

„Grundwassersysteme und Numerik“

Veranstaltung im Modul Hydrosystemanalyse

- Übung: QGIS in der Grundwassermodellierung

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Einleitung

- Die Übung soll Ihnen einen Eindruck zu Konzepten zur Geodatenprozessierung mit QGIS vermitteln.
- 2 Übungsteile: 1) Übung Vektordaten in QGIS
2) Übung Rasterdaten in QGIS
- Es gibt Videos zu den Übungen (auf Englisch), diese befinden sich hier:
- <https://nc.ufz.de/s/9WyZYSokq8Y2q3m> (pw: **grundwasser**)
- Die Folien stellen auch ein Step-by-Step Tutorial dar

QGIS: Übung 1

- Das Thema der Übung ist es zu einer Vektordatei ein Polygon hinzuzufügen, die Attributtabelle entsprechend zu ergänzen, Kalkulationen in der Attributtabelle vorzunehmen und die Ergebnisse zu visualisieren
- Ausgangspunkt ist die Datei „CHN_ADM1.shp“, welches Polygone enthält, die in ihrer Gesamtheit Die Festlandprovinzen Chinas bilden
- U.a fehlt ein Polygon, dass die Insel Hainan geometrisch beschreibt!



<https://tinyurl.com/53c4cfbk>

QGIS: Übung 1 : Pointer and Attribute Data

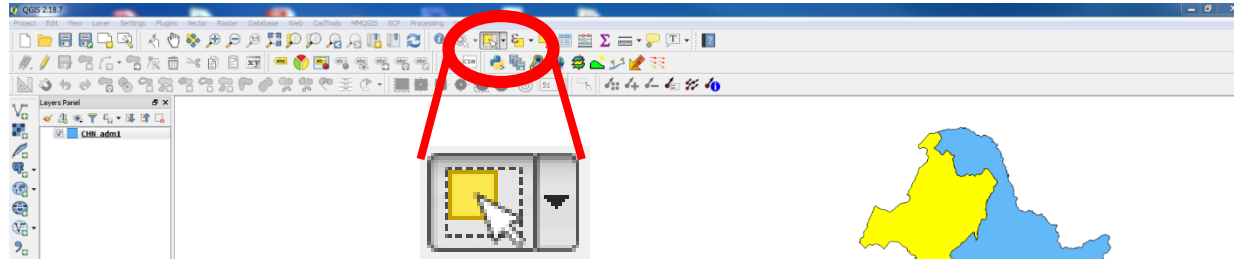
Right click this to open attribute table

ID_0	ISO	NAME_0
1	49	CHN
2	49	CHN
3	49	CHN
4	49	CHN
5	49	CHN
6	49	CHN
7	49	CHN
8	49	CHN
9	49	CHN
10	49	CHN
11	49	CHN
12	49	CHN
13	49	CHN
14	49	CHN
15	49	CHN
16	49	CHN
17	49	CHN
18	49	CHN
19	49	CHN
20	49	CHN
21	49	CHN
22	49	CHN

Feature	Value
# CHN_admin1	
NAME_0	China
ID_0	49
ISO	CHN
NAME_0	China
ISL_1	19
NAME_1	Nor Mongolia
FASCC_1	CHNM
CCN_1	0
CCA_1	
TYPE_1	22-unknown
ENGTYP_1	Autonomous Region
NL_NAME_1	ᠨᠣᠷᠮᠣᠩᠭ᠋ᠢᠨ ᠤᠯᠤᠰ
VARNAME_1	Inner Mongolia[Nor Mongolia]

Where are the Islands???

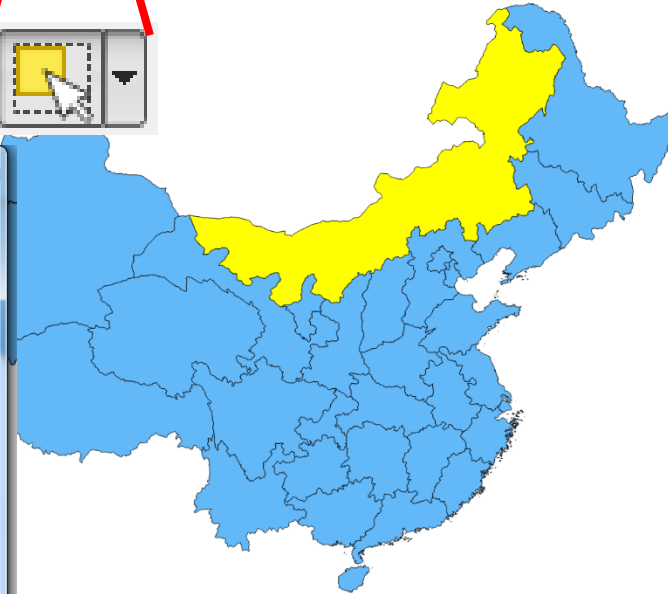
QGIS: Übung 1 : Data Selection



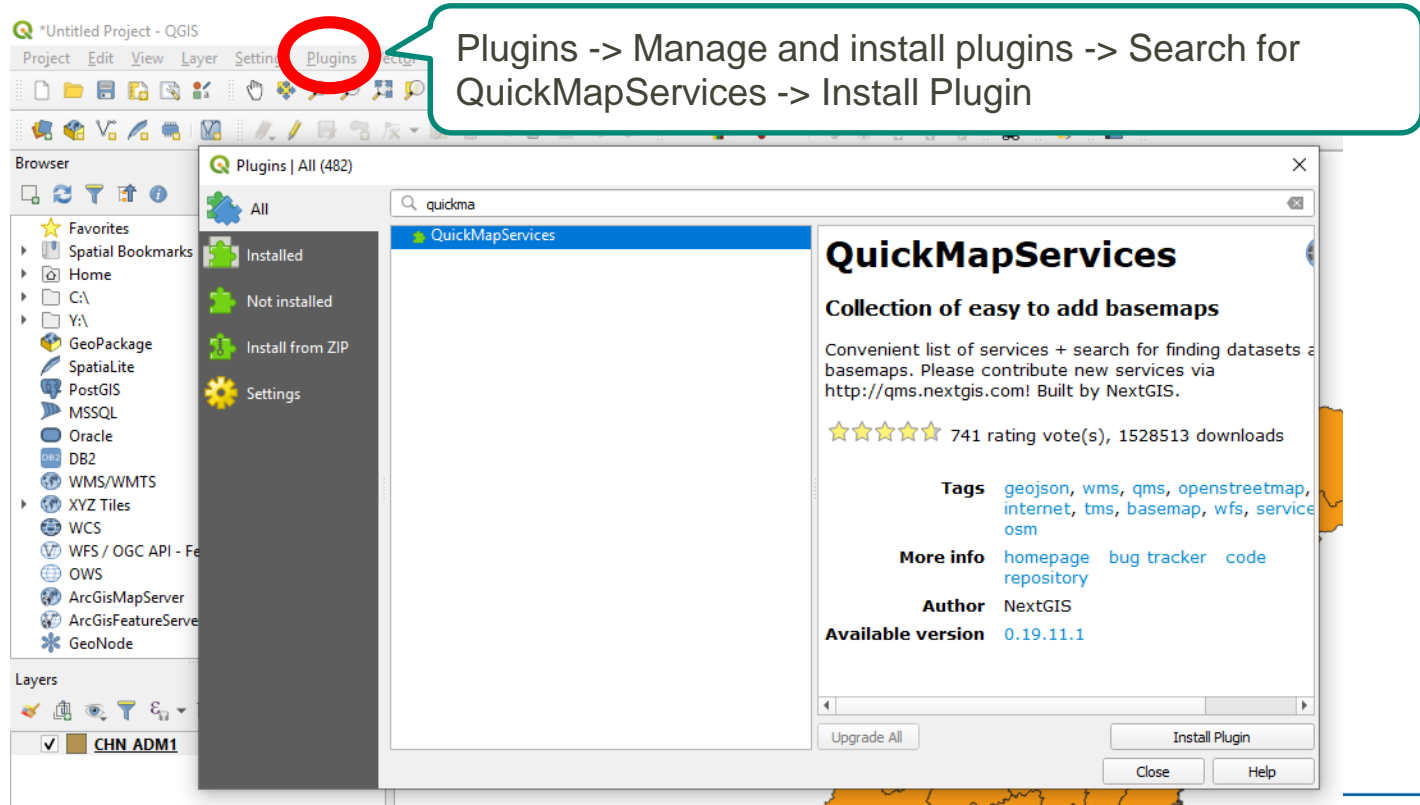
CHN_admin1 :: Features total: 31, filtered: 31, selected: 1

ID_0	ISO	NAME_0	ID_1	NAME_1	H
16	49	CHN	China	16 Jiangxi	CN.JX
17	49	CHN	China	17 Jilin	CN.JL
18	49	CHN	China	18 Liaoning	CN.LN
19	49	CHN	China	19 Nei Mongol	CN.NM
20	49	CHN	China	20 Ningxia Hui	CN.NX
21	49	CHN	China	21 Qinghai	CN.QH
22	49	CHN	China	22 Shaanxi	CN.SA
23	49	CHN	China	23 Shandong	CN.SD
24	49	CHN	China	24 Shanghai	CN.SH
25	49	CHN	China	25 Shaanxi	CN.SY

Show All Features



QGIS: Übung 1 : Use Layers Plugin



The screenshot shows the QGIS interface with the 'Plugins' menu highlighted in red. A callout box contains the text: 'Plugins -> Manage and install plugins -> Search for QuickMapServices -> Install Plugin'. The 'Plugins | All (482)' dialog is open, showing a search for 'quickma' and the 'QuickMapServices' plugin selected. The details for 'QuickMapServices' are displayed on the right, including its description, rating, tags, and version information.

Plugins -> Manage and install plugins -> Search for QuickMapServices -> Install Plugin

QuickMapServices
Collection of easy to add basemaps

Convenient list of services + search for finding datasets & basemaps. Please contribute new services via <http://qms.nextgis.com>! Built by NextGIS.

★★★★★ 741 rating vote(s), 1528513 downloads

Tags [geojson](#), [wms](#), [qms](#), [openstreetmap](#), [internet](#), [tms](#), [basemap](#), [wfs](#), [service](#), [osm](#)

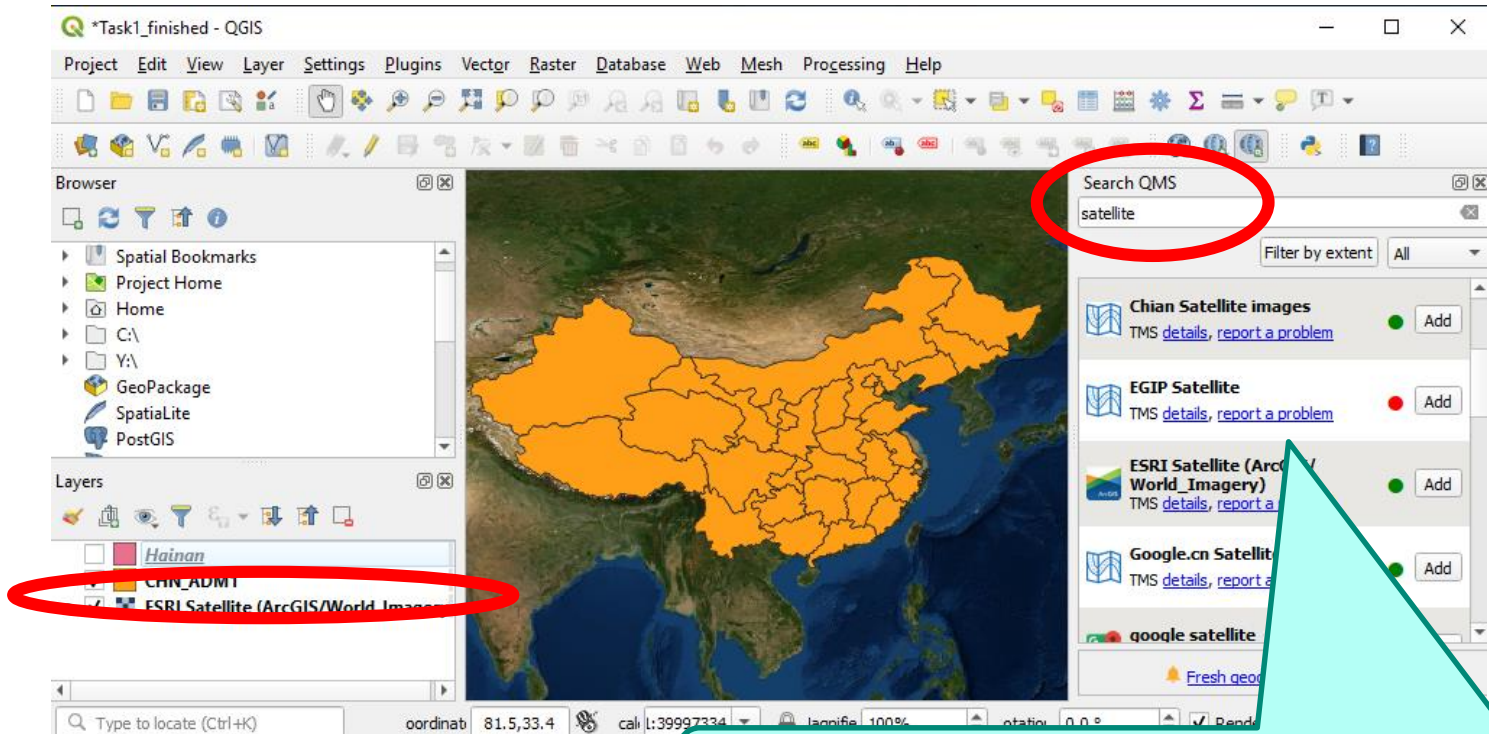
More info [homepage](#) [bug tracker](#) [code repository](#)

Author NextGIS

Available version 0.19.11.1

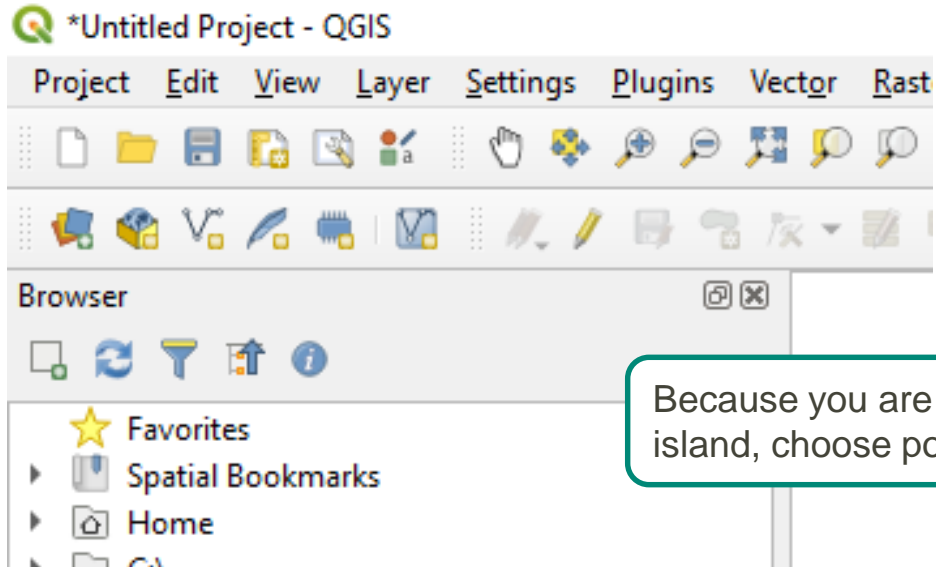
Upgrade All Install Plugin Close Help

QGIS: Übung 1 : Use Layers Plugin



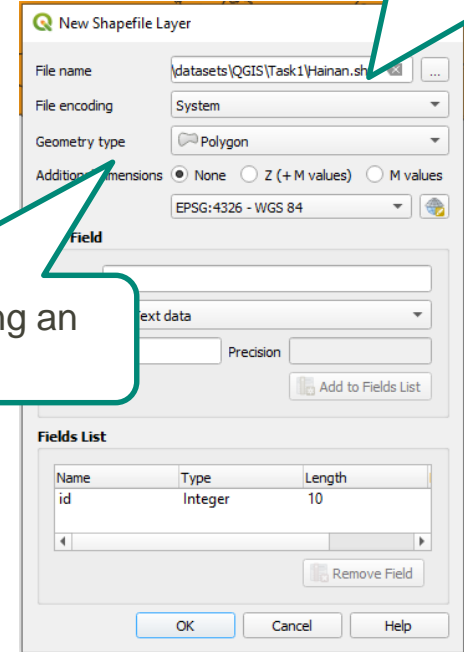
For example, you want to add a satellite map as a basemap.

QGIS: Übung 1 : New Layer

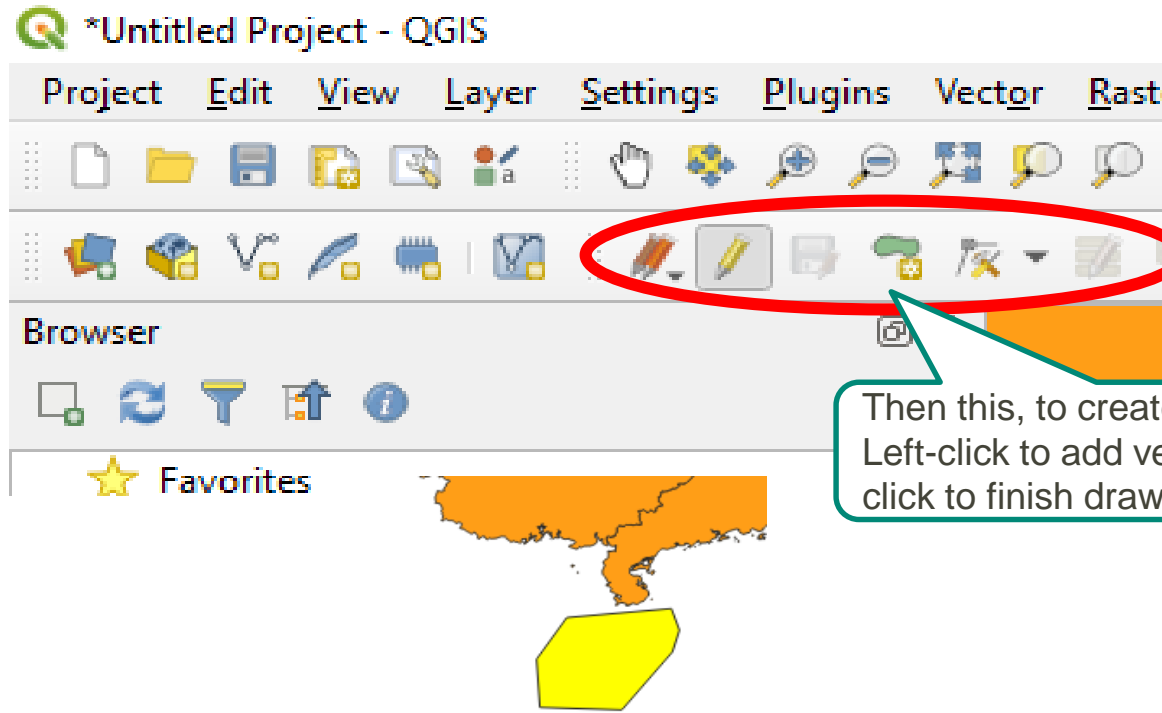


Enter the whole directory and the file name you want to name

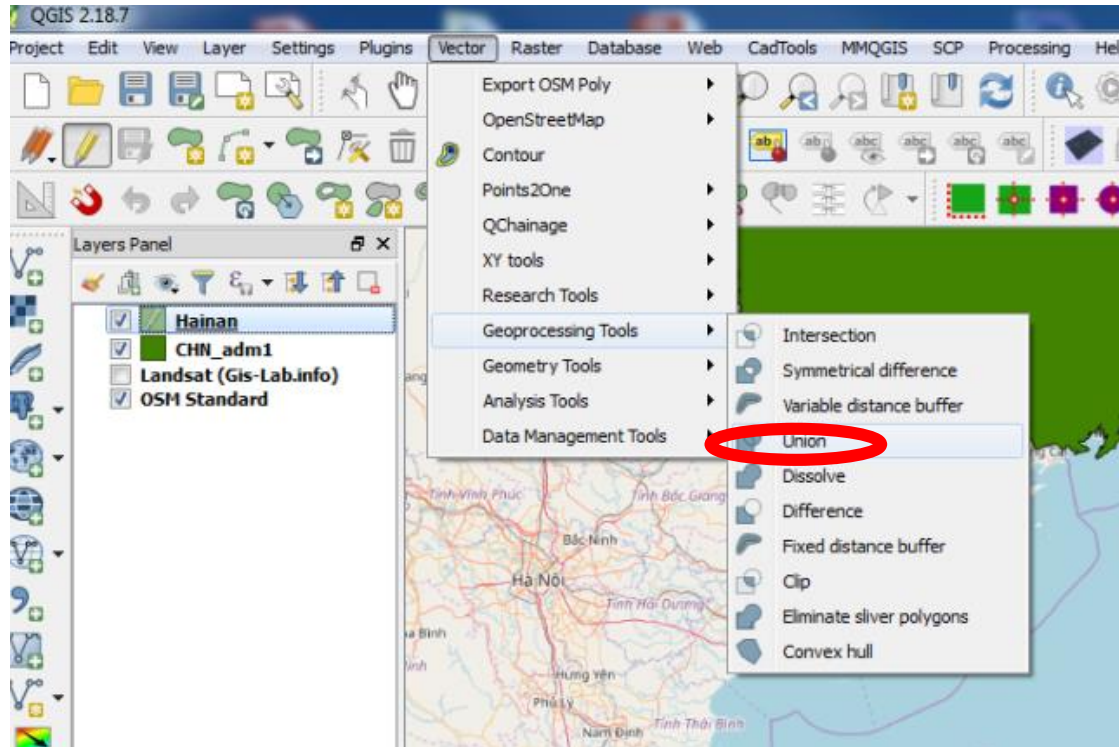
Because you are creating an island, choose polygon



QGIS: Übung 1 : New Layer

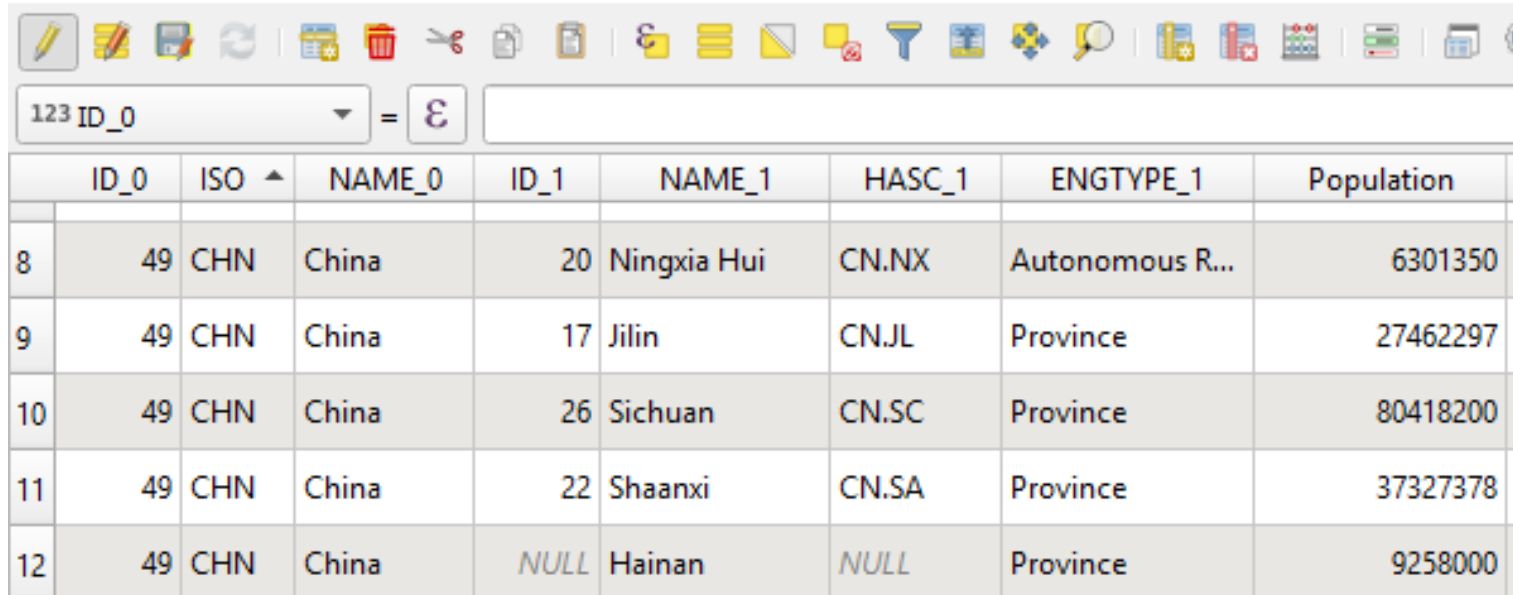


QGIS: Übung 1 : Merge the Datasets



QGIS: Übung 1 : Merge the Datasets

Union :: Features Total: 31, Filtered: 31, Selected: 1

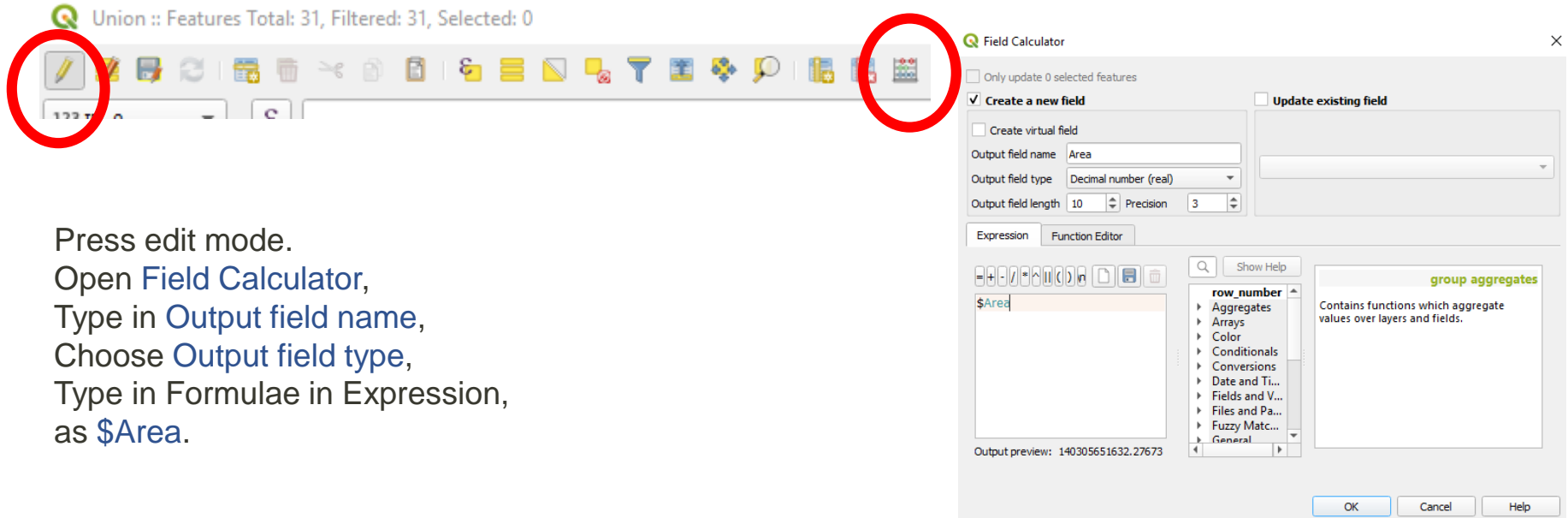


	ID_0	ISO	NAME_0	ID_1	NAME_1	HASC_1	ENGTYP_1	Population
8	49	CHN	China	20	Ningxia Hui	CN.NX	Autonomous R...	6301350
9	49	CHN	China	17	Jilin	CN.JL	Province	27462297
10	49	CHN	China	26	Sichuan	CN.SC	Province	80418200
11	49	CHN	China	22	Shaanxi	CN.SA	Province	37327378
12	49	CHN	China	NULL	Hainan	NULL	Province	9258000

Enter the population for Hainan Province in the editing mode -> Save

QGIS: Übung 1 : Get the Population Density

First, calculate the area.



The screenshot shows the QGIS interface. The top toolbar is visible, with the 'Edit' mode icon (a pencil) and the 'Field Calculator' icon (a calculator) circled in red. The 'Field Calculator' dialog box is open, showing the 'Create a new field' option selected. The 'Output field name' is 'Area', the 'Output field type' is 'Decimal number (real)', and the 'Output field length' is 10 and 'Precision' is 3. The 'Expression' field contains '\$Area'. The 'Function Editor' is open, showing a list of functions and a 'group aggregates' section.

Union :: Features Total: 31, Filtered: 31, Selected: 0

Field Calculator

Only update 0 selected features

Create a new field Update existing field

Create virtual field

Output field name: Area

Output field type: Decimal number (real)

Output field length: 10 Precision: 3

Expression: \$Area

Function Editor

row_number

- Aggregates
- Arrays
- Color
- Conditionals
- Conversions
- Date and Ti...
- Fields and V...
- Files and Pa...
- Fuzzy Matc...
- General

group aggregates

Contains functions which aggregate values over layers and fields.

Output preview: 140305651632.27673

OK Cancel Help

Press edit mode.

Open [Field Calculator](#),

Type in [Output field name](#),

Choose [Output field type](#),


Type in Formulae in Expression,

as [\\$Area](#).

QGIS: Übung 1 : Get the Population Density

A new column
'Area' is created

Union :: Features Total: 31, Filtered: 31, Selected: 0



123 ID_0 = €

	ID_0	ISO	NAME_0	ID_1	NAME_1	HASC_1	ENGTYPE_1	Population	id	Area
1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	1	48348520137,324
2	49	CHN	China	1	Anhui	CN.AH	Province	59500510	NULL	140305651632,277
3	49	CHN	China	2	Beijing	CN.BJ	Municipality	19612368	NULL	16405408154,615
4	49	CHN	China	3	Chongqing	CN.CQ	Municipality	28846170	NULL	82439056248,046
5	49	CHN	China	4	Fujian	CN.FJ	Province	36894216	NULL	122121156659,625
6	49	CHN	China	5	Gansu	CN.GS	Province	25575254	NULL	405176105517,402

Do not forget to save the Changes and end the editing mode

QGIS: Übung 1 : Get the Population Density

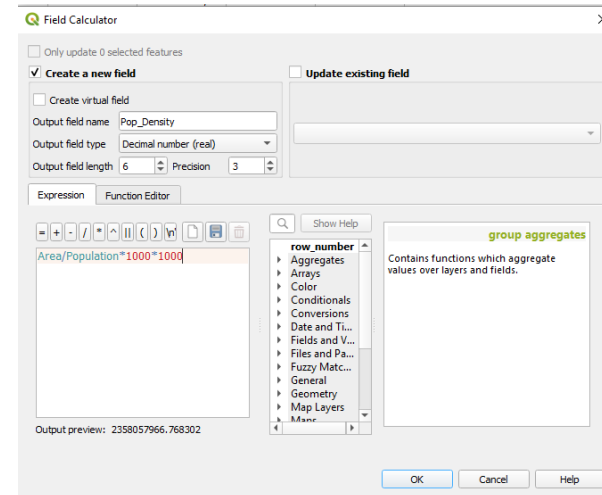
Second, calculate the population density.

 Union :: Features Total: 31, Filtered: 31, Selected: 0



Repeat the procedure.

Type in Formulae in Expression,
as $\text{Population} / \text{Area} * 1000 * 1000$.
(to convert into per square km)



QGIS: Übung 1 : Get the Population Density

A new column
,Pop_Density' is created

Union :: Features Total: 31, Filtered: 31, Selected: 0

	ID_0	ISO	NAME_0	ID_1	NAME_1	HASC_1	ENGTYP_1	Population	id	Area	Pop_Density
1	49	CHN	China	27	Tianjin	CN.TJ	Municipality	12938224	NULL	11698868005,239	1106
2	49	CHN	China	2	Beijing	CN.BJ	Municipality	19612368	NULL	16405408154,615	1195
3	49	CHN	China	30	Yunnan	CN.YN	Province	45966239	NULL	383012737820,189	120
4	49	CHN	China	20	Ningxia Hui	CN.NX	Autonomous R...	6301350	NULL	51860088202,667	122
5	49	CHN	China	28	Xinjiang Uygur	CN.XJ	Autonomous R...	21813334	NULL	1629441628415,...	13
6	49	CHN	China	17	Jilin	CN.JL	Province	27462297	NULL	191009578439,046	144
7	49	CHN	China	26	Sichuan	CN.SC	Province	80418200	NULL	483835223375,291	166

Do not forget to save the Changes and end the editing mode

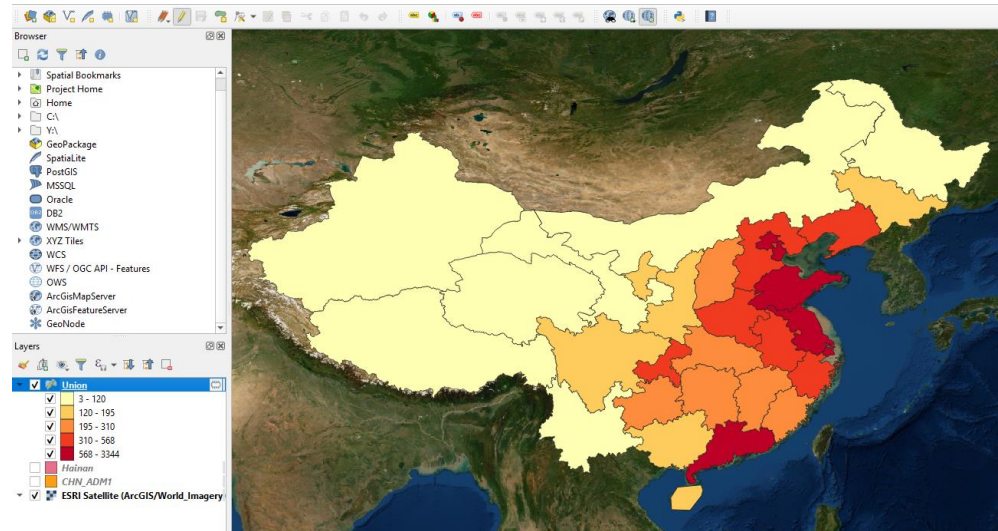
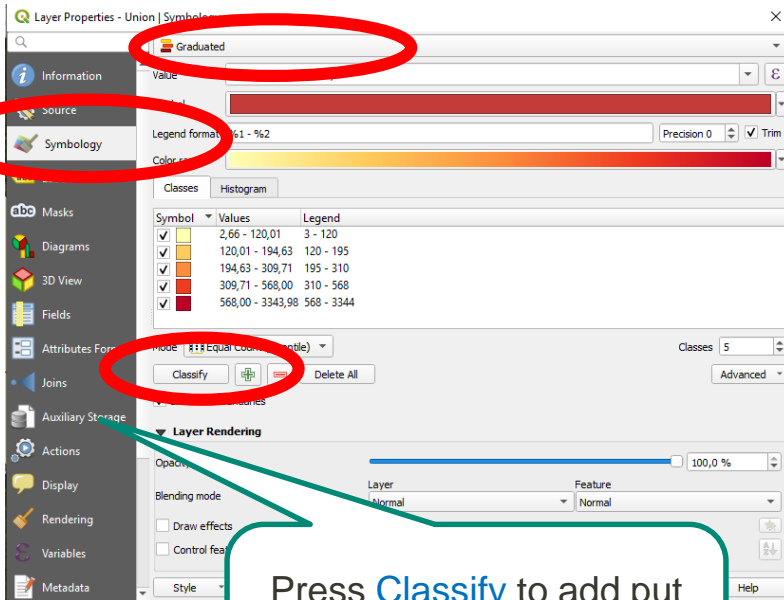
QGIS: Übung 1 :How it should look Now

The screenshot displays the QGIS interface with a 'Union :: Features Total: 31, Filtered: 31, Selected: 0' dialog box open. The dialog box contains a table with the following data:

ID_0	ISO	NAME_0	ID_1	NAME_1	HASC_1	ENGTYPE_1	Population	Pop_Density	Area	
1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	48348520137,32431	
2	49	CHN	China	29	Xizang	CN.XZ	Autonomous R...	3002166	2,656	1130161181287,6838
3	49	CHN	China	21	Qinghai	CN.QH	Province	5626722	7,862	715709733664,5275
4	49	CHN	China	20	Ningxia Hui	CN.NX	Autonomous R...	6301350	121,507	51860088202,66658
5	49	CHN	China	27	Tianjin	CN.TJ	Municipality	12938224	1105,938	11698868005,23899
6	49	CHN	China	2	Beijing	CN.BJ	Municipality	19612368	1195,482	16405408154,615015
7	49	CHN	China	28	Xinjiang Uy...	CN.XJ	Autonomous R...	21813334	13,387	1629441628415,7288
8	49	CHN	China	24	Shanghai	CN.SH	Municipality	23019148	3343,977	6883762910,838238
9	49	CHN	China	19	Nei Mongol	CN.NM	Autonomous R...	24706321	21,550	1146482559238,9583
10	49	CHN	China	5	Guangdong	CN.GD	Province	35575354	62,121	405176105517,4022

The background shows a map of China with various regions highlighted in purple. The QGIS interface includes a menu bar, a toolbar, and a Browser panel on the left.

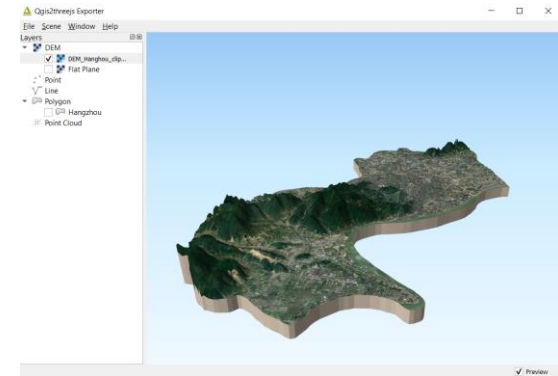
QGIS: Übung 1 :Visualisation



Finished!!!!, save as screenshot or use print composer for export

QGIS: Übung 2 :Einleitung

- Der zweite Teil der Übung bleibt in China
- Das Ziel ist eine 3D Visualisierung der Umgebung des Westsees in der Nähe der Stadt Hangzhou zu erstellen
- Dafür werden sie ihre Kenntnisse zu Vektordaten in QGIS vertiefen und zusätzlich sich mit Rasterdatenprozessierung auseinandersetzen



• 2D GIS World

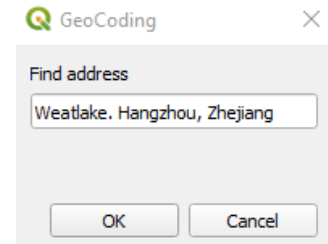


3D world



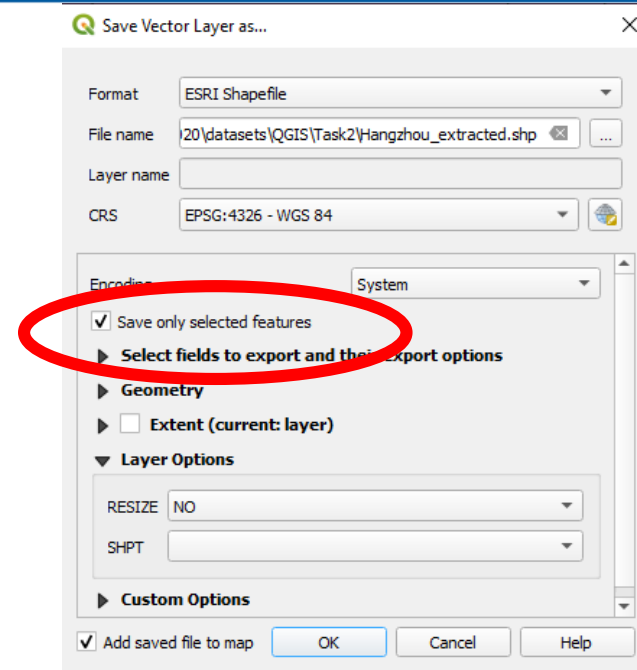
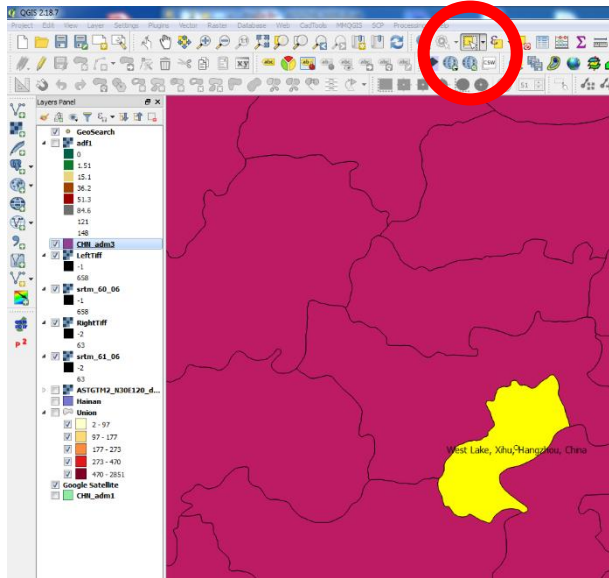
QGIS: Übung 2 :Find the Westlake

Download the plugin, 'GeoCoding', and search by pressing the icon



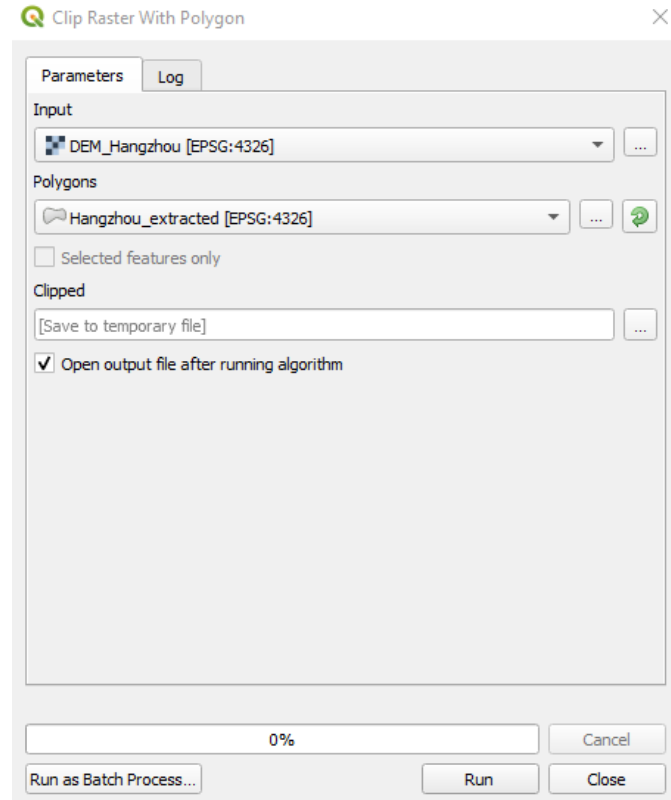
QGIS: Übung 2 : Extract the Polygon of Hangzhou

- Open „CHN_adm3.shp“
- Find the Polygon which describes Hangzhou City
- Select the polygon. On the toolbar, Layer -> Save As



QGIS: Übung 2 :Extract the DEM of Hangzhou

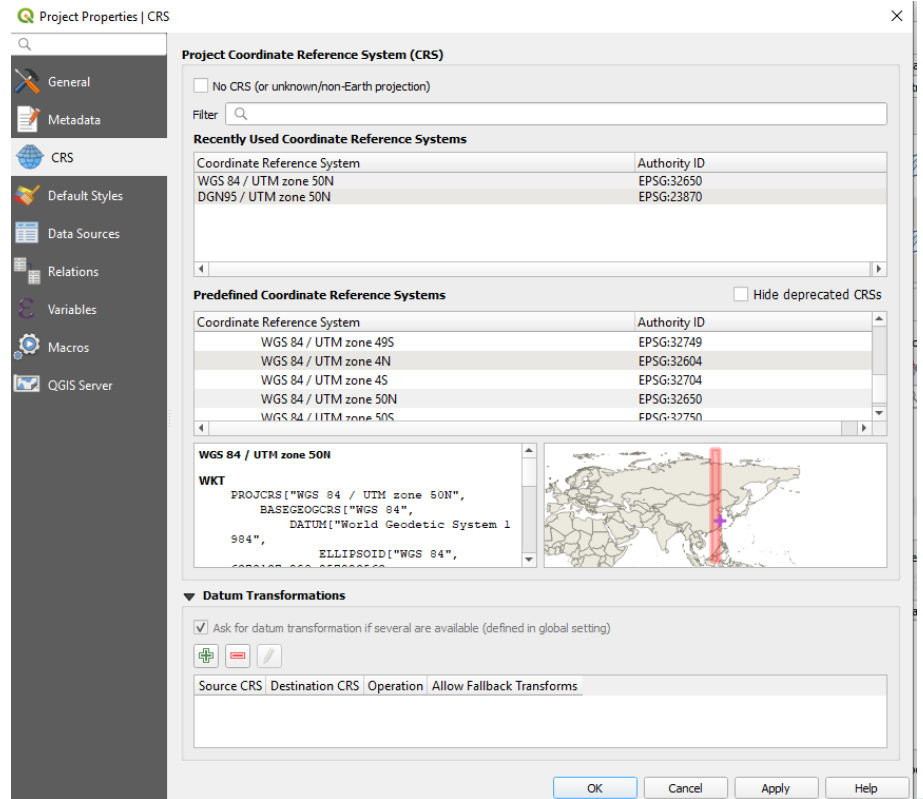
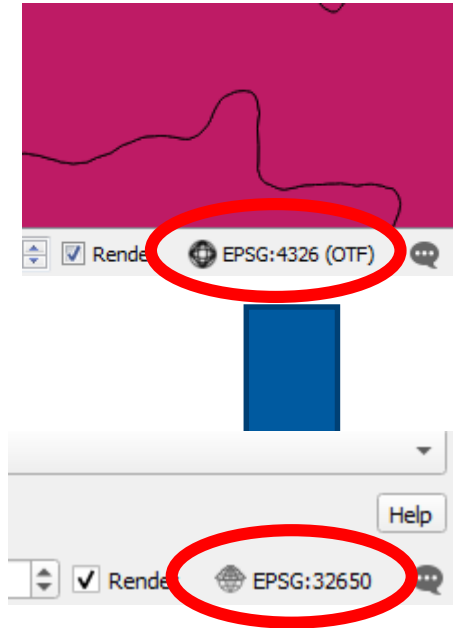
- Input the DEM_Hangzhou tif file.
- Select the previous cutted polygon



QGIS: Übung 2 :Do the 3D Visualisation

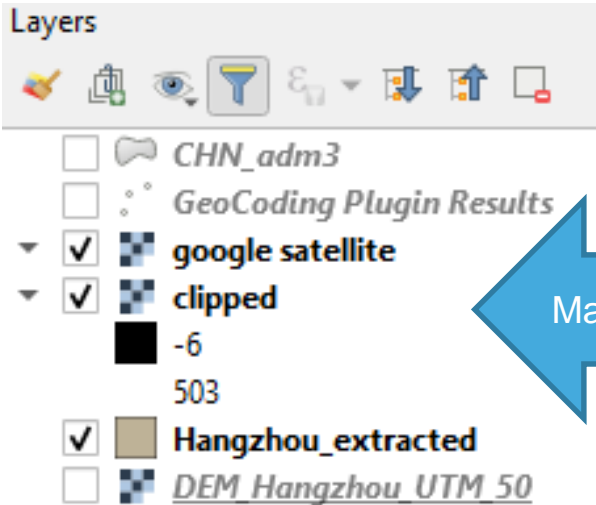
- Install the QGIS2threejs Plugin
- Change the Project Projection to UTM zone 50N (EPSG:32650)
- Open it
- Follow the Instructions
- Open the Result in the Browser (locally)
- Alternative export: use native 3D image viewer









QGIS: Übung 2 : Change the Project Projection



QGIS: Übung 2 : Adjust the order of layers

Layers



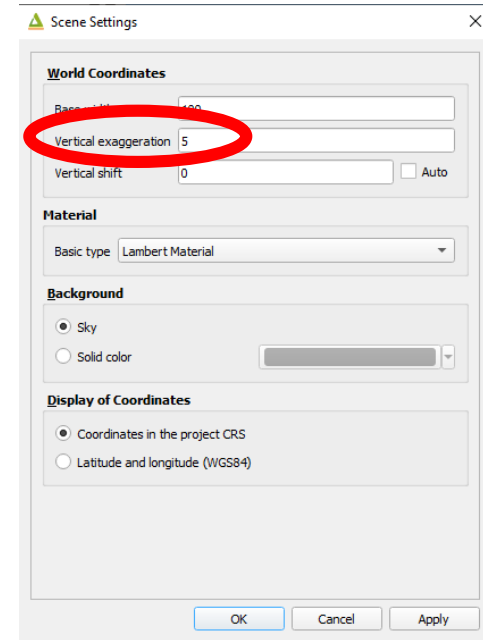
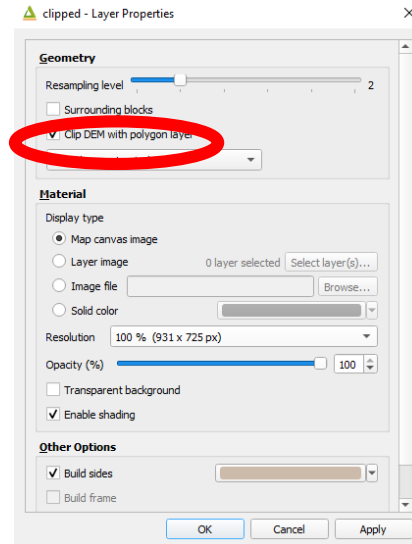
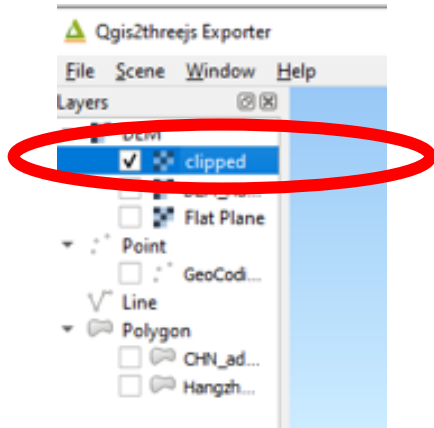
-  CHN_adm3
-  GeoCoding Plugin Results
-  google satellite
-  clipped
-  -6
-  503
-  Hangzhou_extracted
-  DEM Hangzhou UTM 50

Maybe something diff from google



QGIS: Übung 2 :Adjust the vertical exaggeration

- Open QGIS2threejs Plugin
- Adjust the vertical exaggeration
- Right click the layer, select properties, Tick Clip DEM with polygon layer



QGIS: Übung 2 : Result

