

International workshop on GIS, Remote Sensing and Geoarchaeology



14-19 November 2019

Department of Archaeology, University of Kerala

QGIS, .CSV and website tips
with external links

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McDonald Institute for
Archaeological Research



UNIVERSITY OF
CAMBRIDGE

Marie Skłodowska-
Curie Actions



ULL

Universidad
de La Laguna

Excel field reports

Your Excel field data

- Megalithic survey data in Pathanamthitta area!

- Columns (*attributes*)

- Rows (*observations*)

A	B	C	D	E	F	G
No.	Site	Geocoordinates	Type	Panchayat	Taluk	Previous Works
1	1 Ikkad Locality-I	N 09° 10' 56.34" E 076° 45' 23.46"	Urn burial	Kodumon	Adoor	New Site
2	2 Ikkad vadakku	N 09° 11' 22.16" E 076° 45' 26.62"	Urn Burial	Kodumon	Adoor	New Site
3	3 Kodumon Chira Locality-I	N 09° 10' 08.30" E 076° 47' 49.52"	Urn Burial	Kodumon	Adoor	New Site
4	4 Kodumon Chira Locality-II	N 09° 10' 31.11" E 076° 47' 41.30"	Menhir	Kodumon	Adoor	New Site
5	5 Ottathekku-Locality-I	N 09° 10.36.02' E 076° 49.03.14"	Urn Burial	Kodumon	Adoor	New Site
6	6 Ottathekku-Locality-II	N 09° 10.33.48" E 076° 48'.56.44"	Urn Burial	Kodumon	Adoor	New Site
7	7 Neduumonkavu	N 09° 10.24.07" E 076° 49'.19.38"	Cairn Circles	Kalanjoor	Adoor	New Site
8	8 Manakkad	N 09° 12' 04.40" E 076° 46'44 38"	Urn Burial	Kodumon	Adoor	New Site
9	9 Ettimoodu Locality-I	N 09° 07' 30.23" E 076° 46' 44.06"	Urn Burial	Ezhamkulam	Adoor	New Site
10	10 Ettimoodu Locality-II	N 09° 07' 23.86" E 076° 46' 24.53"	Urn Burial	Ezhamkulam	Adoor	New Site
11	11 Ettimoodu Locality-III	N 09° 07' 28.23" E 076° 47' 30.24"	Cist Burial	Ezhamkulam	Adoor	New Site
12	12 Ettimoodu Locality-IV	N 09° 07' 32.25" E 076° 46' 57.25"	Urn Burial	Ezhamkulam	Adoor	New Site
13	13 Ettimoodu Locality-v	N 09° 07' 29.01" E 076° 46' 58.20"	Urn Burial	Ezhamkulam	Adoor	New Site
14	14 Arukalikkal	N 09° 08' 26.24" E 076° 45' 32.48"	Urn Burial	Ezhamkulam	Adoor	New Site
15	15 Kuthiramukku	N 09° 07' 59.70" E 076° 54' 02.33"	Urn Burial	Ezhamkulam	Adoor	New Site
16	16 Elangamangalam	N 09° 04' 39.56" E 076° 46' 02.04"	Urn Burial	Ezhamkulam	Adoor	New Site
17	17 Kadika	N 09° 06' 30.00" E 076° 45' 44.39"	Urn Burial	Ezhamkulam	Adoor	New Site
18	18 Chayalod Locality-I	N 09° 07' 43" E 076° 47' 57.76"	Cist Burial	Enadimangalam	Adoor	New Site
19	19 Chayalod Locality-II	N 09° 07' 42.33" E 076° 48' 05.15"	Cist Burial	Enadimangalam	Adoor	New Site
20	20 Chayalod Locality-III	N 09° 07' 35.77" E 076° 48' 14.96"	Cist Burial	Enadimangalam	Adoor	New Site

Field coordinates

- Geocoordinates

- But we need two columns!

- One for *latitude (y)*

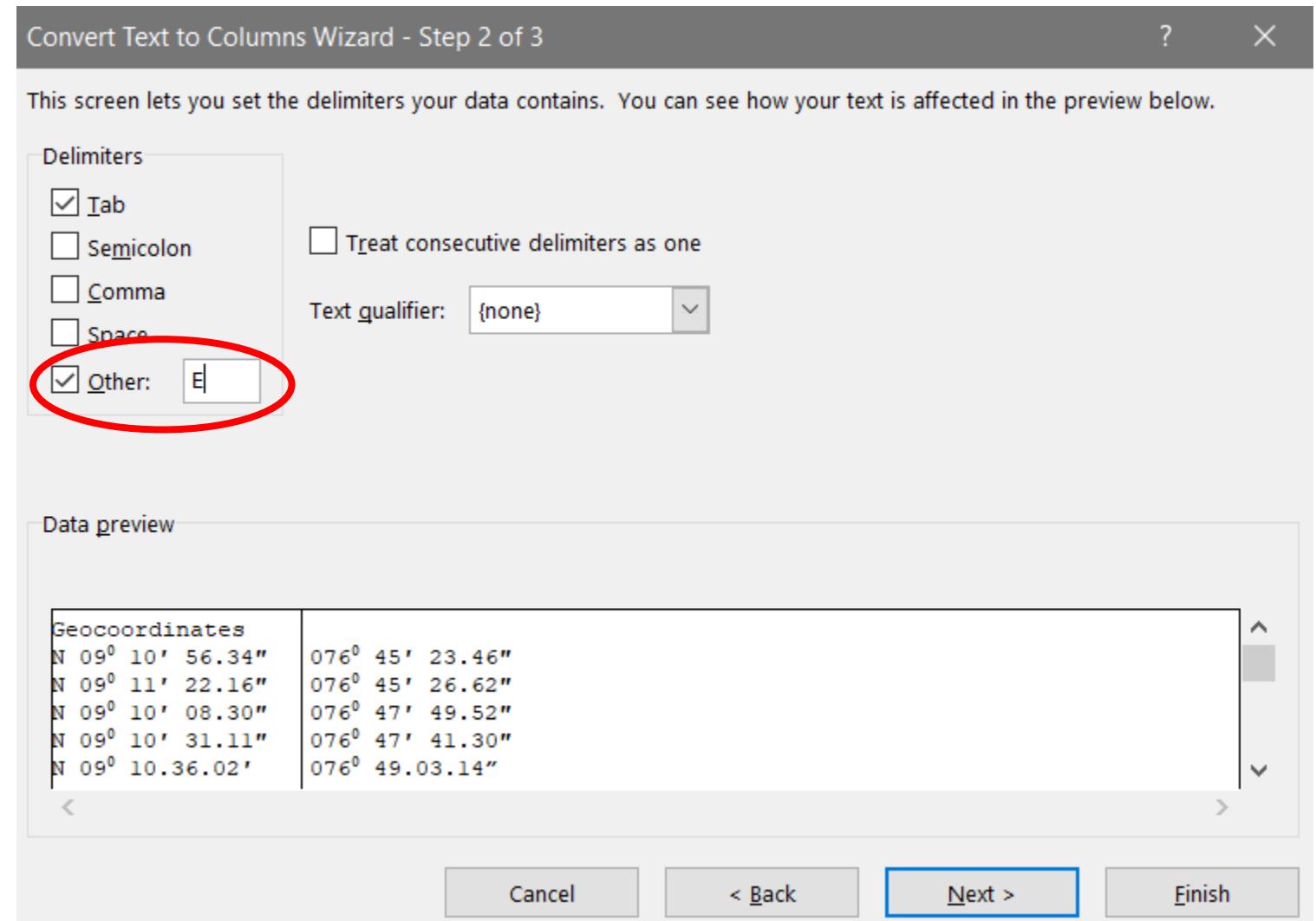
- One for *longitude (x)*

A	B	C	D	E	F	G
No.	Site	Geocoordinates	Type	Panchayat	Taluk	Previous Works
1						
2	1 Ikkad Locality-I	N 09° 10' 56.34" E 076° 45' 23.46"	Urn burial	Kodumon	Adoor	New Site
3	2 Ikkad vadakku	N 09° 11' 22.16" E 076° 45' 26.62"	Urn Burial	Kodumon	Adoor	New Site
4	3 Kodumon Chira Locality-I	N 09° 10' 08.30" E 076° 47' 49.52"	Urn Burial	Kodumon	Adoor	New Site
5	4 Kodumon Chira Locality-II	N 09° 10' 31.11" E 076° 47' 41.30"	Menhir	Kodumon	Adoor	New Site
6	5 Ottathekku-Locality-I	N 09° 10.36.02' E 076° 49.03.14"	Urn Burial	Kodumon	Adoor	New Site
7	6 Ottathekku-Locality-II	N 09° 10.33.48" E 076° 48'.56.44"	Urn Burial	Kodumon	Adoor	New Site
8	7 Neduumonkavu	N 09° 10.24.07" E 076° 49'.19.38"	Cairn Circles	Kalanjoor	Adoor	New Site
9	8 Manakkad	N 09° 12' 04.40" E 076° 46'44 38"	Urn Burial	Kodumon	Adoor	New Site
10	9 Ettimoodu Locality-I	N 09° 07' 30.23" E 076° 46' 44.06"	Urn Burial	Ezhamkulam	Adoor	New Site
11	10 Ettimoodu Locality-II	N 09° 07' 23.86" E 076° 46' 24.53"	Urn Burial	Ezhamkulam	Adoor	New Site
12	11 Ettimoodu Locality-III	N 09° 07' 28.23" E 076° 47' 30.24"	Cist Burial	Ezhamkulam	Adoor	New Site
13	12 Ettimoodu Locality-IV	N 09° 07' 32.25" E 076° 46' 57.25"	Urn Burial	Ezhamkulam	Adoor	New Site
14	13 Ettimoodu Locality-v	N 09° 07' 29.01" E 076° 46' 58.20"	Urn Burial	Ezhamkulam	Adoor	New Site
15	14 Arukalikkal	N 09° 08' 26.24" E 076° 45' 32.48"	Urn Burial	Ezhamkulam	Adoor	New Site
16	15 Kuthiramukku	N 09° 07' 59.70" E 076° 54' 02.33"	Urn Burial	Ezhamkulam	Adoor	New Site
17	16 Elangamangalam	N 09° 04' 39.56" E 076° 46' 02.04"	Urn Burial	Ezhamkulam	Adoor	New Site
18	17 Kadika	N 09° 06' 30.00" E 076° 45' 44.39"	Urn Burial	Ezhamkulam	Adoor	New Site
19	18 Chayalod Locality-I	N 09° 07' 43" E 076° 47' 57.76"	Cist Burial	Enadimangalam	Adoor	New Site
20	19 Chayalod Locality-II	N 09° 07' 42.33" E 076° 48' 05.15"	Cist Burial	Enadimangalam	Adoor	New Site
21	20 Chayalod Locality-III	N 09° 07' 35.77" E 076° 48' 14.96"	Cist Burial	Enadimangalam	Adoor	New Site

Split text in columns

- We can use [Excel tools](#) to Split in two columns
- Create [new empty column](#) next to Geocordinates column (*so we can automatically paste the next split data*)
- And then:

Data / Data Tools / Text to Columns / Delimited



Latitude and longitude columns

- Add names for the new two columns
- Is that all? Are you **sure**?
- Ideally, LAT and LONG columns **must** only have numbers
- These numbers can be expressed as:

Degree minute seconds

09 10 56.34

	A	B	C	D	E	F	G
1	No.	Site	[New name] LONG	[New name] LAT	Panchayat	Taluk	Previous Works
2	1	Ikkad Locality-I	N 09° 10' 56.34"	076° 45' 23.40"	Kodumon	Adoor	New Site
3	2	Ikkad vadaku	N 09° 11' 22.16"	076° 45' 26.62"	Kodumon	Adoor	New Site
4	3	Kodumon Chira Locality-I	N 09° 10' 08.30"	076° 47' 49.52"	Kodumon	Adoor	New Site
5	4	Kodumon Chira Locality-II	N 09° 10' 31.11"	076° 47' 41.30"	Kodumon	Adoor	New Site
6	5	Ottathekku-Locality-I	N 09° 10.36.02'	076° 49.03.14"	Kodumon	Adoor	New Site
7	6	Ottathekku-Locality-II	N 09° 10.33,48"	076° 48' 56.44"	Kodumon	Adoor	New Site
8	7	Neduumonkavu	N 09° 10.24.07"	076° 49' 19.38"	Kalanjoor	Adoor	New Site
9	8	Manakkad	N 09° 12' 04.40"	076° 46'44 38"	Kodumon	Adoor	New Site
10	9	Ettimoodu Locality-I	N 09° 07' 30.23"	076° 46' 44.06"	Ezhamkulam	Adoor	New Site
11	10	Ettimoodu Locality-II	N 09° 07' 23.86"	076° 46' 24.53"	Ezhamkulam	Adoor	New Site
12	11	Ettimoodu Locality-III	N 09° 07' 28.23"	076° 47' 30.24"	Ezhamkulam	Adoor	New Site
13	12	Ettimoodu Locality-IV	N 09° 07' 32.25"	076° 46' 57.25"	Ezhamkulam	Adoor	New Site
14	13	Ettimoodu Locality-v	N 09° 07' 29.01"	076° 46' 58.20"	Ezhamkulam	Adoor	New Site
15	14	Arukalikkal	N 09° 08' 26.24"	076° 45' 32.48"	Ezhamkulam	Adoor	New Site
16	15	Kuthiramukku	N 09° 07' 59.70"	076° 54' 02.33"	Ezhamkulam	Adoor	New Site
17	16	Elangamangalam	N 09° 04' 39.56"	076° 46' 02.04"	Ezhamkulam	Adoor	New Site
18	17	Kadika	N 09° 06' 30.00"	076° 45' 44.39"	Ezhamkulam	Adoor	New Site
19	18	Chayalod Locality-I	N 09° 07' 43"	076° 47' 57.76"	Enadimangalam	Adoor	New Site
20	19	Chayalod Locality-II	N 09° 07' 42.33"	076° 48' 05.15"	Enadimangalam	Adoor	New Site
21	20	Chayalod Locality-III	N 09° 07' 35.77"	076° 48' 14.96"	Enadimangalam	Adoor	New Site

Clean Excel columns

- We can use [Excel tools](#) to clean columns

Replace

- We want all the coordinates fields to look like:

Degree minute seconds

09 10 56.34

09[SPACE]10[SPACE]56.34

C	D
[New name] LONG	[New name] LAT
N 09° 10' 56.34"	076° 45' 23.46"
N 09° 11' 22.16"	076° 45' 26.62"
N 09° 10' 08.30"	076° 47' 49.52"
N 09° 10' 31.11"	
N 09° 10.36.02'	
N 09° 10.33,48"	
N 09° 10.24.07"	
N 09° 12' 04.40"	
N 09° 07' 30.23"	
N 09° 07' 23.86"	
N 09° 07' 28.23"	
N 09° 07' 32.25"	
N 09° 07' 29.01"	076° 46' 58.20"
N 09° 08' 26.24"	076° 45' 32.48"
N 09° 07' 59.70"	
N 09° 04' 39.56"	
N 09° 06' 30.00"	
N 09° 07' 43"	
N 09° 07' 42.33"	
N 09° 07' 35.77"	

The image shows two 'Find and Replace' dialog boxes overlaid on an Excel spreadsheet. The top dialog is for column C (LONG) and the bottom one is for column D (LAT). Both dialogs have 'Find what:' set to 'N' and 'Replace with:' empty, with a red circle highlighting this area. The 'Find Next' button is highlighted in blue in both dialogs. The 'Replace All' button is also visible in the bottom dialog.

Lat and Long columns

- Clean **x y** columns!

	A	B	C	D	E	F	G	H
1	No.	Site	Lat	Long	Type	Panchayat	Taluk	Previous Works
2	1	Ikkad Locality-I	09 10 56.34	76 45 23.46	Urn burial	Kodumon	Adoor	New Site
3	2	Ikkad vadakku	09 11 22.16	76 45 26.62	Urn Burial	Kodumon	Adoor	New Site
4	3	Kodumon Chira Locality-I	09 10 08.30	76 47 49.52	Urn Burial	Kodumon	Adoor	New Site
5	4	Kodumon Chira Locality-II	09 10 31.11	76 47 41.30	Menhir	Kodumon	Adoor	New Site
6	5	Ottathekku-Locality-I	09 10 36.02	76 49 03.14	Urn Burial	Kodumon	Adoor	New Site
7	6	Ottathekku-Locality-II	09 10 33.48	76 48 56.44	Urn Burial	Kodumon	Adoor	New Site
8	7	Neduumonkavu	09 10 24.07	76 49 19.38	Cairn Circles	Kalanjoor	Adoor	New Site
9	8	Manakkad	09 12 04.40	76 46 44.38	Urn Burial	Kodumon	Adoor	New Site
10	9	Ettimoodu Locality-I	09 07 30.23	76 46 44.06	Urn Burial	Ezhamkulam	Adoor	New Site
11	10	Ettimoodu Locality-II	09 07 23.86	76 46 24.53	Urn Burial	Ezhamkulam	Adoor	New Site
12	11	Ettimoodu Locality-III	09 07 28.23	76 47 30.24	Cist Burial	Ezhamkulam	Adoor	New Site
13	12	Ettimoodu Locality-IV	09 07 32.25	76 46 57.25	Urn Burial	Ezhamkulam	Adoor	New Site
14	13	Ettimoodu Locality-v	09 07 29.01	76 46 58.20	Urn Burial	Ezhamkulam	Adoor	New Site
15	14	Arukalkkal	09 08 26.24	76 45 32.48	Urn Burial	Ezhamkulam	Adoor	New Site
16	15	Kuthiramukku	09 07 59.70	76 54 02.33	Urn Burial	Ezhamkulam	Adoor	New Site
17	16	Elangamangalam	09 04 39.56	76 46 02.04	Urn Burial	Ezhamkulam	Adoor	New Site
18	17	Kadika	09 06 30.00	76 45 44.39	Urn Burial	Ezhamkulam	Adoor	New Site
19	18	Chayalod Locality-I	09 07 43	76 47 57.76	Cist Burial	Enadimangalam	Adoor	New Site
20	19	Chayalod Locality-II	09 07 42.33	76 48 05.15	Cist Burial	Enadimangalam	Adoor	New Site
21	20	Chayalod Locality-III	09 07 35.77	76 48 14.96	Cist Burial	Enadimangalam	Adoor	New Site
22	21	Chayalod Locality-IV	09 07 49.01	76 48 16.33	Menhir	Enadimangalam	Adoor	New Site
23	22	Kunnida Locality-I	09 07 09.19	76 48 39.05	Cist Burial	Enadimangalam	Adoor	New Site
24	23	Kunnida Locality-II	09 07 01.82	76 48 34.14	Cist Burial	Enadimangalam	Adoor	New Site

Observations consistency

- Last check!
- Consistency in your categories (*observations*) for each field
- Check the use of *capitals*, *double spaces*, *misspellings*, etc

	A	B	C	D	E	F	G	H
1	No.	Site	Lat	Long	Type	Panchayat	Taluk	Previous Works
2	1	Ikkad Locality-I	09 10 56.34	76 45 23.46	Urn burial	Kodumon	Adoor	New Site
3	2	Ikkad vadakku	09 11 22.16	76 45 26.62	Urn Burial	Kodumon	Adoor	New Site
4	3	Kodumon Chira Locality-I	09 10 08.30	76 47 49.52	Urn Burial	Kodumon	Adoor	New Site
5	4	Kodumon Chira Locality-II	09 10 31.11	76 47 41.30	Menhir	Kodumon	Adoor	New Site
6	5	Ottathekku-Locality-I	09 10 36.02	76 49 03.14	Urn Burial	Kodumon	Adoor	New Site
7	6	Ottathekku-Locality-II	09 10 33.48	76 48 56.44	Urn Burial	Kodumon	Adoor	New Site
8	7	Neduumonkavu	09 10 24.07	76 49 19.38	Cairn Circles	Kalanjoor	Adoor	New Site
9	8	Manakkad	09 12 04.40	76 46 44.35	Urn Burial	Kodumon	Adoor	New Site
10	9	Ettimoodu Locality-I	09 07 30.23	76 46 44.05	Urn Burial	Ezhamkulam	Adoor	New Site
11	10	Ettimoodu Locality-II	09 07 23.86	76 46 24.53	Urn Burial	Ezhamkulam	Adoor	New Site
12	11	Ettimoodu Locality-III	09 07 28.23	76 47 30.24	Cist Burial	Ezhamkulam	Adoor	New Site
13	12	Ettimoodu Locality-IV	09 07 32.25	76 46 57.25	Urn Burial	Ezhamkulam	Adoor	New Site
14	13	Ettimoodu Locality-v	09 07 29.01	76 46 58.20	Urn Burial	Ezhamkulam	Adoor	New Site
15	14	Arukalkkal	09 08 26.24	76 45 32.48	Urn Burial	Ezhamkulam	Adoor	New Site
16	15	Kuthiramukku	09 07 59.70	76 54 02.33	Urn Burial	Ezhamkulam	Adoor	New Site
17	16	Elangamangalam	09 04 39.56	76 46 02.04	Urn Burial	Ezhamkulam	Adoor	New Site
18	17	Kadika	09 06 30.00	76 45 44.39	Urn Burial	Ezhamkulam	Adoor	New Site
19	18	Chayalod Locality-I	09 07 43	76 47 57.76	Cist Burial	Enadimangalam	Adoor	New Site
20	19	Chayalod Locality-II	09 07 42.33	76 48 05.15	Cist Burial	Enadimangalam	Adoor	New Site
21	20	Chayalod Locality-III	09 07 35.77	76 48 14.96	Cist Burial	Enadimangalam	Adoor	New Site
22	21	Chayalod Locality-IV	09 07 49.01	76 48 16.33	Menhir	Enadimangalam	Adoor	New Site
23	22	Kunnida Locality-I	09 07 09.19	76 48 39.05	Cist Burial	Enadimangalam	Adoor	New Site
24	23	Kunnida Locality-II	09 07 01.82	76 48 34.14	Cist Burial	Enadimangalam	Adoor	New Site

Ready? -> save as .csv

- Once the data is clean, we can save the excel sheet as .csv



File name:

Save as type:

No.	Site	Lat	Long	Type	Panchayat	Taluk	Previous Works
1	Ikkad Locality-I	09 10 56.34	, 76 45 23.46	Urn burial	Kodumon	Adoor	New Site
2	Ikkad vadakku	09 11 22.16	, 76 45 26.62	Urn Burial	Kodumon	Adoor	New Site
3	Kodumon Chira Locality-I	09 10 08.30	, 76 47 49.52	Urn Burial	Kodumon	Adoor	New Site
4	Kodumon Chira Locality-II	09 10 31.11	, 76 47 41.30	Menhir	Kodumon	Adoor	New Site
5	Ottathekkku-Locality-I	09 10 36.02	, 76 49 03.14	Urn Burial	Kodumon	Adoor	New Site
6	Ottathekkku-Locality-II	09 10 33.48	, 76 48 56.44	Urn Burial	Kodumon	Adoor	New Site
7	Neduumonkavu	09 10 24.07	, 76 49 19.38	Cairn Circles	Kalanjoor	Adoor	New Site
8	Manakkad	09 12 04.40	, 76 46 44.38	Urn Burial	Kodumon	Adoor	New Site
9	Ettimoodu Locality-I	09 07 30.23	, 76 46 44.06	Urn Burial	Ezhamkulam	Adoor	New Site
10	Ettimoodu Locality-II	09 07 23.86	, 76 46 24.53	Urn Burial	Ezhamkulam	Adoor	New Site
11	Ettimoodu Locality-III	09 07 28.23	, 76 47 30.24	Cist Burial	Ezhamkulam	Adoor	New Site
12	Ettimoodu Locality-IV	09 07 32.25	, 76 46 57.25	Urn Burial	Ezhamkulam	Adoor	New Site
13	Ettimoodu Locality-v	09 07 29.01	, 76 46 58.20	Urn Burial	Ezhamkulam	Adoor	New Site
14	Arukalikkal	09 08 26.24	, 76 45 32.48	Urn Burial	Ezhamkulam	Adoor	New Site
15	Kuthiramukku	09 07 59.70	, 76 54 02.33	Urn Burial	Ezhamkulam	Adoor	New Site
16	Elangamangalam	09 04 39.56	, 76 46 02.04	Urn Burial	Ezhamkulam	Adoor	New Site
17	Kadika	09 06 30.00	, 76 45 44.39	Urn Burial	Ezhamkulam	Adoor	New Site
18	Chayalod Locality-I	09 07 43	, 76 47 57.76	Cist Burial	Enadimangalam	Adoor	New Site
19	Chayalod Locality-II	09 07 42.33	, 76 48 05.15	Cist Burial	Enadimangalam	Adoor	New Site
20	Chayalod Locality-III	09 07 35.77	, 76 48 14.96	Cist Burial	Enadimangalam	Adoor	New Site
21	Chayalod Locality-IV	09 07 49.01	, 76 48 16.33	Menhir	Enadimangalam	Adoor	New Site
22	Kunnida Locality-I	09 07 09.19	, 76 48 39.05	Cist Burial	Enadimangalam	Adoor	New Site
23	Kunnida Locality-II	09 07 01.82	, 76 48 34.14	Cist Burial	Enadimangalam	Adoor	New Site
24	Mannattoor	09 07 04.28	, 76 48 45.50	Cist Burial	Enadimangalam	Adoor	New Site
25	Chayalod Locality-V	09 07 57.55	, 76 48 03.47	Cist Burial	Enadimangalam	Adoor	New Site
26	Kurumbakara Padinjaru	09 06 35.40	, 76 48 54 57	Cist Burial	Enadimangalam	Adoor	New Site

Open .csv files in QGIS

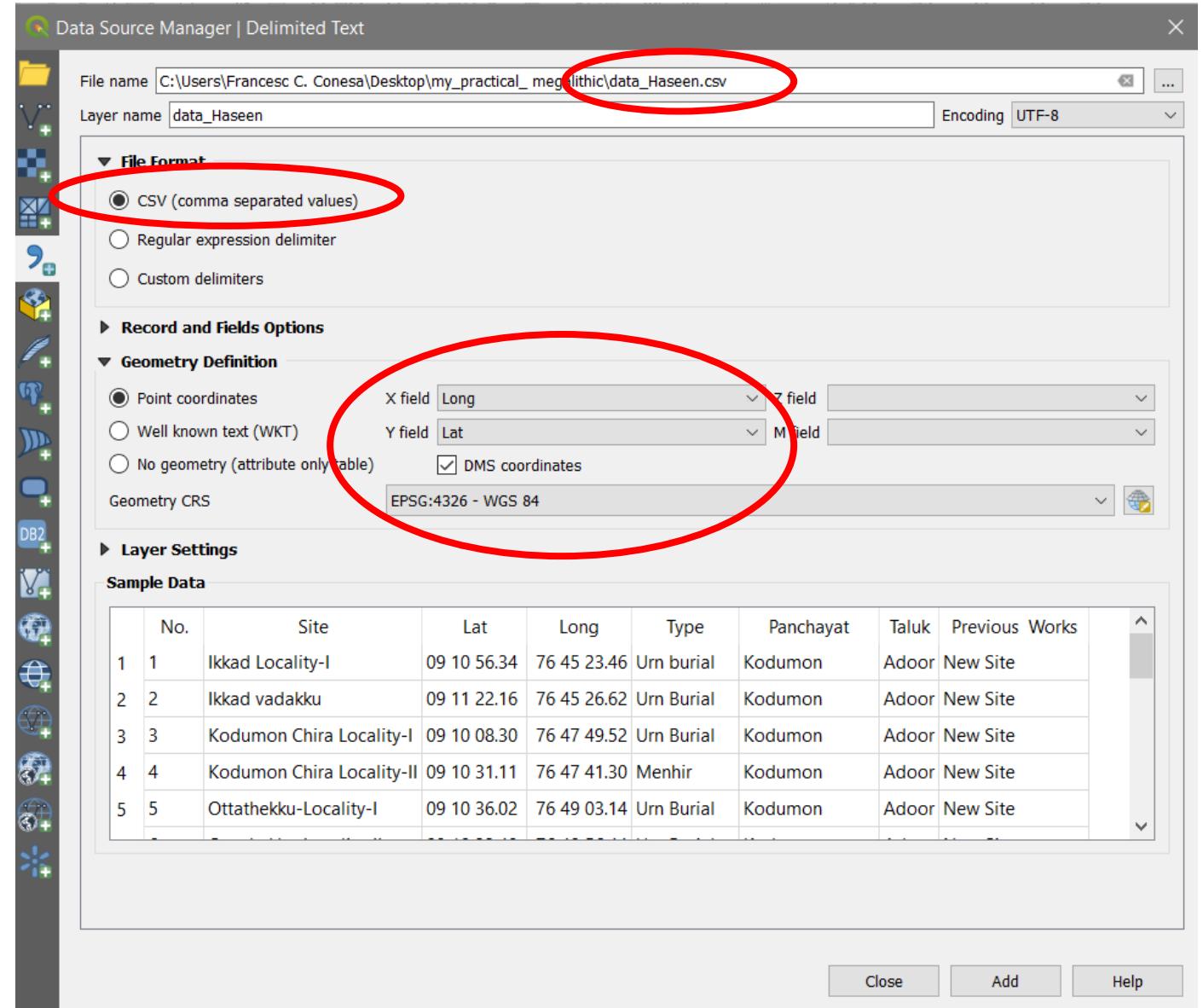
Open .csv

- Once the data is clean, we can **save** the excel sheet as .csv

Layer / Add Layer /

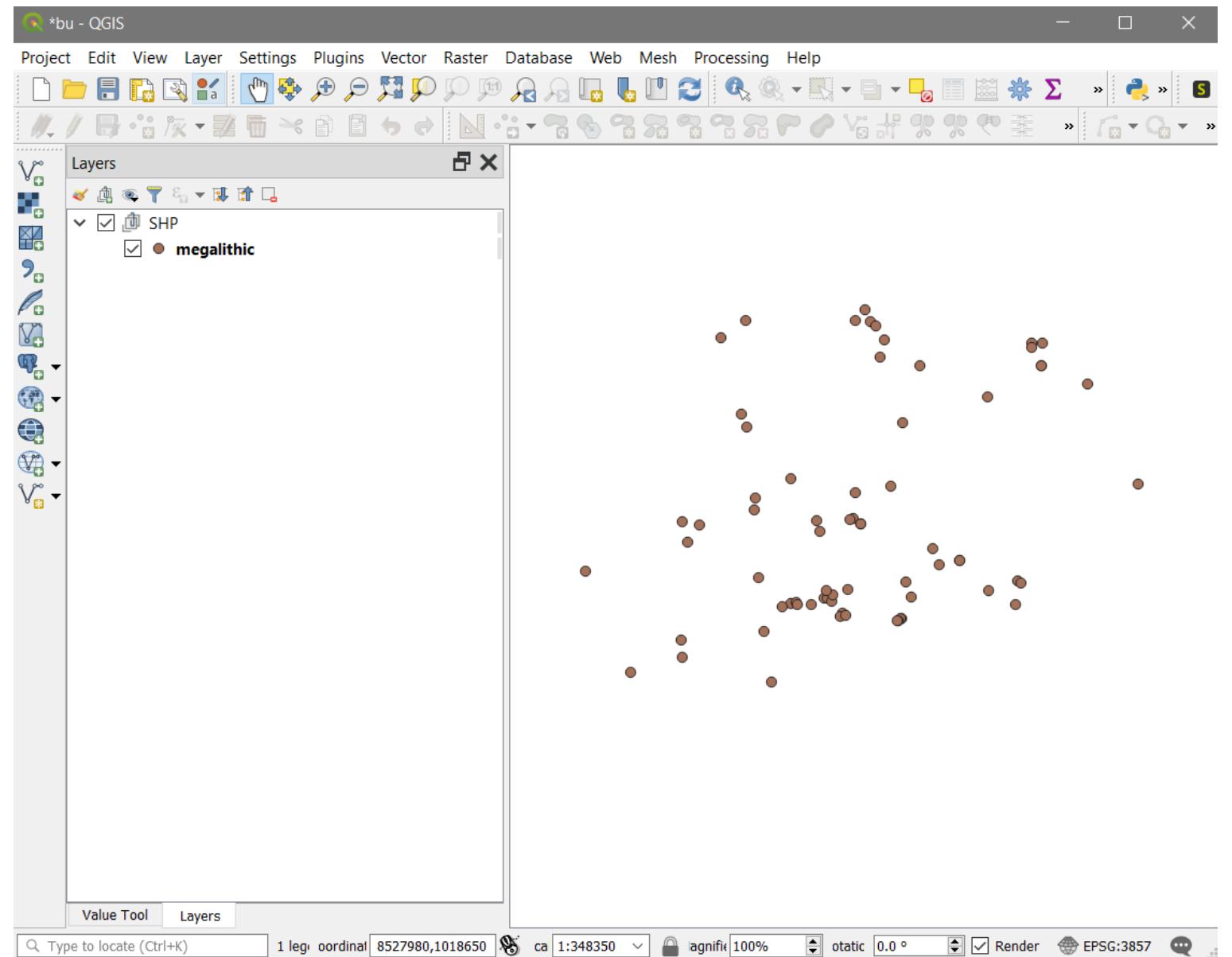
Add Delimited Text Layer

Or also:



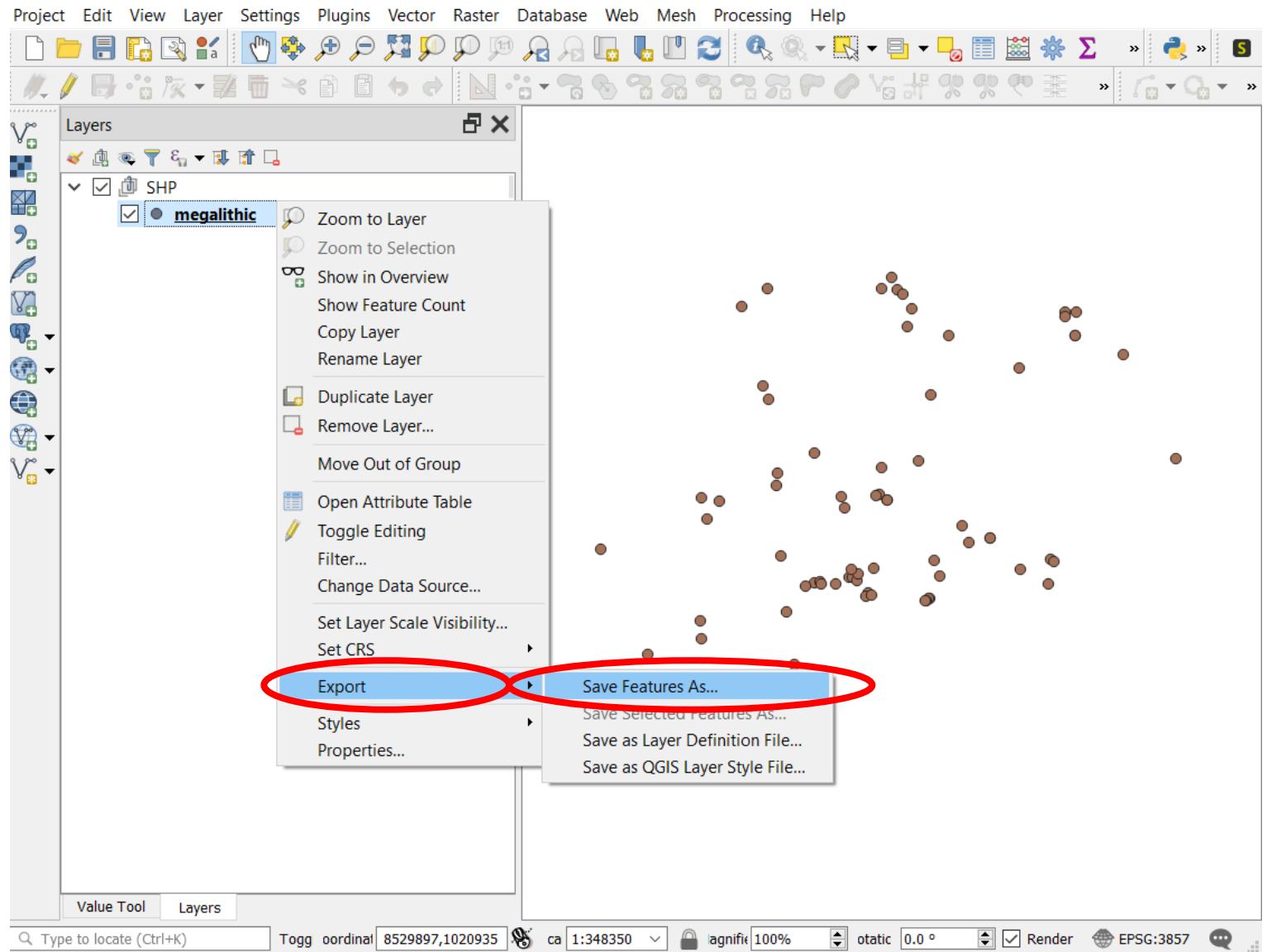
Visualise .csv

- .csv can be [read](#), [displayed](#) and [visualised](#) in QGIS
- ... But we can't edit them!
- So it's better if we save the file as a [new shapefile](#)



Save your spatial .csv to a .shp

- .csv can be [read](#), [displayed](#) and [visualised](#) in QGIS
- ... But we can't edit them!
- So it's better if we save the file as a [new shapefile](#)



Save new .shp

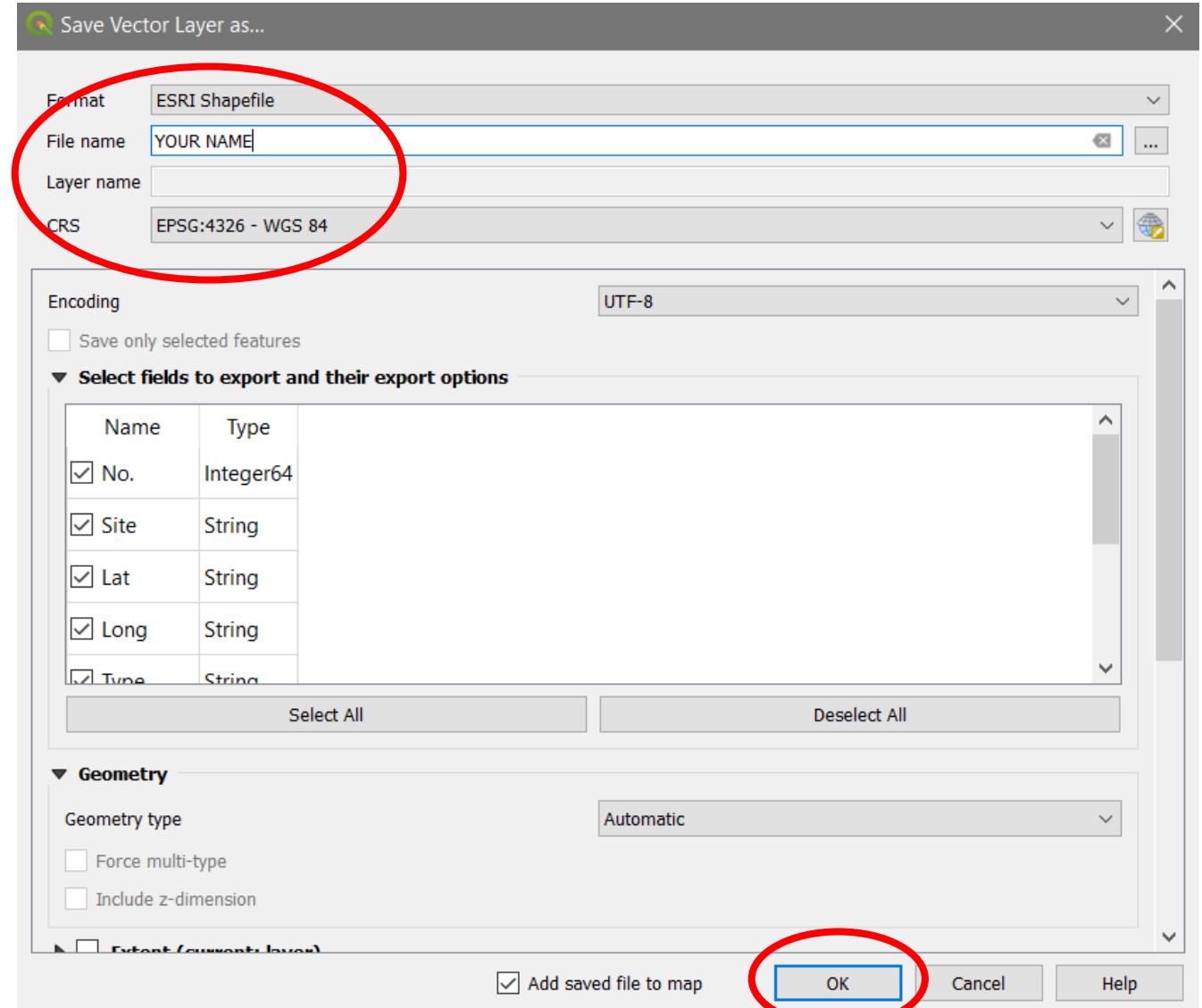
- *Save vector layer as...*
- There are actually **many** file extensions that can store spatial vector data:

.kmz -> Google

.csv -> text file

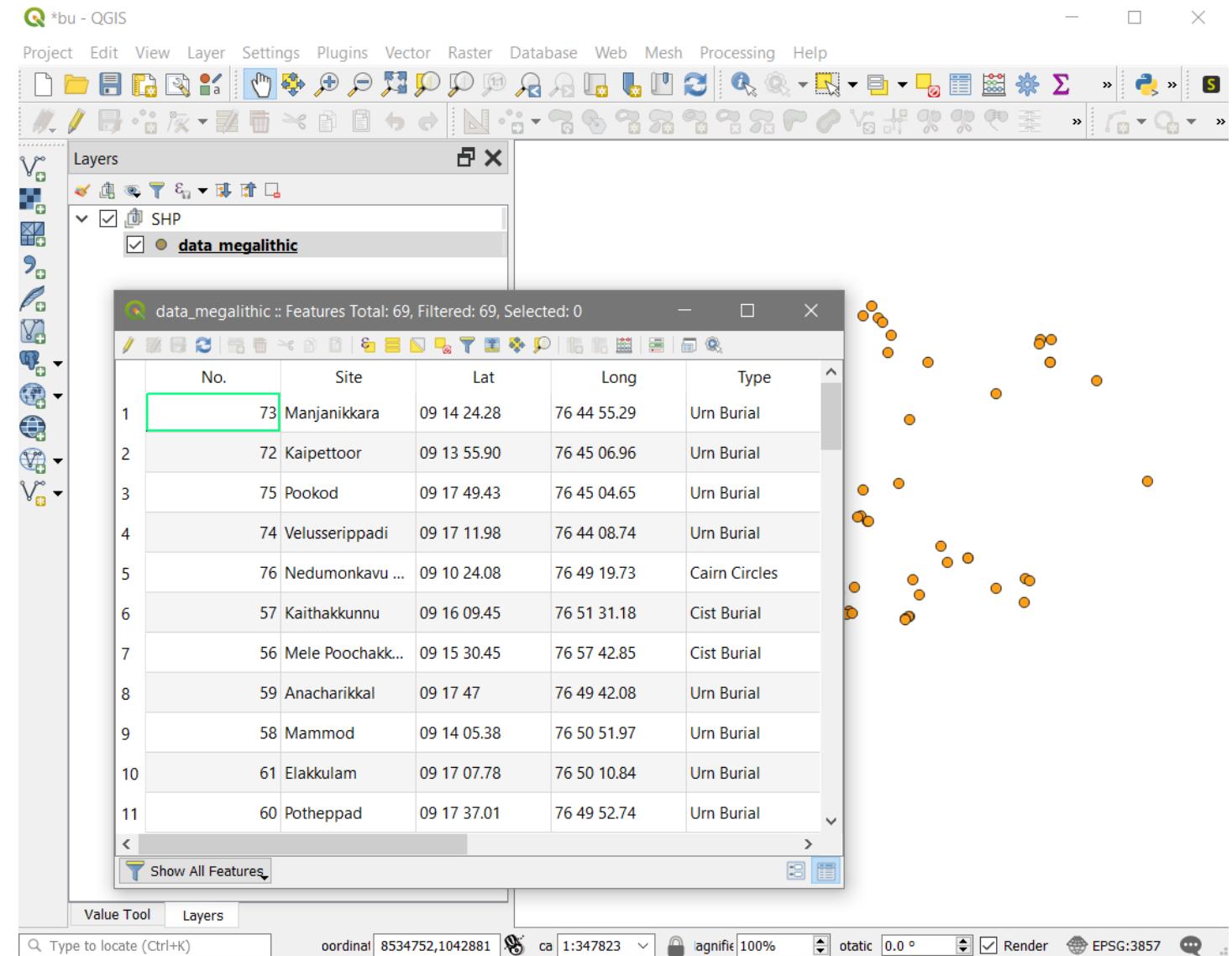
.geoJSON -> text file

.shp -> ArcGIS



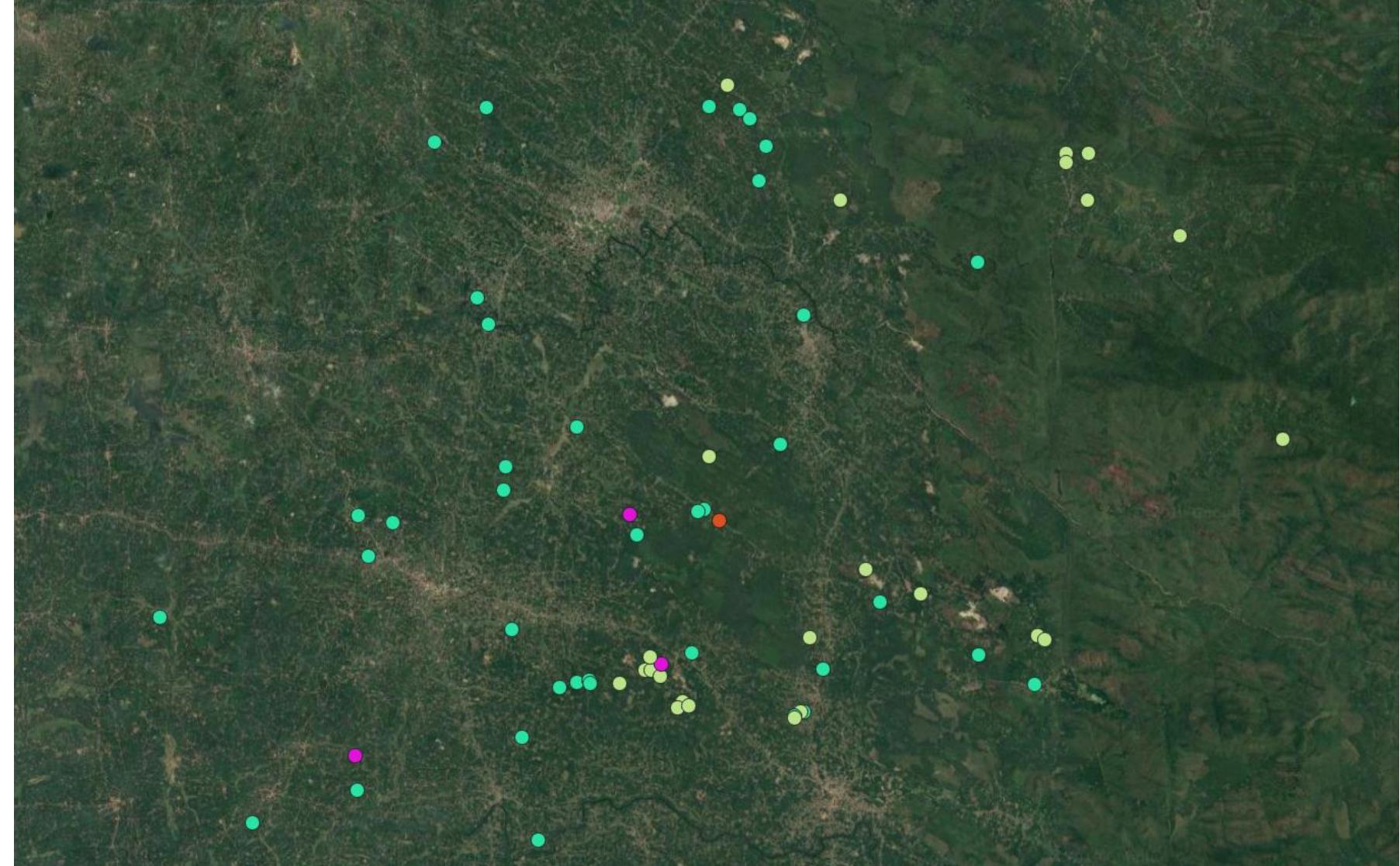
Explore the Atribute Table in your new .shp

- You are now really to map!



Try categories, other visualisations and Google basemaps

- You **know** this already!



Get vectors and rasters

Vector data

- Example -> DIVA GIS -> administrative vector boundaries (e.g. *districts, taluka* levels)

→ <https://www.diva-gis.org/>

The screenshot shows the DIVA-GIS website interface. At the top, there is a dark blue header with the text "DIVA-GIS" and "free, simple & effective". Below the header are three buttons: "Download program", "Documentation", and "Free Spatial Data". The main content area has a white background. It features a title "Download data by country" and a subtitle "Select and download free geographic (GIS) data for any country in the world". There are two dropdown menus: one for "Country" set to "India" and another for "Subject" set to "Administrative areas". A large "OK" button is located at the bottom left of the form. To the right, there is a sidebar with a light gray background containing a list of links: "Frequently Asked Questions", "Development", "Links", and "About us". At the very bottom of the page, there is a small footer section labeled "Sources".

Satellite data: Sentinel (10m)

- Example -> [Sentinel EO Browser](#) -> temporal satellite images (eg. Landsat, Sentinel) free to download



<https://apps.sentinel-hub.com/eo-browser/>

The screenshot shows the EO Browser interface. On the left, there is a list of satellite imagery results:

- 2019-11-10, 05:26:38 UTC, 8.84 % cloud cover, EPSG:4326, 43PFL, with a "Visualize" button.
- 2019-10-11, 05:26:23 UTC, 6.2 % cloud cover, EPSG:4326, 43PFL, with a "Visualize" button.
- 2019-10-11, 05:26:23 UTC, 6.2 % cloud cover, EPSG:4326, 43PFL, with a "Visualize" button.

At the bottom of this list, it says "Powered by [Sinergise](#) with contributions from the European Space Agency v2.19.20".

On the right, there is a map of southern India, specifically the state of Kerala. A search bar at the top right shows "Adoor, Kerala, India". The map displays several districts: Kollam, Thiruvananthapuram, Tirunelveli, Nagercoil, and Kanyakumari. A green shaded area covers parts of Alappuzha, Pathanamthitta, and Kollam districts. A blue shaded area covers parts of Kollam, Thiruvananthapuram, and Tirunelveli districts. A white shaded area covers parts of Tirunelveli and Nagercoil districts. The map also shows various towns and rivers. A legend on the right side includes icons for location, zoom, and other map functions. At the bottom, there are links for "About EO Browser", "Contact us", and "Get data".

Digital Elevation Model (DEM): Alos (30m)

- Example -> [Google Earth Engine](#) -> an online data catalogue and processing platform

<https://earthengine.google.com/>



Google Earth Engine pathanap

Scripts Docs Assets NEW

Owner (3)
users/francesccecilia/mallorca
users/francesccecilia/mongolia
users/francesccecilia/repo1

```
export_ALOS_DSM * var geometry2: Polygon, 4 vertices
1
2 // call ALOS DSM 30m
3 // visualise
4 // export
5
6 // call ALOS dataset, mode "ave" -> meters resampled from original 5m ALOS
7 var ALOS30 = ee.Image ('JAXA/ALOS/AW3D30_V1_1').select('AVE');
8
9 // rename data and clip by AOI
10 var DSM = ALOS30
11   .clip(geometry2);
12
13 // add DSM layer in the screen, with default visualisation
14 Map.addLayer(DSM, {}, "DSM")
15
16 // export raster to Drive
17 Export.image.toDrive({
18   image: DSM,
19   description: 'mega',
20   scale: 30,
21   maxPixels: 999999999,
22   region: geometry2,
23});
```

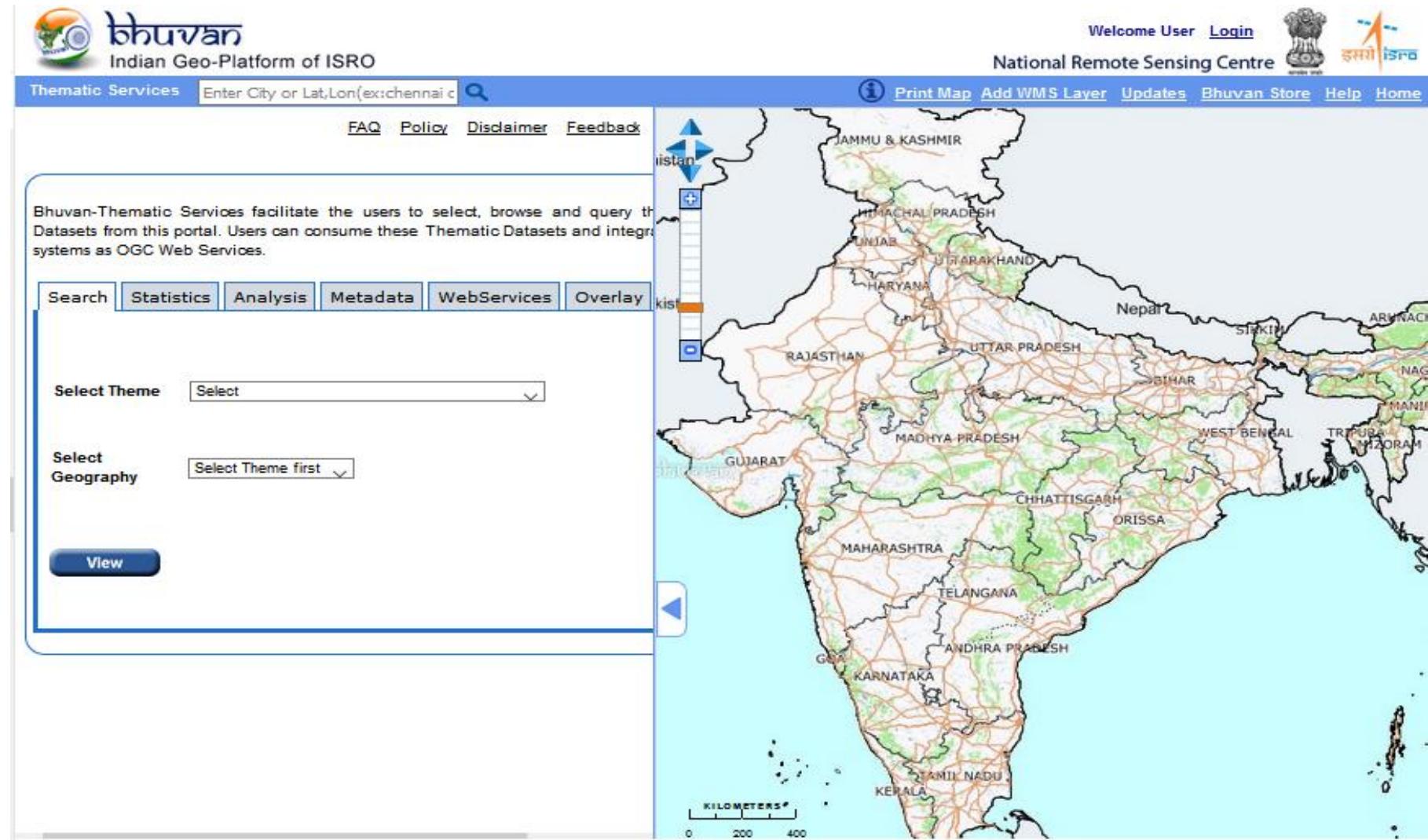
Inspector Console Tasks

mega ✓ 3m
mega ✓ 2m
thrissur_2 ✓ 2m
thrissur_dem ✓ 51s
DEM_GJ ✓ 5m

Geometry Imports Layers Map Satellite

Bhuvan data

- India ISRO's Bhuvan geoportal data -> national satellite imagery and online (*WMS*) geospatial products



[https://www.isro.gov.in
/isros-geo-portal-
bhuvan-gateway-to-
indian-earth-
observation](https://www.isro.gov.in/isros-geo-portal-bhuvan-gateway-to-indian-earth-observation)

Old maps

- PAHAR's and Old Maps Online -> old published maps



<http://pahar.in/>

PAHAR Mountains of Central Asia Digital Dataset

Search Site Log In

Home→Maps→Indian Subcontinent→Indian Subcontinent-After 1900→Indian Subcontinent-After 1900

← Indian Subcontinent-Pre-1899 Geography of Himalayas-Charts from 1933 →

Indian Subcontinent-After 1900

In the Google map below you will see many color-coded rectangles. If you click on the corner of any rectangle it will 'select' and open a balloon with a link to the respective map. The rectangles show the map boundary and the color indicates the date of original publication. You can zoom in and drag the map to get a closer view of the rectangles.

Red = before 1800; Orange = 1800-1849; Yellow = 1850-1899; Blue = 1900-1949; Green = after 1950

A Google map of the Indian Subcontinent and surrounding regions. Numerous colored rectangles are overlaid on the map, representing the boundaries of historical maps. The colors correspond to the publication dates: Red (before 1800), Orange (1800-1849), Yellow (1850-1899), Blue (1900-1949), and Green (after 1950). Major cities like New Delhi, Mumbai, and Bangalore are labeled. The map also shows parts of Central Asia, the Persian Gulf, and Southeast Asia.



<https://www.oldmapsonline.org>

OLD MAPS ONLINE

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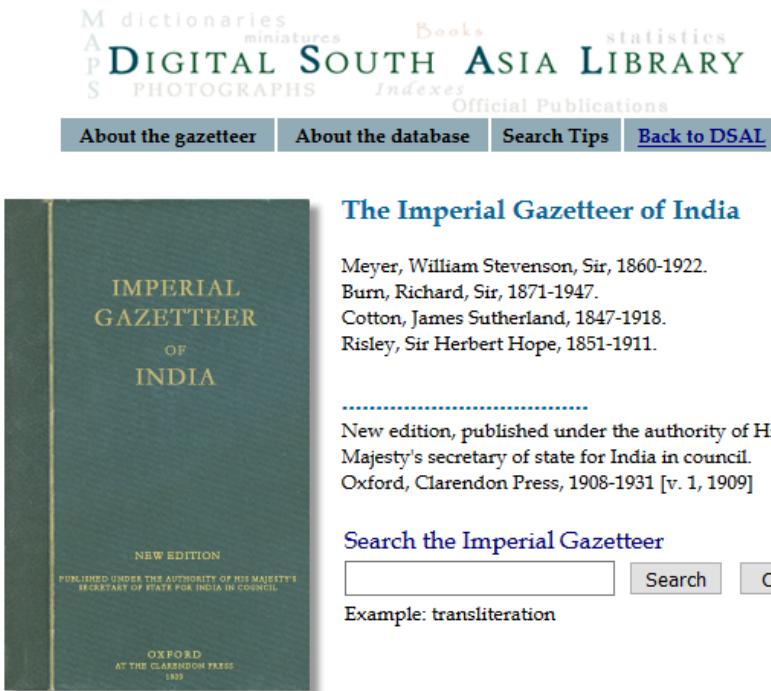
kerala

The screenshot shows a map of the state of Kerala, India, with various locations labeled such as Mangalore, Bengaluru, Mysore, and Kochi. A red rectangular box highlights a specific area in the southern part of the state. To the right of the map is a sidebar titled "Maps of Kerala" containing thumbnails of historical maps. The sidebar includes titles such as "Arbeitsgebiet der Basler Mission G. Peter 1893-1910", "Anandapur Markung Eckelmann, O.", "Situationsplan [von Anandapur] Eckelmann, O.", "Map of the Codacal Church Fu... A. Paul 1857-1911", "Map of the Basel German Eva... Eckelmann, O.", "Plan des Missions-Compound ... Eckelmann, O.", "Ground plan of the new Tellic... Eckelmann, O.", and "The Church Missionary Atlas. ... 1887".

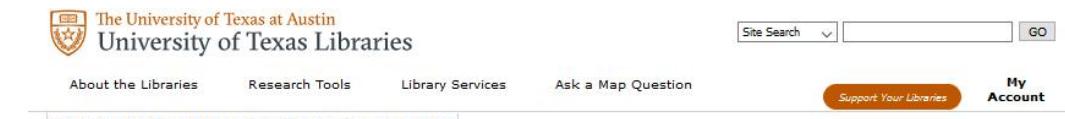
Historical India maps

- Imperial Gazetteer and University of Texas Repository (*1955 US Topographic maps*)

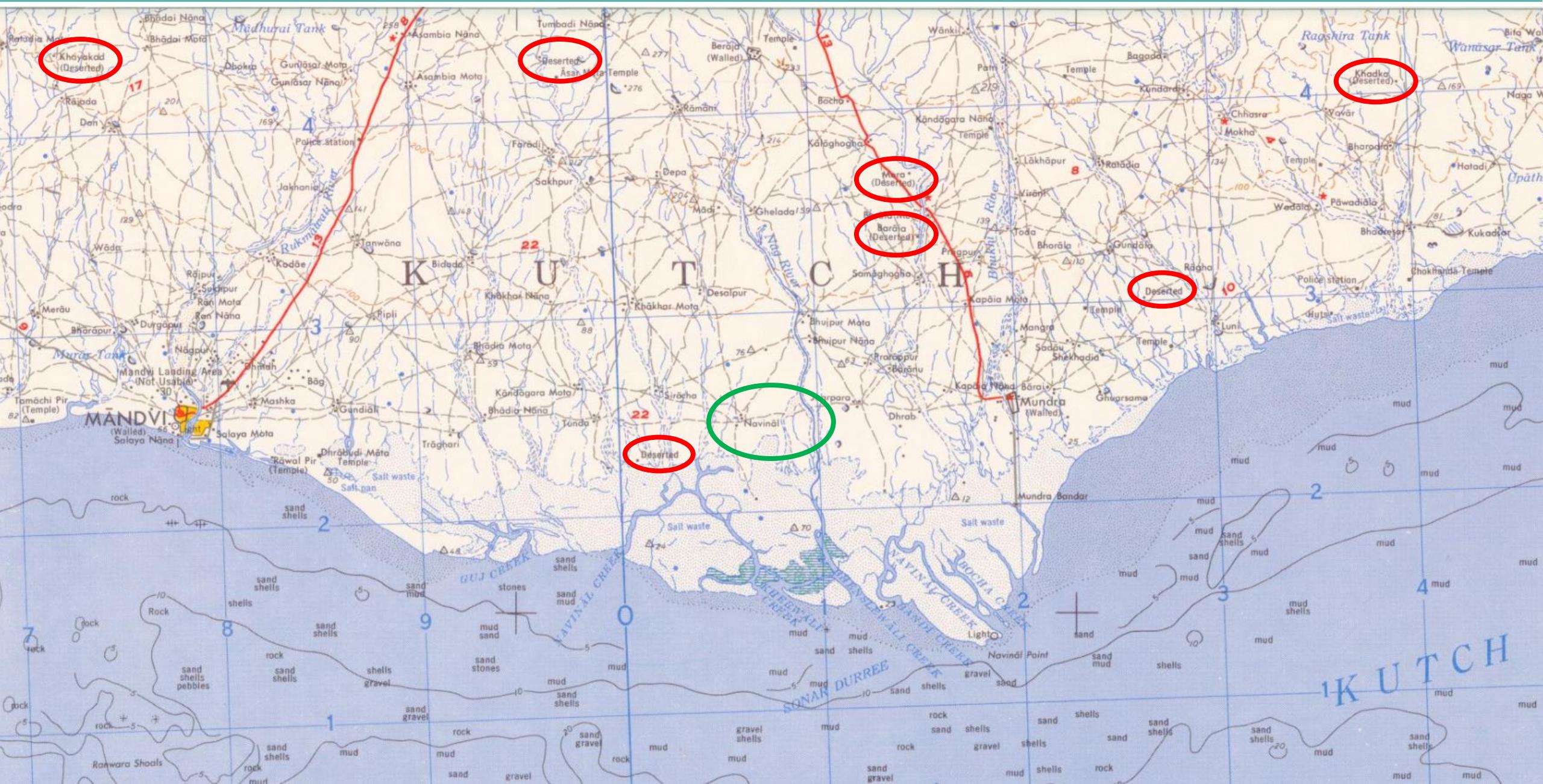
→ <https://dsal.uchicago.edu/reference/gazetteer/>



→ <https://legacy.lib.utexas.edu/maps/ams/india/>



1955 US Topographical maps in Kachchh



Google Earth Pro

- Free for everyone!



<https://www.google.com/earth/versions/#earth-pro>

Also for phones!

- Open as:

.csv -> vector

.shp -> vector

.gpx -> vector

.tif -> raster

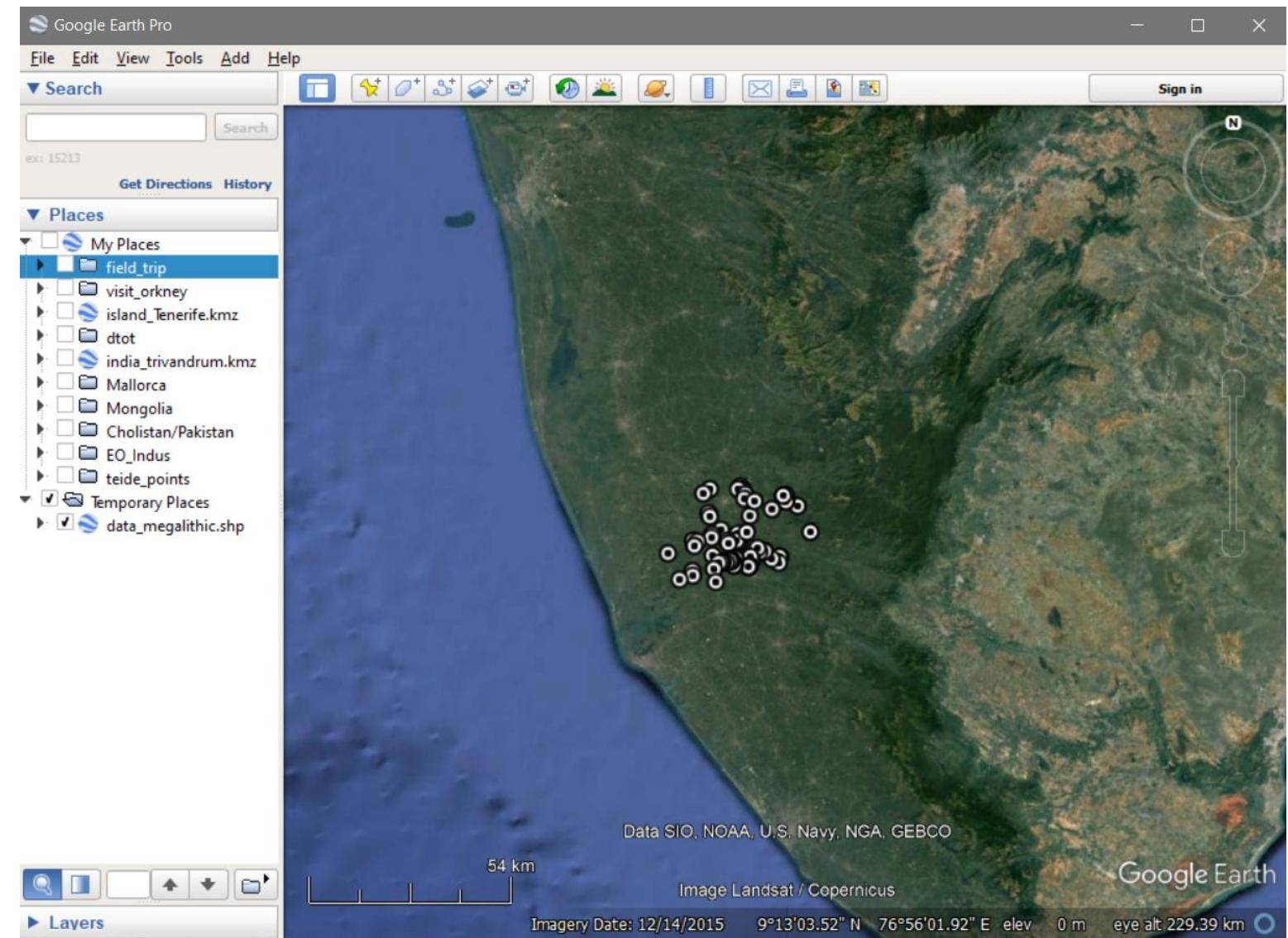
- Export as:

.kmz

.kml

- Also visualise in the phone:

(add kmz to your [Google Drive](#) or [Google Maps](#))



Viewshed analyses and intervisibility network

What's next?

- Let's use our imagination... and think that the megalithic sites in Kerala were....

.... giant fire beacons!



<https://www.youtube.com/watch?v=QhRFaY8A9cA>

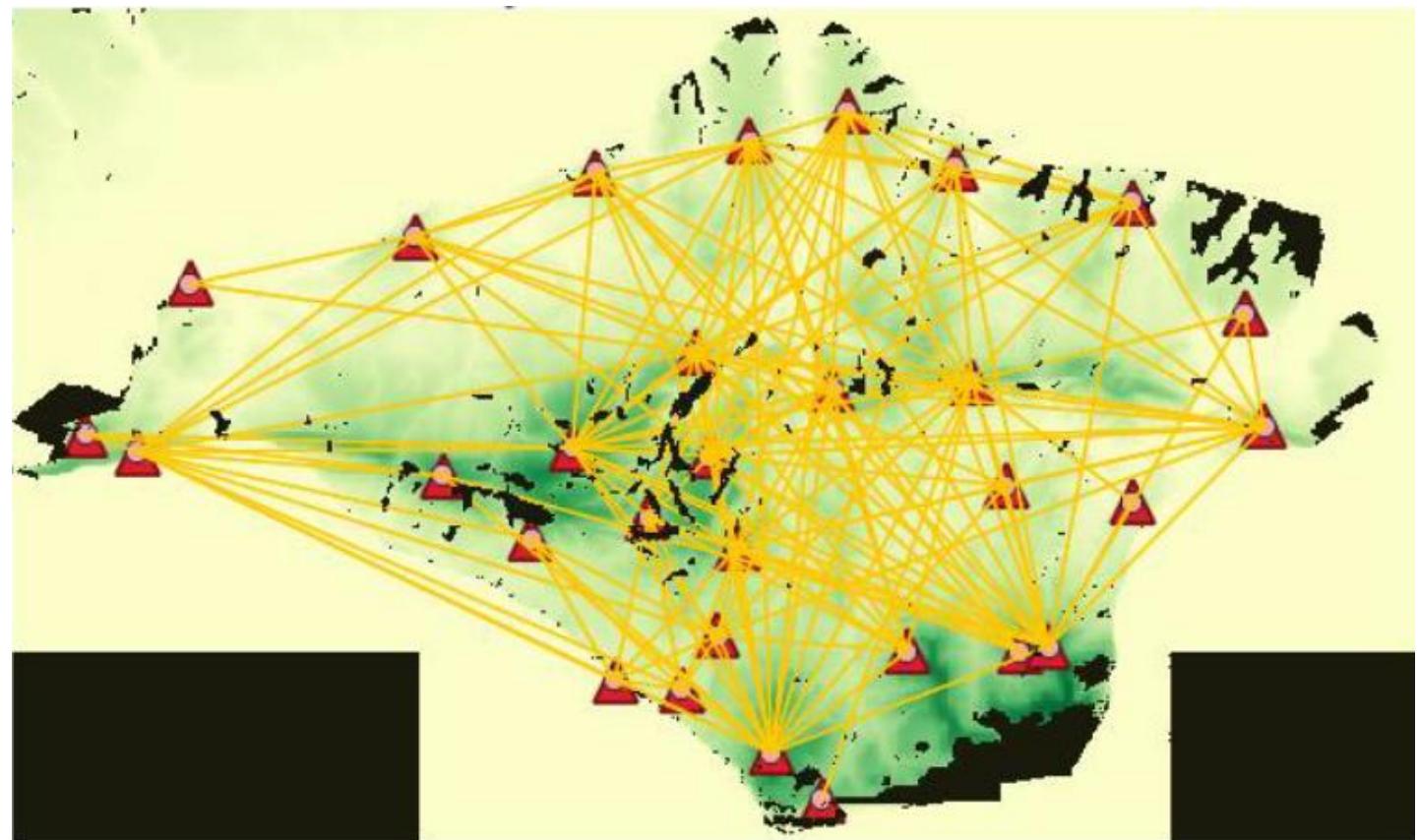
Intervisibility networks

- Visibility networks create vector (*lines*) that unifies those *points* that, *at a given elevation*, could be *seen* from another *point* (*at a given elevation*)

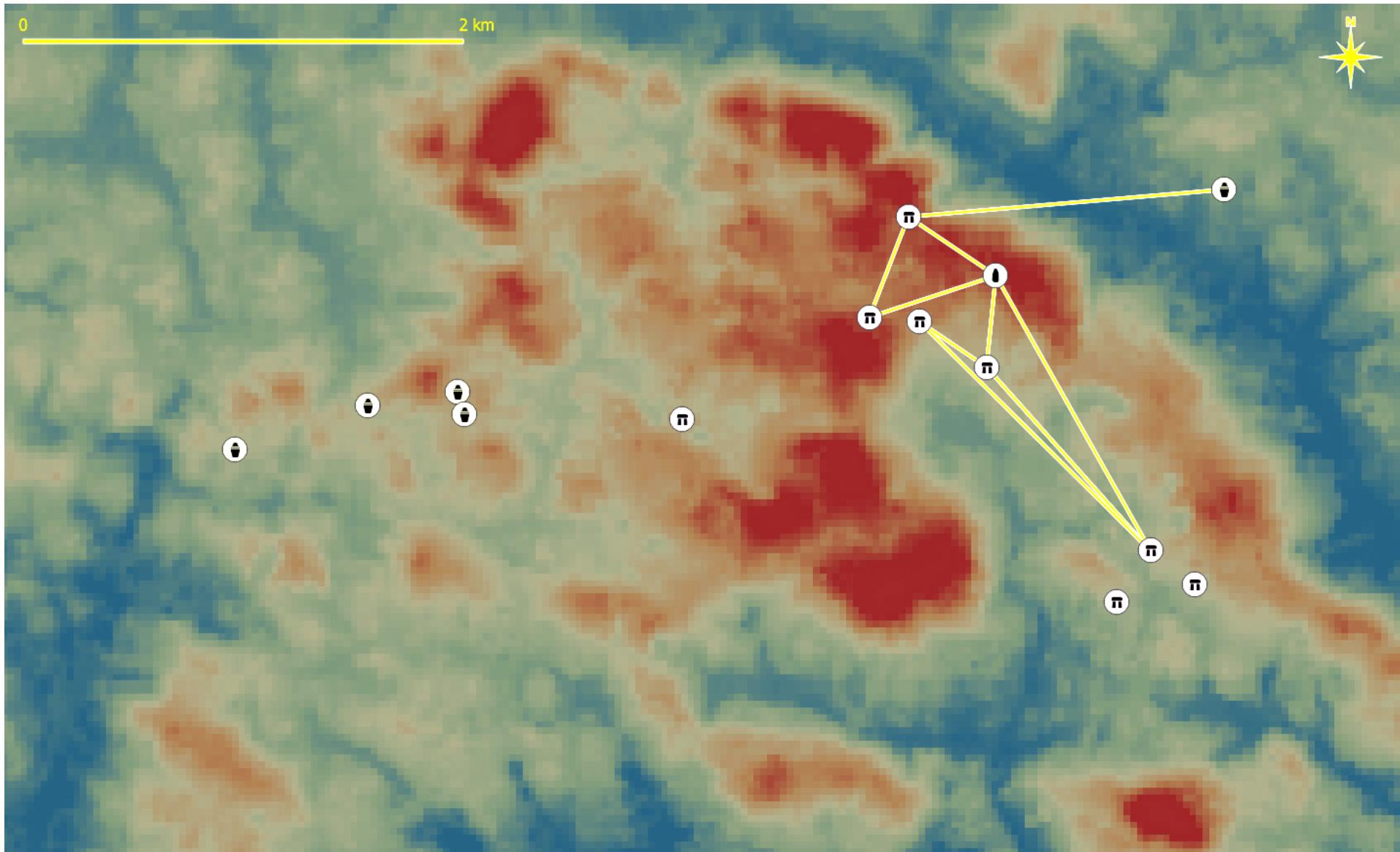
- What we need?

- 1) A list of points (*.shp*)
- 2) A raster with elevations (*DEM*)
- 3) The same *projected* coordinates for both data

It will not work with lat/long



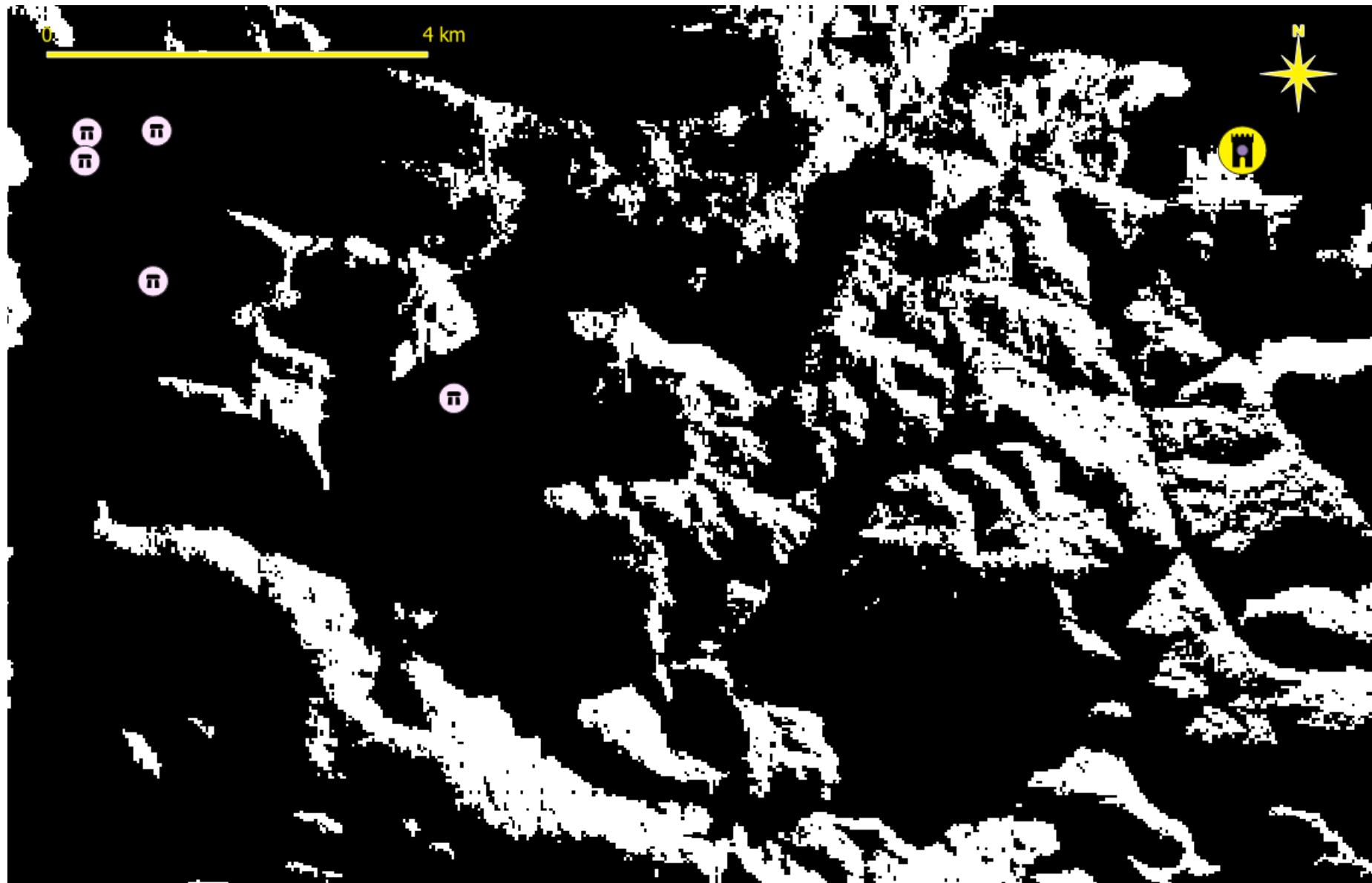
Intervisibility networks



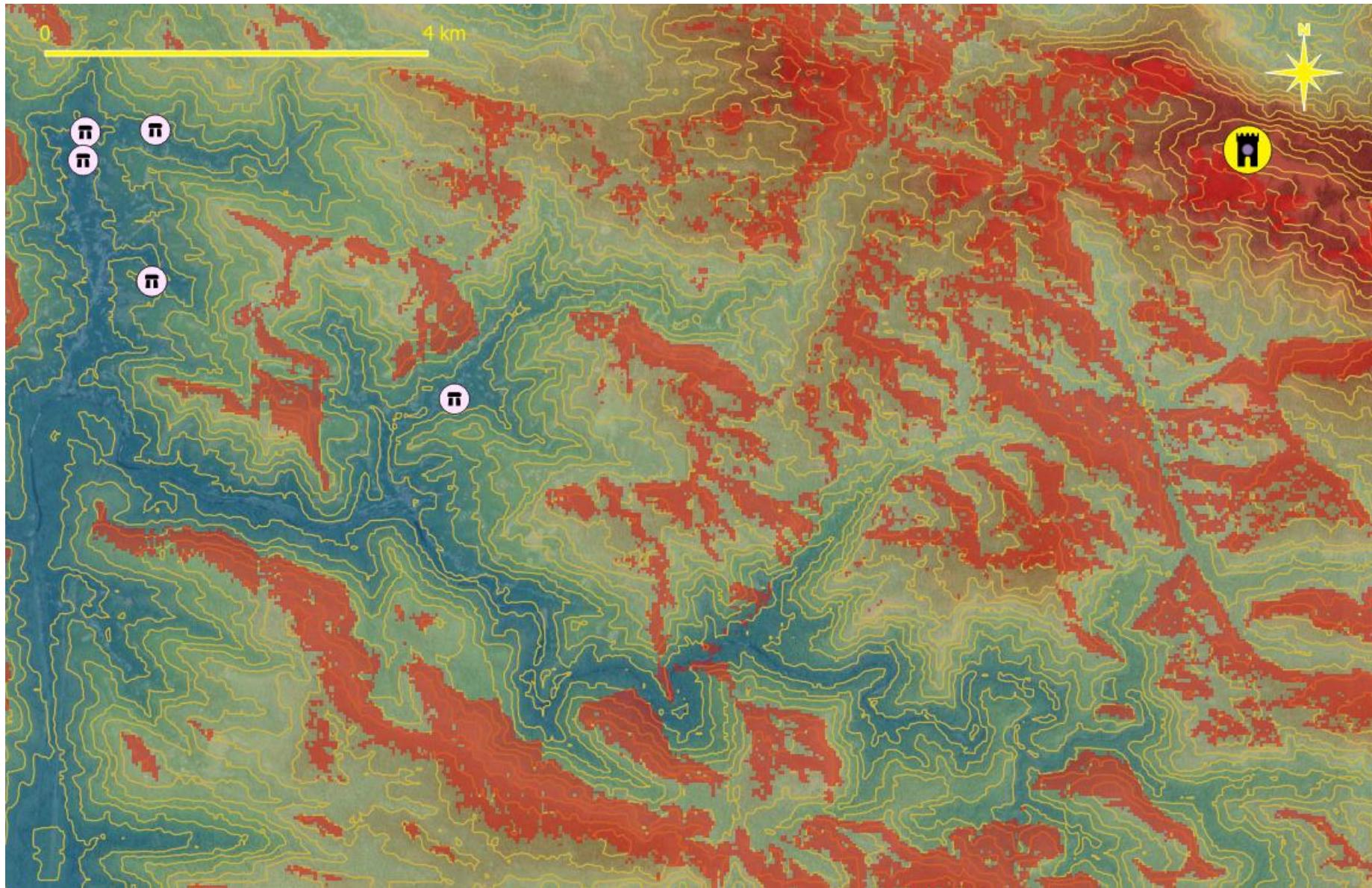
Viewshed analyses



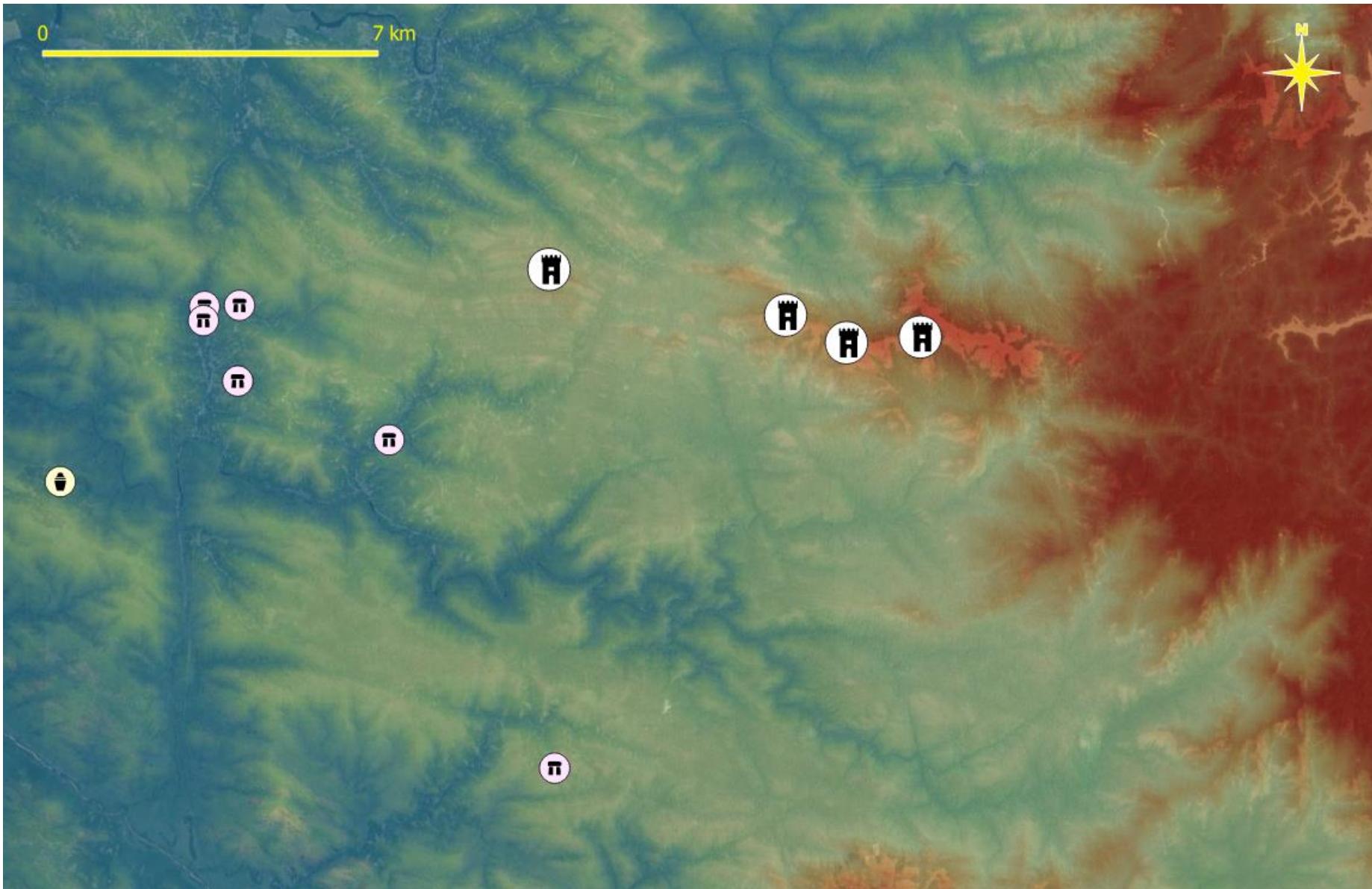
Viewshed analyses



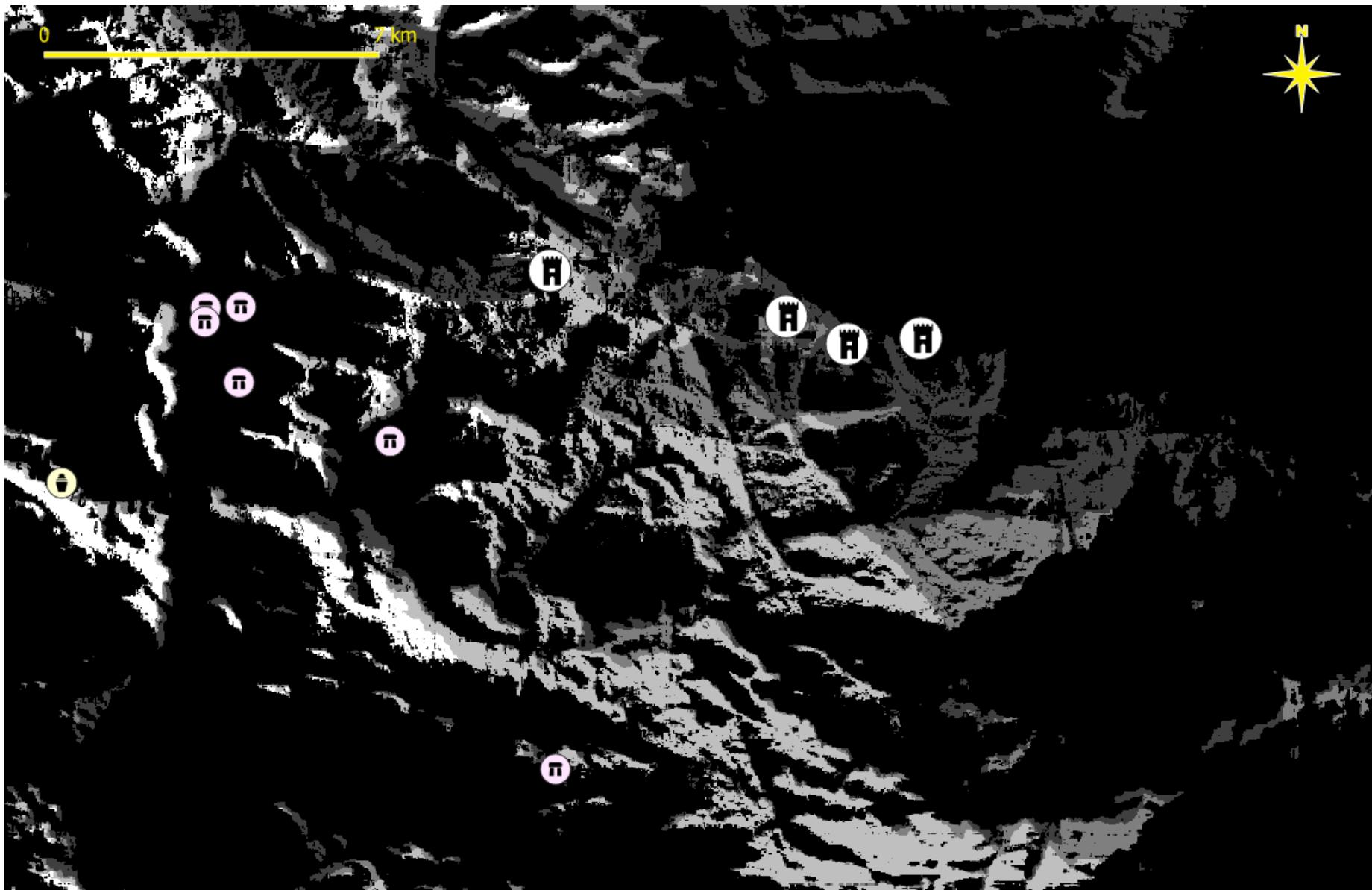
Viewshed analyses



Multiple viewsheds



Multiple viewsheds



Check coordinate projection in vector .shp AND raster DEM

- To do viewshed analyses, first of all make sure that your files are in projected coordinates! Check:

- The megalithic sites (*.shp*)

Layer / properties / Source

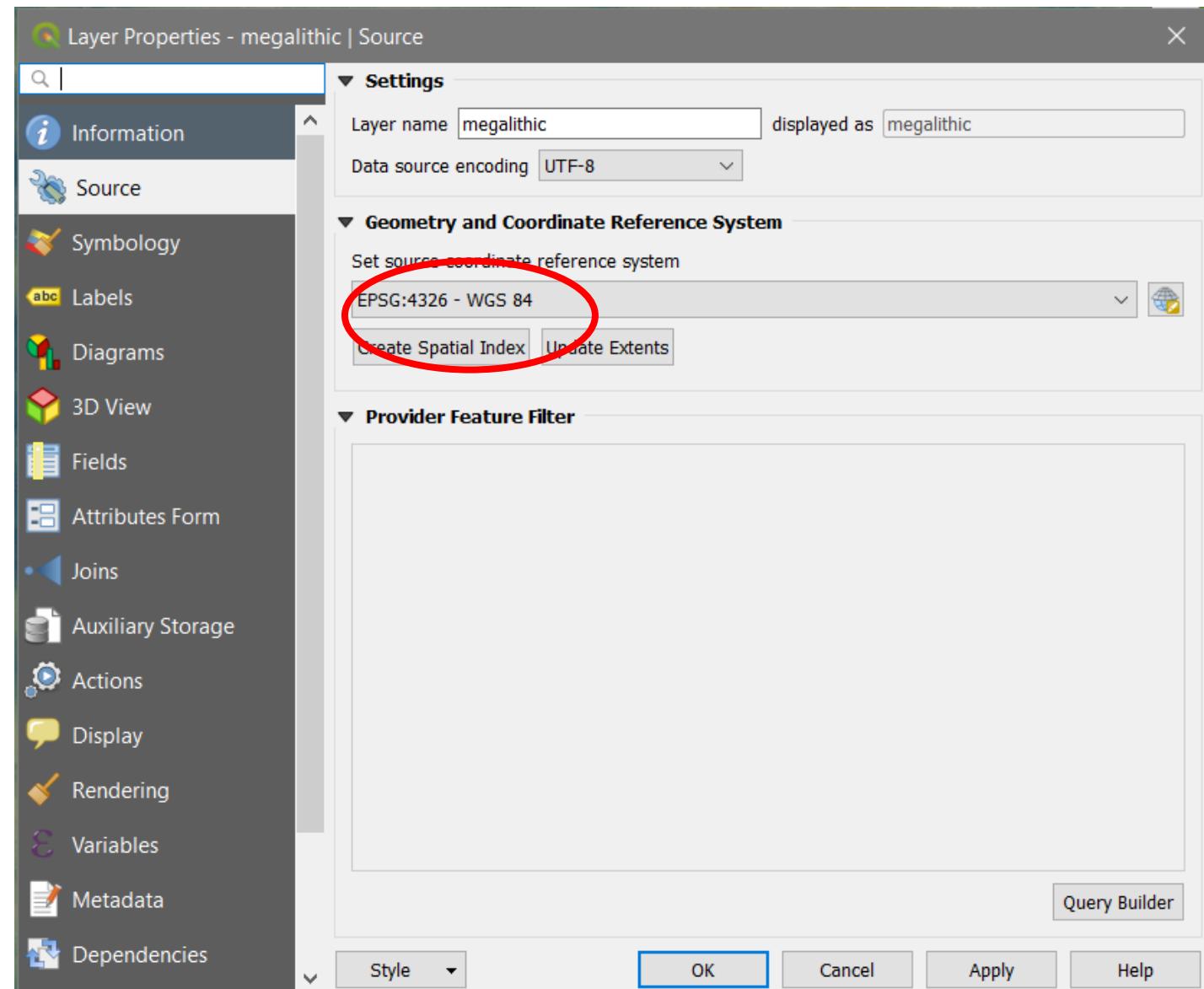
- The ALOS *DEM* raster (30m)

Layer / properties / Source

Are those in Lat/Long coordinates?

ESPG 4326 – WGS 84

Change to projected coordinates

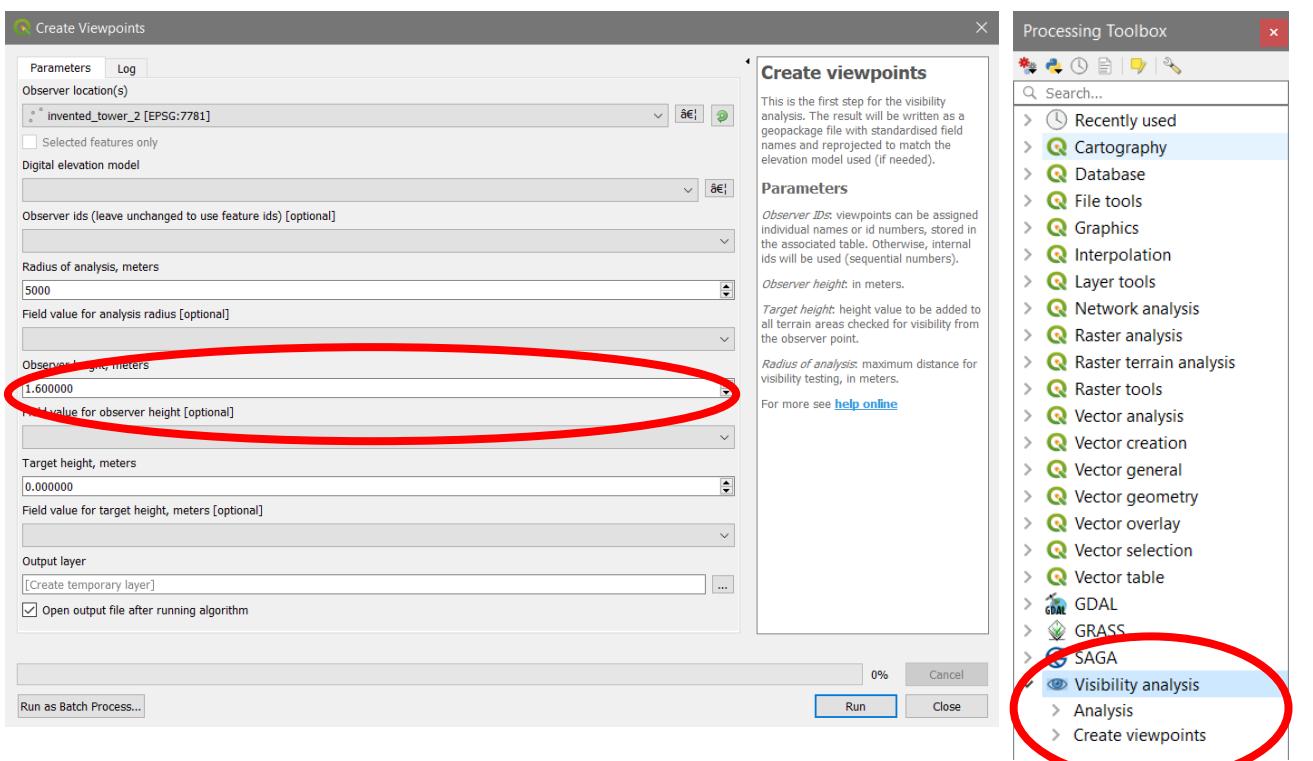
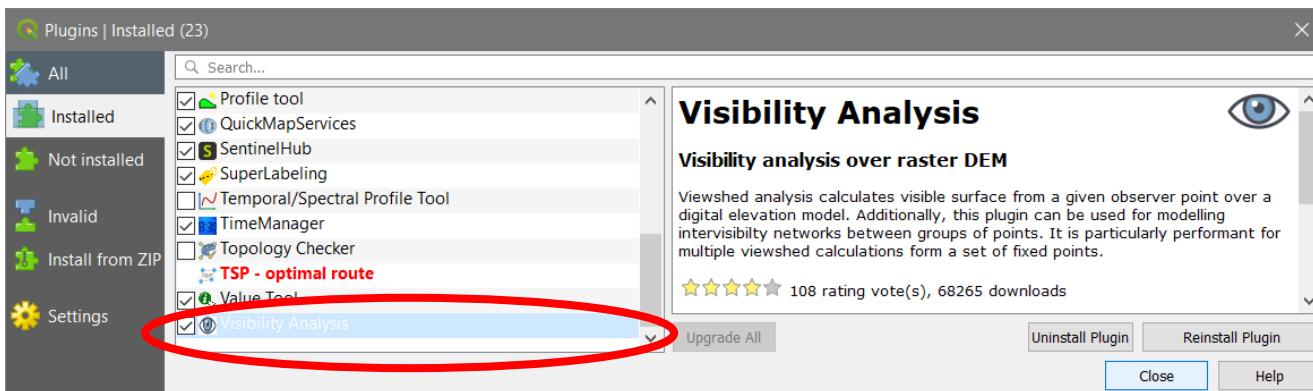


Viewshed plugin

- To install a **new plugin** (an external tool from QGIS that can be installed into the main software), go to:

Main menu / Plugins / Manage and install plugins

- Search for the **Visibility Analysis** plugin, install it and make sure it is checked on the Installed Plugin list.
- Access the plugin via the **Processing Toolbox**.
- To use the **Analysis** tools, you first must convert your .shp points into a **Viewpoint** format, using the **Create viewpoints** tool. Take into account that the **Observer Height** is the theoretical “tower” height.
- In **Analysis**, you can use your **viewpoint** points and your **DEM raster** to perform viewshed analyses.



Other tips

Other tips to explore... there are many ones waiting for you!

- **Extract** contour lines from DEM

Raster / Extraction / Contour

- **Clip** (to crop) a raster using a shapefile polygon

Raster / Extraction / Clip raster by Mask Layer

- **Select** points by location (eg inside polygon)

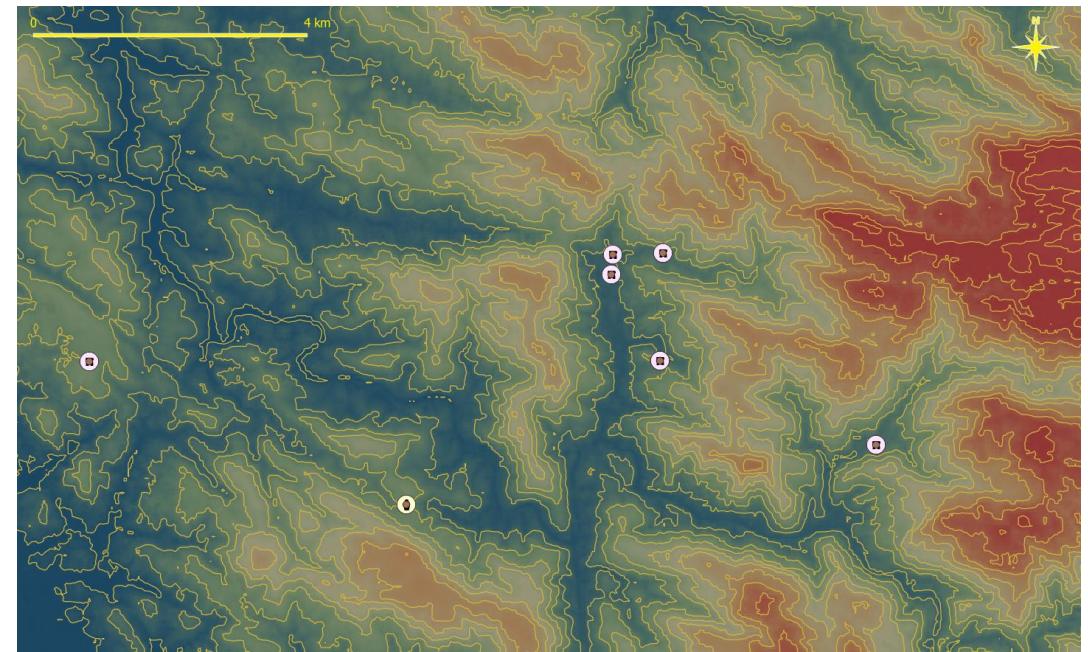
Vector / Research tools / Select by location

- **Select** point by category attributes in column

Select features by value

- **Add** x,y columns for new shapefiles

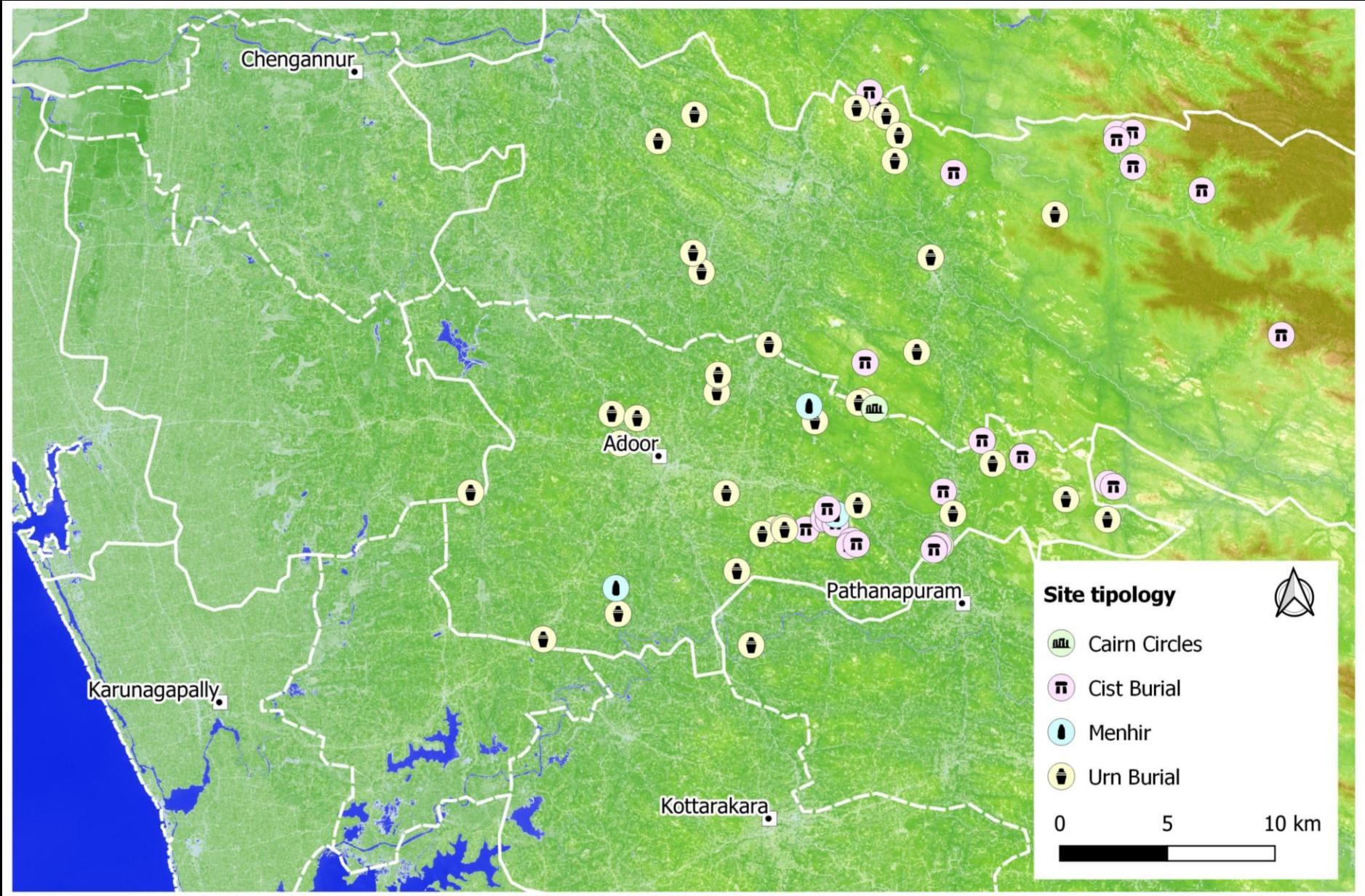
Edit x. y columns in field calculator



Please ask or write us for more, and read the plenty of tutorials online!

Keep exploring
GIS, remote sensing and geoarchaeology!

... and create final maps 😊



What we did...

- Workshop 2019

- Open **.csv**, **.shp**

- Create and save new **.shp**

- Change **visualisation** settings

- Open **rasters**

- Change **DEM** visualisations

- Extract DEM **point values**

- Clip** rasters using vector polygons

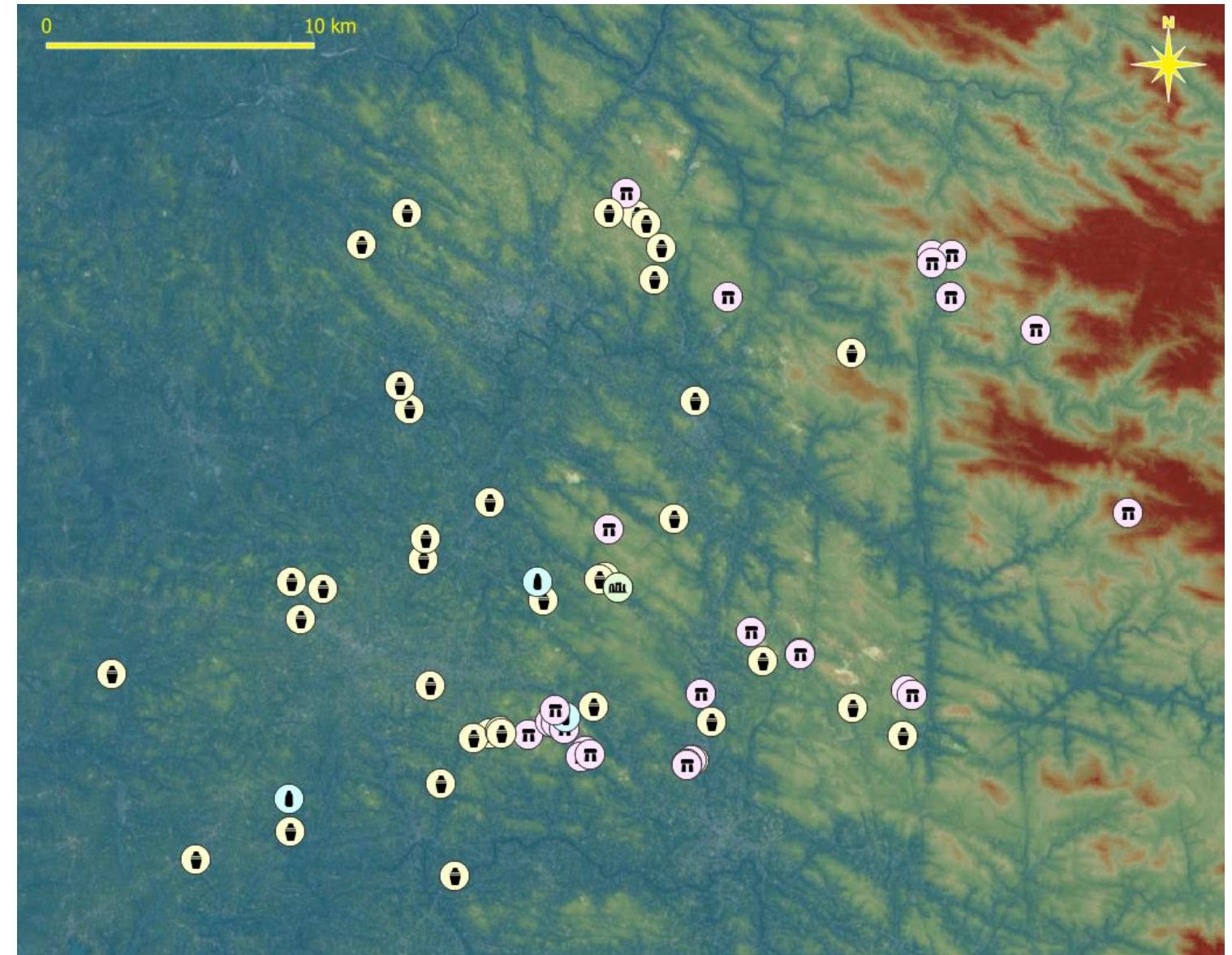
- Select** vector features and attributes

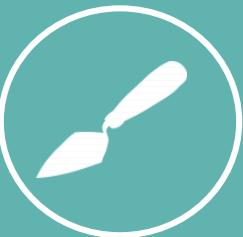
- Hillshade** and transparency settings

- Add rasters from **satellite Sentinel**

- Create maps (**dirty** and **Composer**)

- 3D photogrammetry** with PhotoScan





Thank you മുഖി

Francesc C. Conesa · Arnau Garcia-Molsosa · Natalia Égüez



McDonald Institute for
Archaeological Research



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