserine	0	NULL	0	0	Tunisi
14	10	1	7	Admin-1 capital	Sdid Bouzid	NULL	NULL	Sdid Bouzid	0	NULL	0	0	Tunisi
15	10	1	7	Admin-1 capital	Siliana	NULL	NULL	Siliana	0	NULL	0	0	Tunisi
16	10	1	7	Admin-1 capital	Mahdia	NULL	NULL	Mahdia	0	NULL	0	0	Tunisi
17	10	1	7	Admin-1 capital	Monastir	NULL	NULL	Monastir	0	NULL	0	0	Tunisi
18	10	1	7	Admin-1 capital	Zaghouan	NULL	NULL	Zaghouan	0	NULL	0	0	Tunisi
19	10	1	5	Admin-1 capital	Tây Ninh	NULL	NULL	Tay Ninh	0	NULL	0	0	Vietna

Fig. 13.2: Attribute table of the point data

4. Go to **Show All Features** icon 

on the left bottom corner of the Attribute window and click on *Field Filters*. Select **abcNAME** in the list. Type *New Delhi* in the text box. Press *Enter on the Keyboard* and Select *New Delhi* as shown in Fig. 13.3. This will select *New Delhi* point feature and it will be highlighted in yellow colour as shown in Fig. 13.4.



	SCALERANK	NATSCALE	LABELRANK	FEATURECLA	NAME	NAMEPAR	NAMEALT	NAMEASCII	ADM0CAP	CAPIN	WORLDCITY	MEGACITY	SOVONAI
1	1	300	1	Admin-0 capital	New Delhi	NULL	NULL	New Delhi	1	NULL	1	0	India

Fig. 13.3: Search for New Delhi

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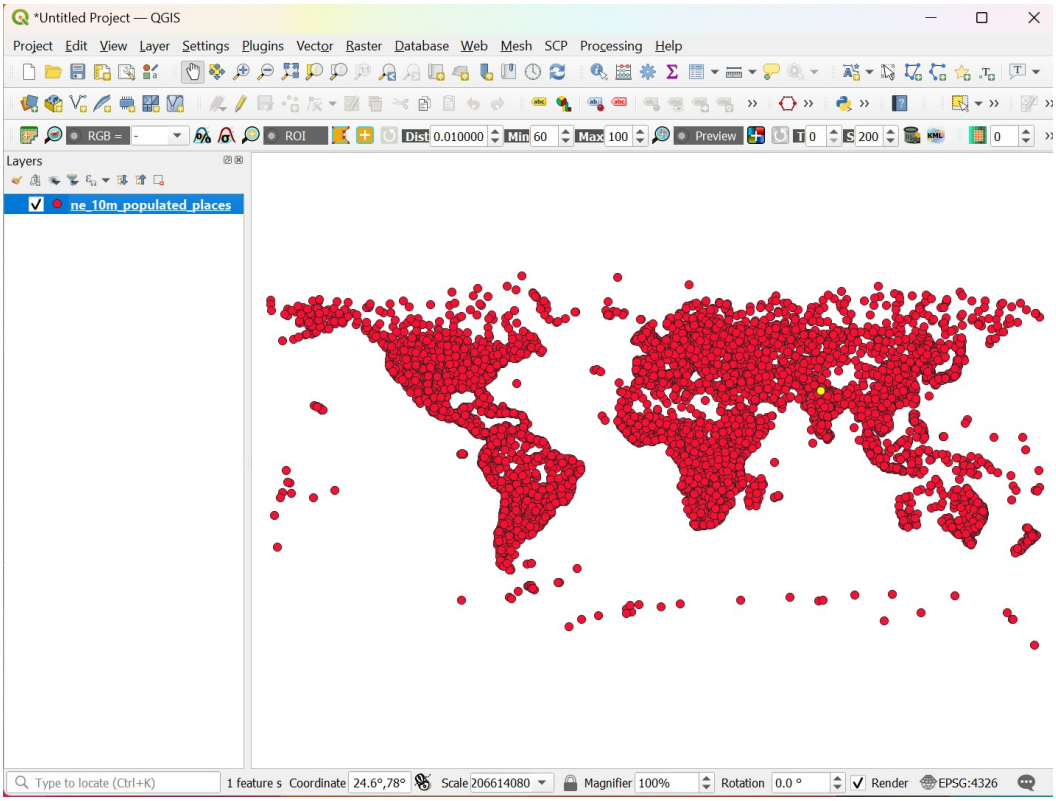

Fig. 13.4: Result of the query showing New Delhi as highlighted in yellow colour

5. Click *Close* button to finish.

13.4.2 Complex Attribute Query

In QGIS, complex attribute query can be performed using query builder. The query builder defines a subset of a table using a SQL-like WHERE clause. The result will be plotted on the QGIS map and you can also save it as a separate layer.

1. Open the same dataset as in the previous example. Click on *Filter* in *Layer* menu. This will open the ***Query builder*** as shown in Fig. 13.5.

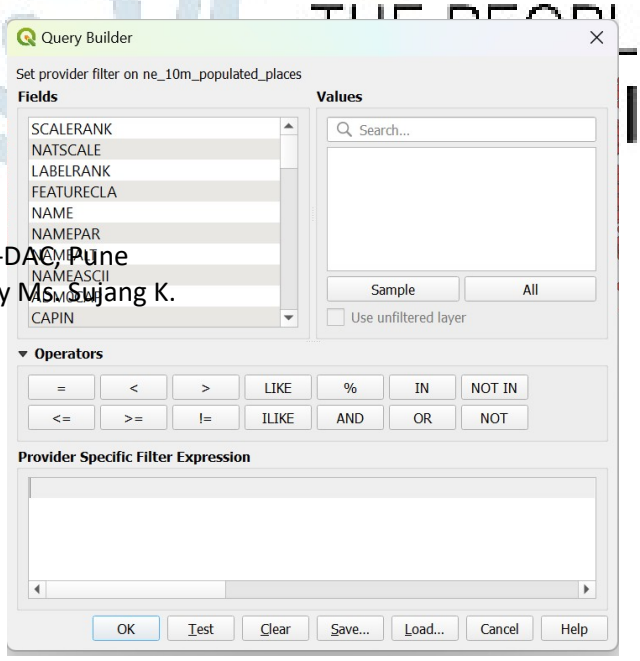

Fig. 13.5: Query builder

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2. The Fields list contains all attributes of the attribute table to be searched. To add an attribute to *SQL where clause* field, double click its name in the ***Fields*** list. Use various *Fields*, *Values* and *Operators* as shown in the menu box of Fig. 13.5 to construct the query or else type the query in *SQL* box.
3. The Values list box shows the values of an attribute. To list all possible values of an attribute, select the attribute in the Fields list and click the *All* button. To add a value to the SQL where clause field, double click its name in the *Values* list.
4. The Operators section contains all usable operators. To add an operator to the SQL where clause field, click the appropriate button. Relational operators namely, =, >, <, etc., string comparison operator namely, LIKE, ILIKE, etc., logical operators namely, AND, OR, NOT, etc. are available.
5. The *Test* button shows a message box with the number of features satisfying the current query, which is usable in the process of query construction. The *Clear* button clears the text in the SQL where clause field. The *Save* and *Load* buttons allow saving and loading SQL queries, respectively. The *OK* button closes the window and selects the features satisfying the query. The *Cancel* button closes the window without changing the current selection.
6. To construct a complex query to select places in India having population more than 10 Lakhs, write a SQL query "SOV0NAME = 'India' AND POP_MAX > 1000000" in the query builder as shown in Fig. 13.6.

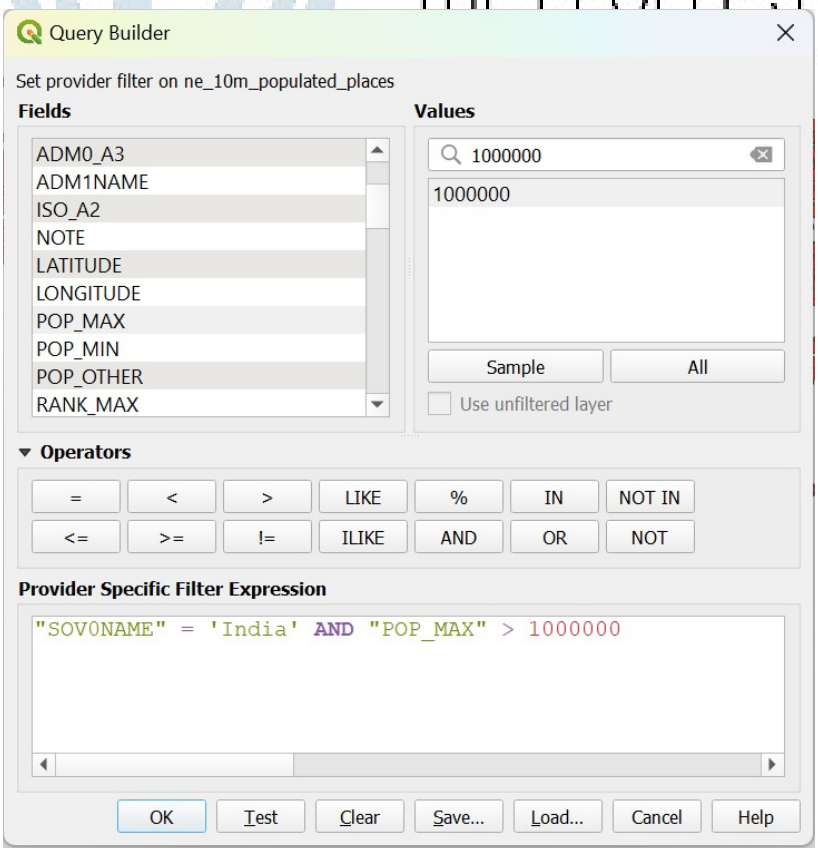

Fig. 13.6: Complex query using relational and logical operators

7. Click on *Test* button and a dialog box showing the matching features will be displayed as in Fig. 13.7.

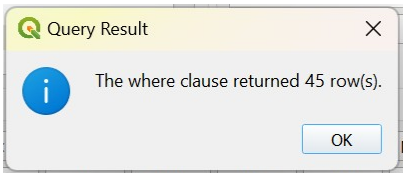

Fig. 13.7: Test result dialog box

8. Click on *OK* button on the query builder, to see the result on QGIS map, which appears as in Fig. 13.8 and the attribute table appears as shown in Fig. 13.9 after checking *Show selected only*.

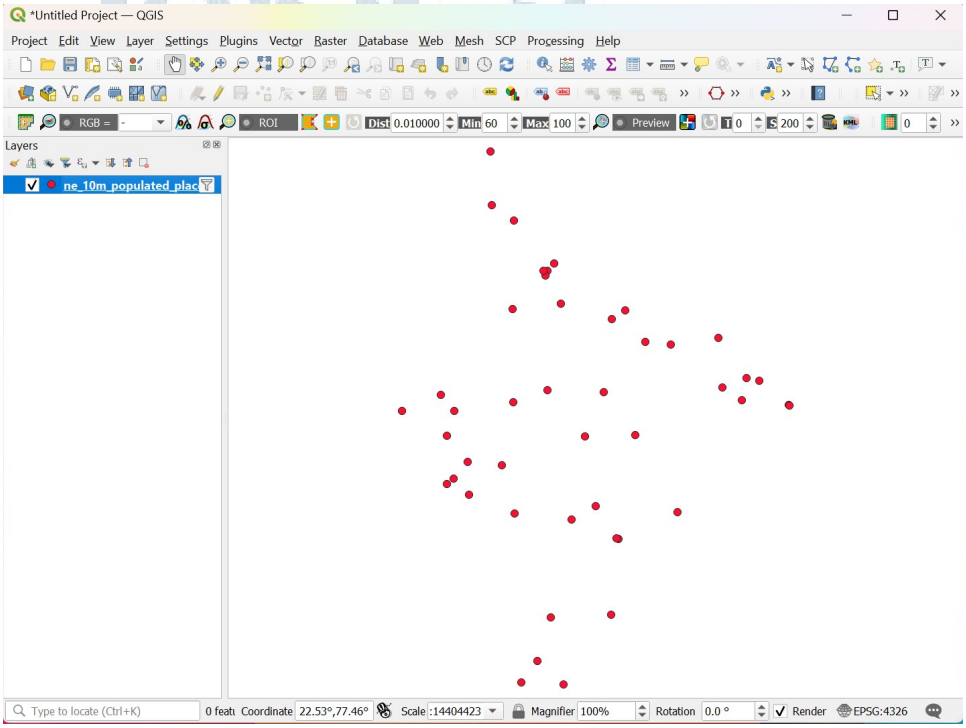

Fig. 13.8: Query builder result as displayed in QGIS map

ne_10m_populated_places — Features Total: 45, Filtered: 45, Selected: 0

	MEGACITY	SOV0NAME	SOV_A3	ADM0NAME	ADM0_A3	ADM1NAME	ISO_A2	NOTE	LATITUDE	LONGITUDE	POP_MAX	POP_MIN	POP_OTH
1	0	India	IND	India	IND	Maharashtra	IN	NULL	19.250232	73.160175	1576614	1576614	437
2	0	India	IND	India	IND	West Bengal	IN	NULL	22.580390	88.329947	4841638	1027672	1117
3	0	India	IND	India	IND	Telangana	IN	NULL	18.009998	79.579990	1203853	865527	150
4	1	India	IND	India	IND	Maharashtra	IN	NULL	17.672352	75.898062	1057000	961112	96
5	1	India	IND	India	IND	Maharashtra	IN	NULL	19.897642	75.318356	1113000	1016441	119
6	1	India	IND	India	IND	Maharashtra	IN	NULL	20.002365	73.778036	1473000	1289497	212
7	1	India	IND	India	IND	Uttar Pradesh	IN	NULL	25.456941	81.838061	1201000	1073438	791
8	1	India	IND	India	IND	Uttar Pradesh	IN	NULL	28.662327	77.406445	1341000	1199191	245
9	1	India	IND	India	IND	Uttar Pradesh	IN	NULL	27.172366	78.013075	1592000	1430055	345
10	1	India	IND	India	IND	Uttar Pradesh	IN	NULL	29.002358	77.698055	1398000	1223184	326
11	1	India	IND	India	IND	Jharkhand	IN	NULL	23.802339	86.418040	1246000	219636	1059
12	1	India	IND	India	IND	Dadra and Nag...	IN	NULL	22.311965	73.178073	1756000	1409476	416
13	1	India	IND	India	IND	Dadra and Nag...	IN	NULL	22.311965	70.798063	1260000	1099882	106
14	1	India	IND	India	IND	Haryana	IN	NULL	28.435279	77.314721	1394000	1394000	
15	1	India	IND	India	IND	Jammu and Kas...	IN	NULL	34.101917	74.813064	1140000	975857	305
16	1	India	IND	India	IND	Andhra Pradesh	IN	NULL	16.521905	80.628057	1137000	874587	247
17	1	India	IND	India	IND	Kerala	IN	NULL	10.016953	76.221970	1519000	604696	575
18	1	India	IND	India	IND	Punjab	IN	NULL	30.929708	75.870312	1649000	1545368	366
19	1	India	IND	India	IND	Uttar Pradesh	IN	NULL	26.856985	80.913053	2695000	2472011	714

Show All Features

Fig. 13.9: Query builder result displayed on attribute table

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9. The selected features can be saved as any OGR supported vector formats and also transformed into another Coordinate Reference System (CRS). For performing this right click on the selected layer and click on ***Save selection as*** to define the name of the output file, its format and CRS.

13.5 LABORATORY EXERCISES

Submit answers to the following to your counsellor for evaluation:

- snapshot of the result of the simple attribute query.
- snapshot of the result of complex attribute query.

13.6 EXERCISES: EXPLORE YOURSELF

- Explore use of different fields, values and operations in Query Builder and note their results.

13.7 FURTHER/SUGGESTED READING

- QGIS User Guide, https://docs.qgis.org/3.22/pdf/en/QGIS-3.22-DesktopUserGuide-en.pdf
- https://docs.qgis.org/3.28/en/docs/user_manual
- https://docs.qgis.org/3.28/en/docs/training_manual/

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