Water Rennovation in Ukraine
Project no. 22320101

Data Processing in GIS

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Kraków
22-28 IV 2024

The project is co-financed by the Governments of the Czechia, Hungary, Poland and Slovakia through Visegrad Grants from International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe.

Data Processing in GIS

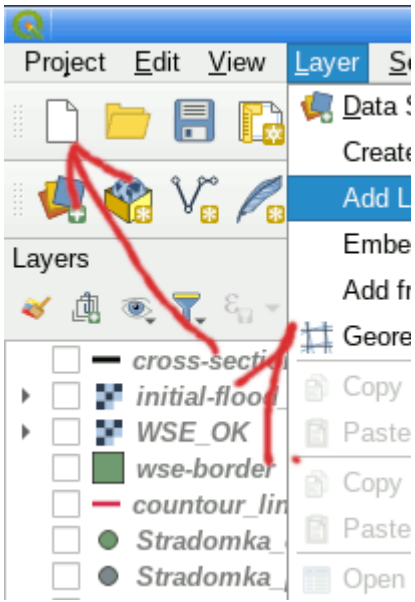
Visegrad Fund

Plan:
1. new project
2. project data (DTM, river, ortofotomap)
3. data analysis
4. drawing new objects
5. data export

modeling of flow

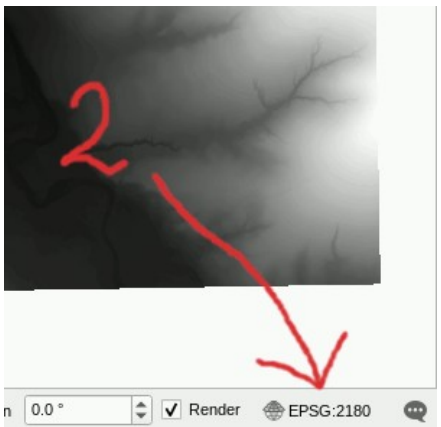
6. data import
7. generating flood zones

Data Processing in GIS – new project

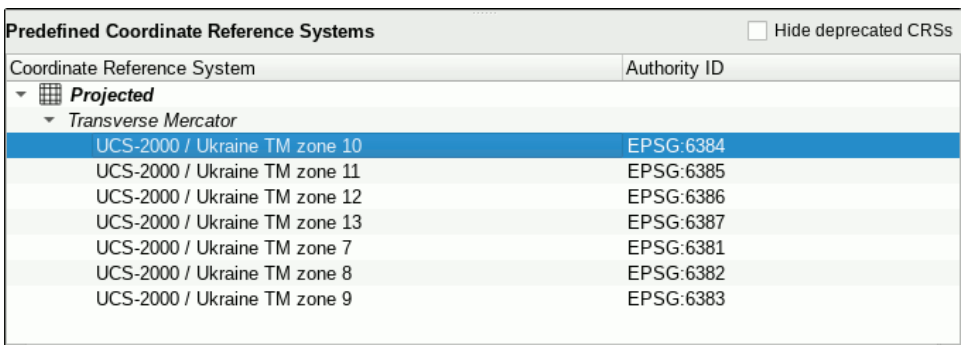


create new project

set the right coordinate system
in Poland EPSG:2180

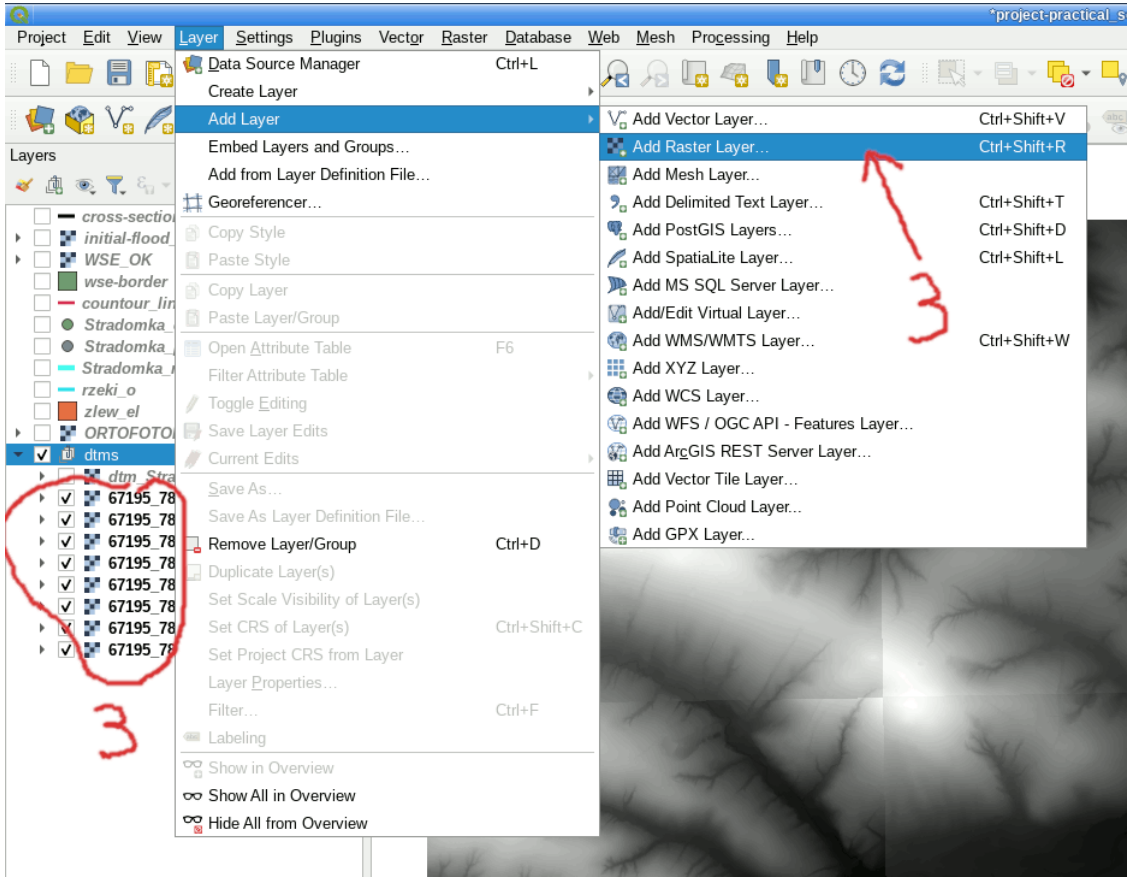


in Ukraine



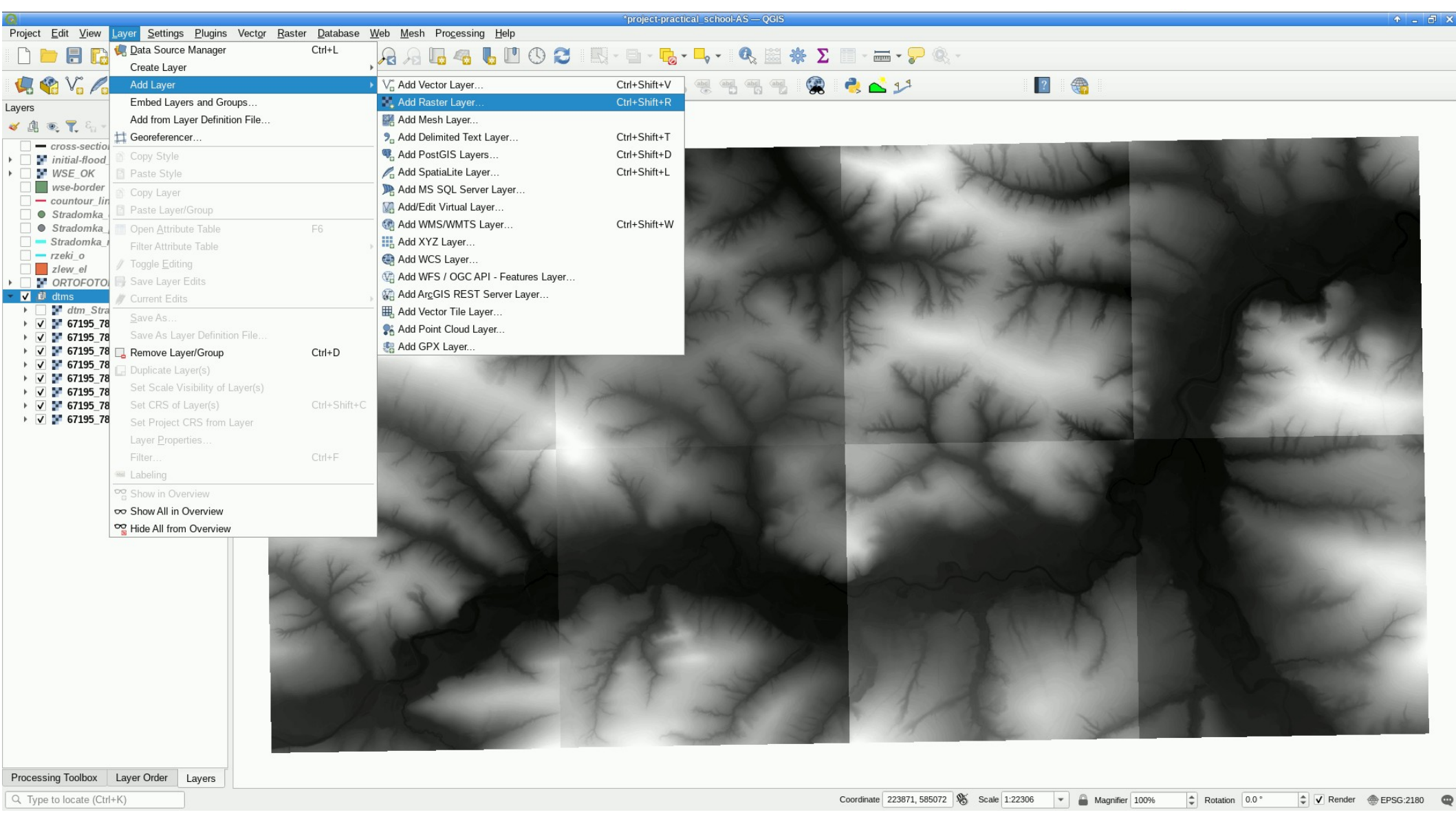
Save project in good location !!!

Data Processing in GIS – project data



add rasters

and set their CRS to the proper one (for this project epsg:2180)


*project-practical_school-AS — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Data Source Manager Ctrl+L
Create Layer
Add Layer
Embed Layers and Groups…
Add from Layer Definition File…
Georeferencer…
Copy Style
Paste Style
Copy Layer
Paste Layer/Group
Open Attribute Table F6
Filter Attribute Table
Toggle Editing
Save Layer Edits
Current Edits
Save As…
Save As Layer Definition File…
Remove Layer/Group Ctrl+D
Duplicate Layer(s)
Set Scale Visibility of Layer(s)
Set CRS of Layer(s) Ctrl+Shift+C
Set Project CRS from Layer
Layer Properties…
Filter… Ctrl+F
Labeling
Show in Overview
Show All in Overview
Hide All from Overview
Add Vector Layer… Ctrl+Shift+V
Add Raster Layer… Ctrl+Shift+R
Add Mesh Layer…
Add Delimited Text Layer… Ctrl+Shift+T
Add PostGIS Layers… Ctrl+Shift+D
Add SpatiaLite Layer… Ctrl+Shift+L
Add MS SQL Server Layer…
Add/Edit Virtual Layer…
Add WMS/WMTS Layer… Ctrl+Shift+W
Add XYZ Layer…
Add WCS Layer…
Add WFS / OGC API - Features Layer…
Add ArcGIS REST Server Layer…
Add Vector Tile Layer…
Add Point Cloud Layer…
Add GPX Layer…
Layers
cross-sectio
initial-flood_
WSE_OK
wse-border
countour_lin
Stradomka_
Stradomka_
Stradomka_
rzeki_o
zlew_el
ORTOFOTO
dtms
dtm_Stra
67195_78
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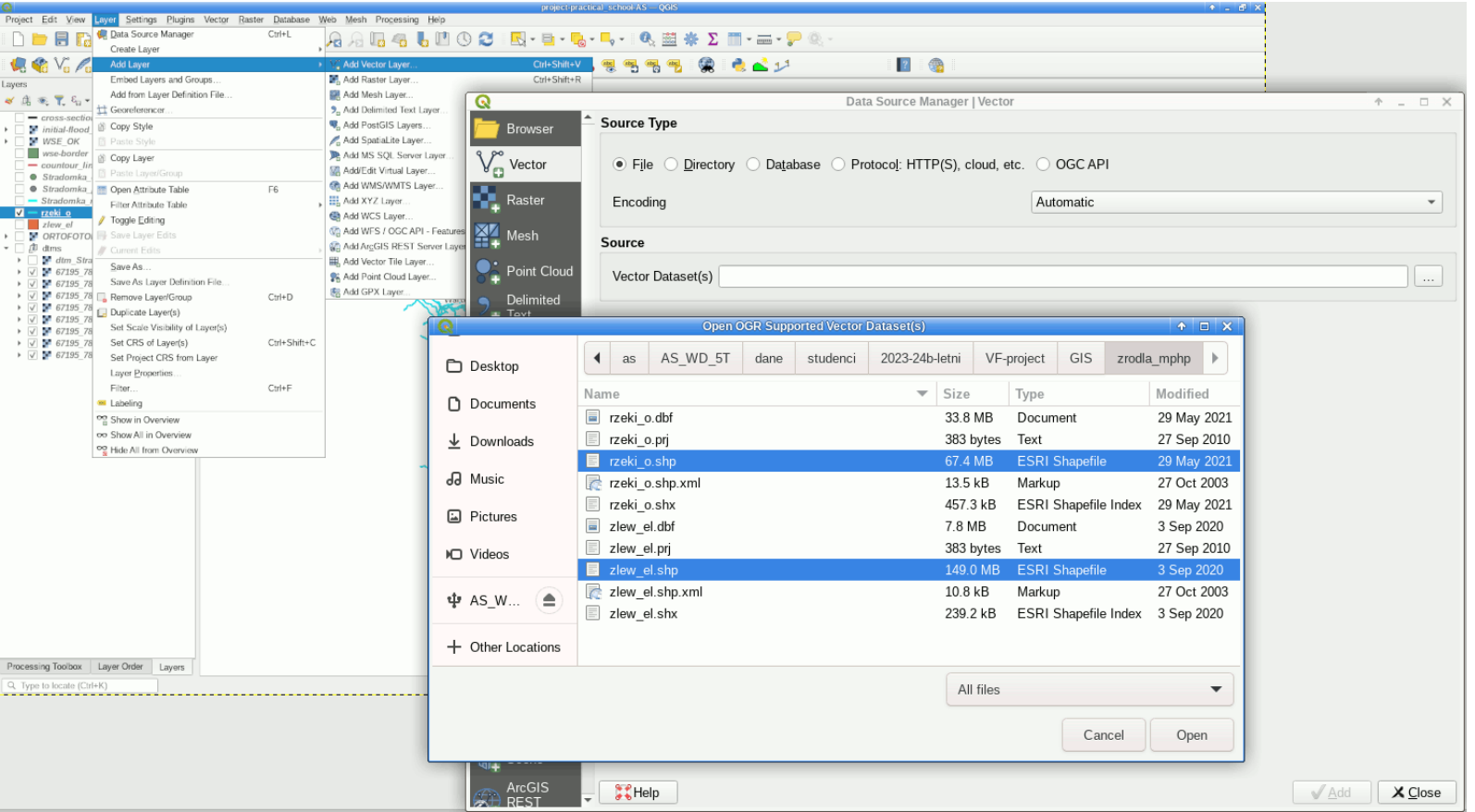
67195_78
67195_78
67195_78
67195_78
67195_78
Processing Toolbox
Layer Order
Layers
Type to locate (Ctrl+K)
Coordinate 223871, 585072
Scale 1:22306
Magnifier 100%
Rotation 0.0 °
Render
EPSG:2180

Data Processing in GIS – project data



insert vector layers

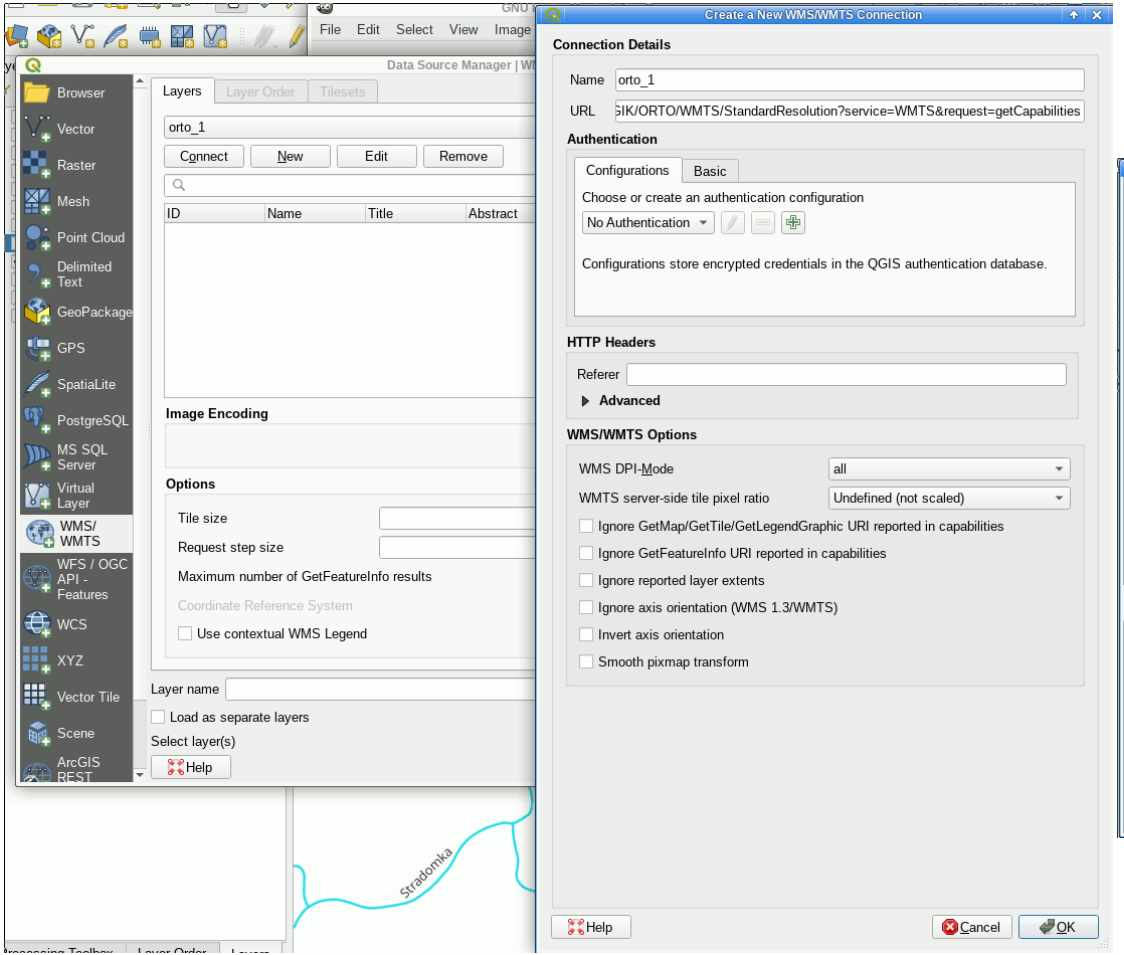
load the ortofotomap

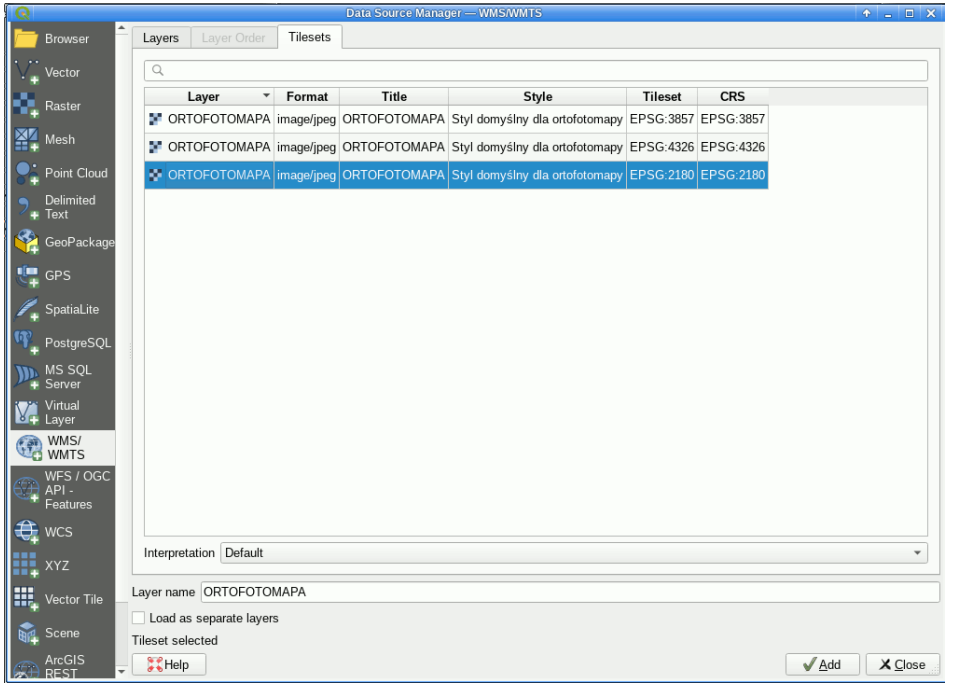
1. the data
https://www.geoportal.gov.pl/uslugi/usluga-przegladania-wms

https://mapy.geoportal.gov.pl/wss/service/PZGIK/ORTO/WMTS/StandardResolution

2. the addition
?service=WMTS&request=getcapabilities

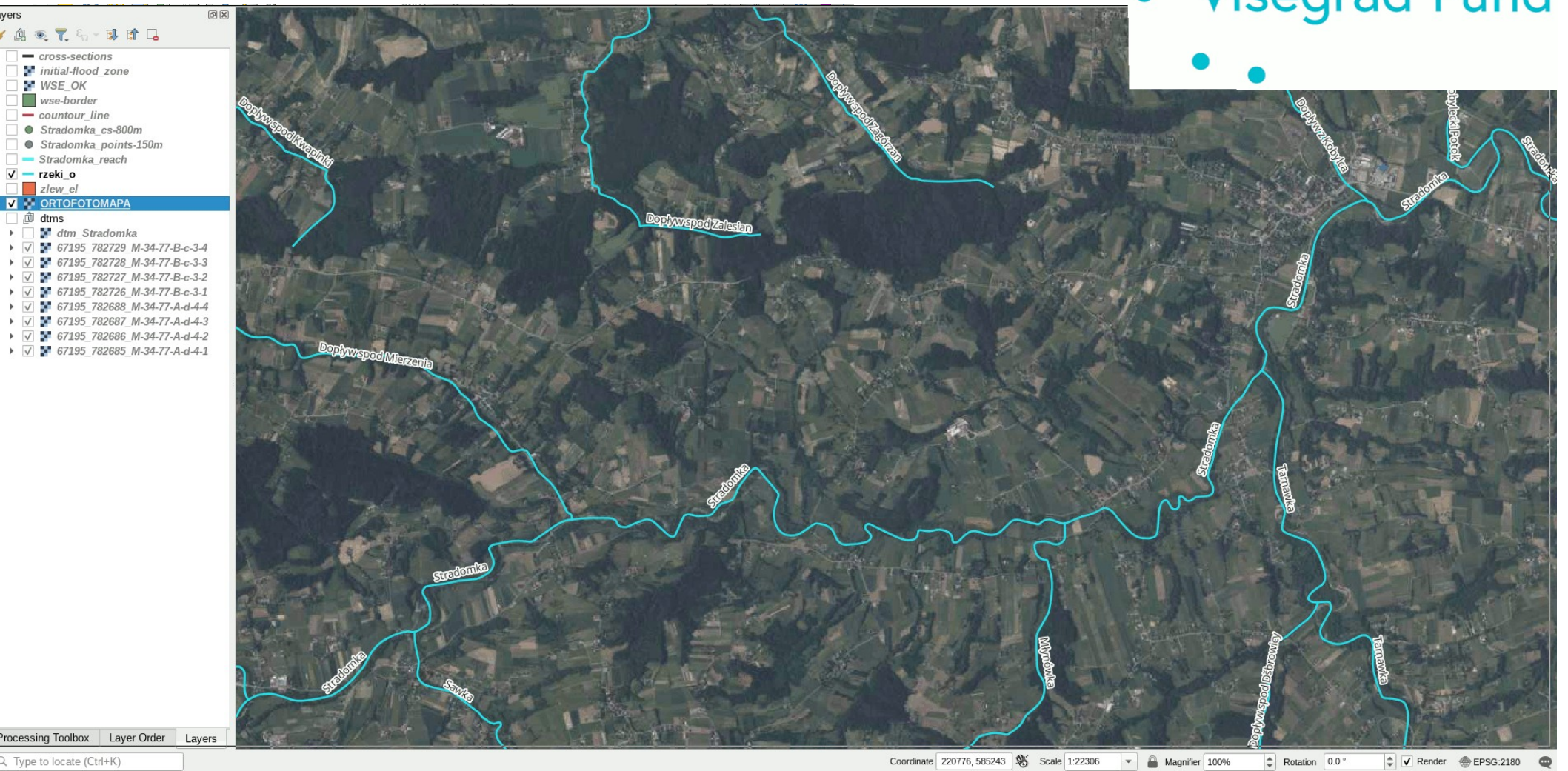
Data Processing in GIS – project data





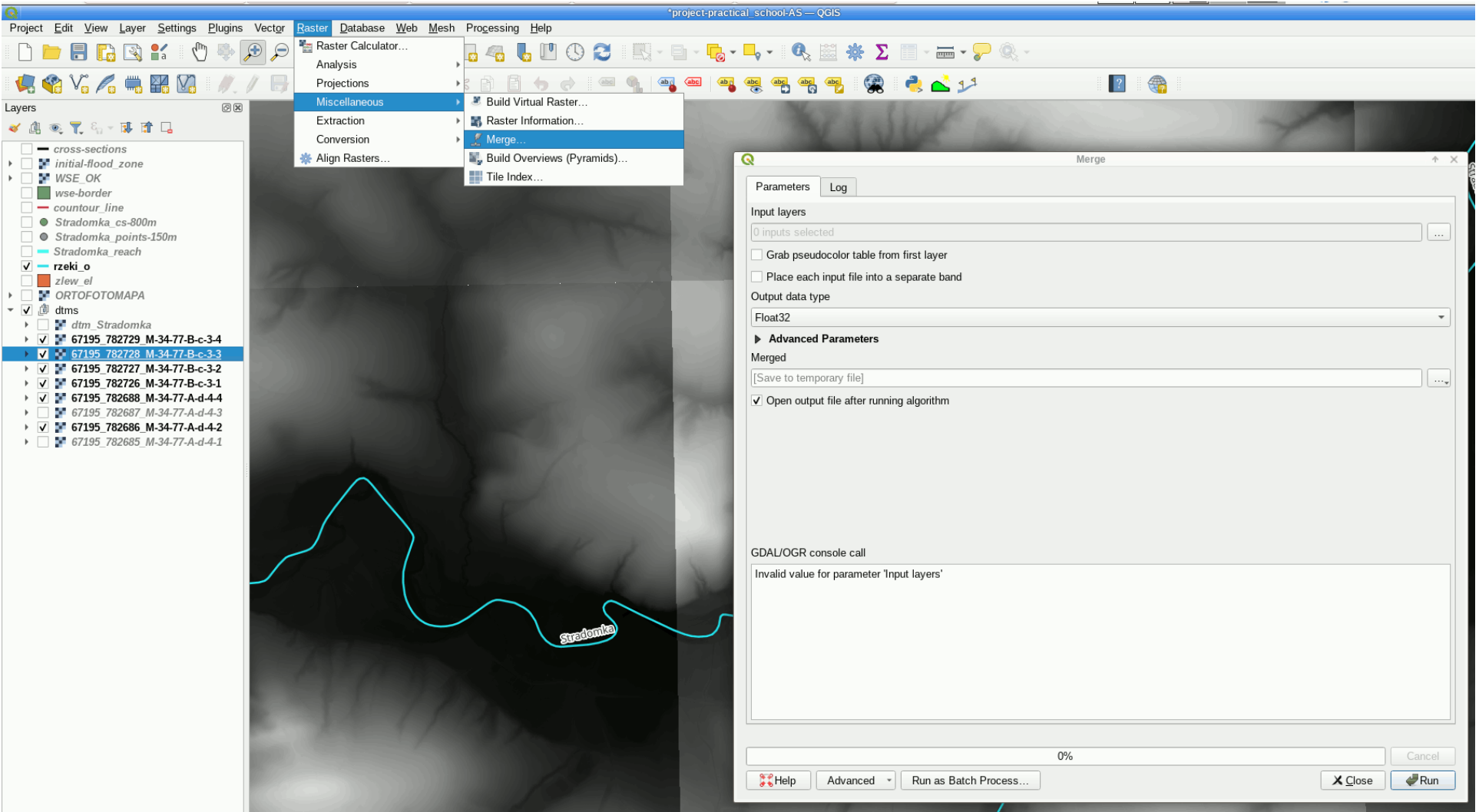
Data Processing in GIS – project data

Visegrad Fund



Data Processing in GIS – data analysis

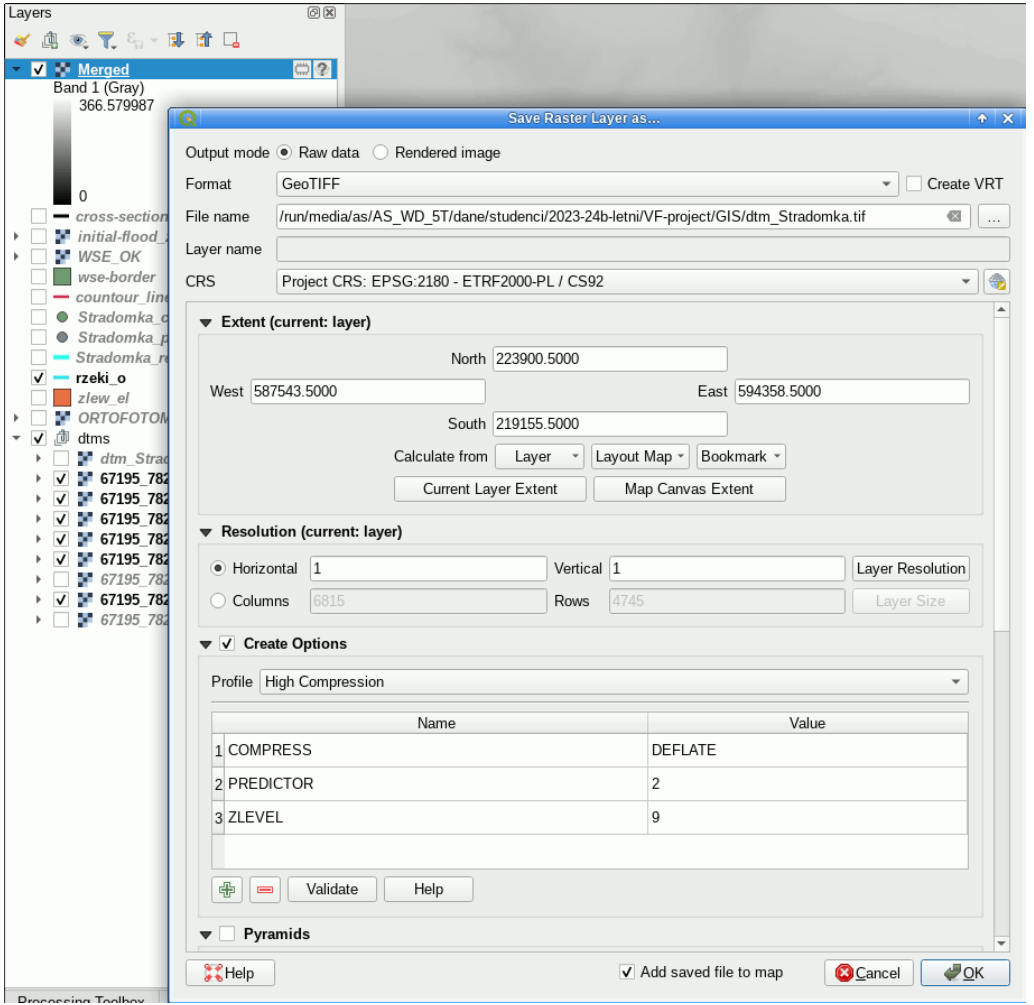
merge rasters

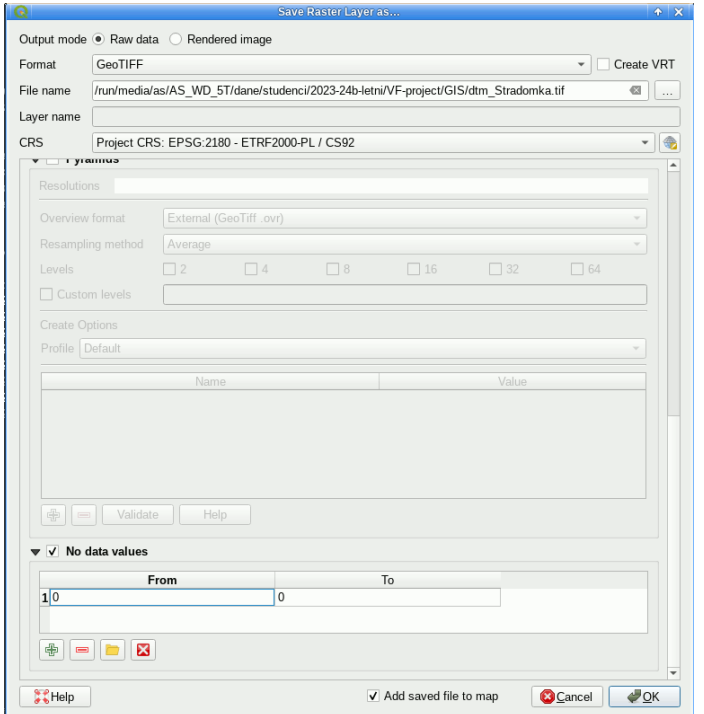


Data Processing in GIS – data analysis

Visegrad Fund

export merged raster to file
- set path and name
- set projection
- set compression
- set no data values





Data Processing in GIS – data analysis

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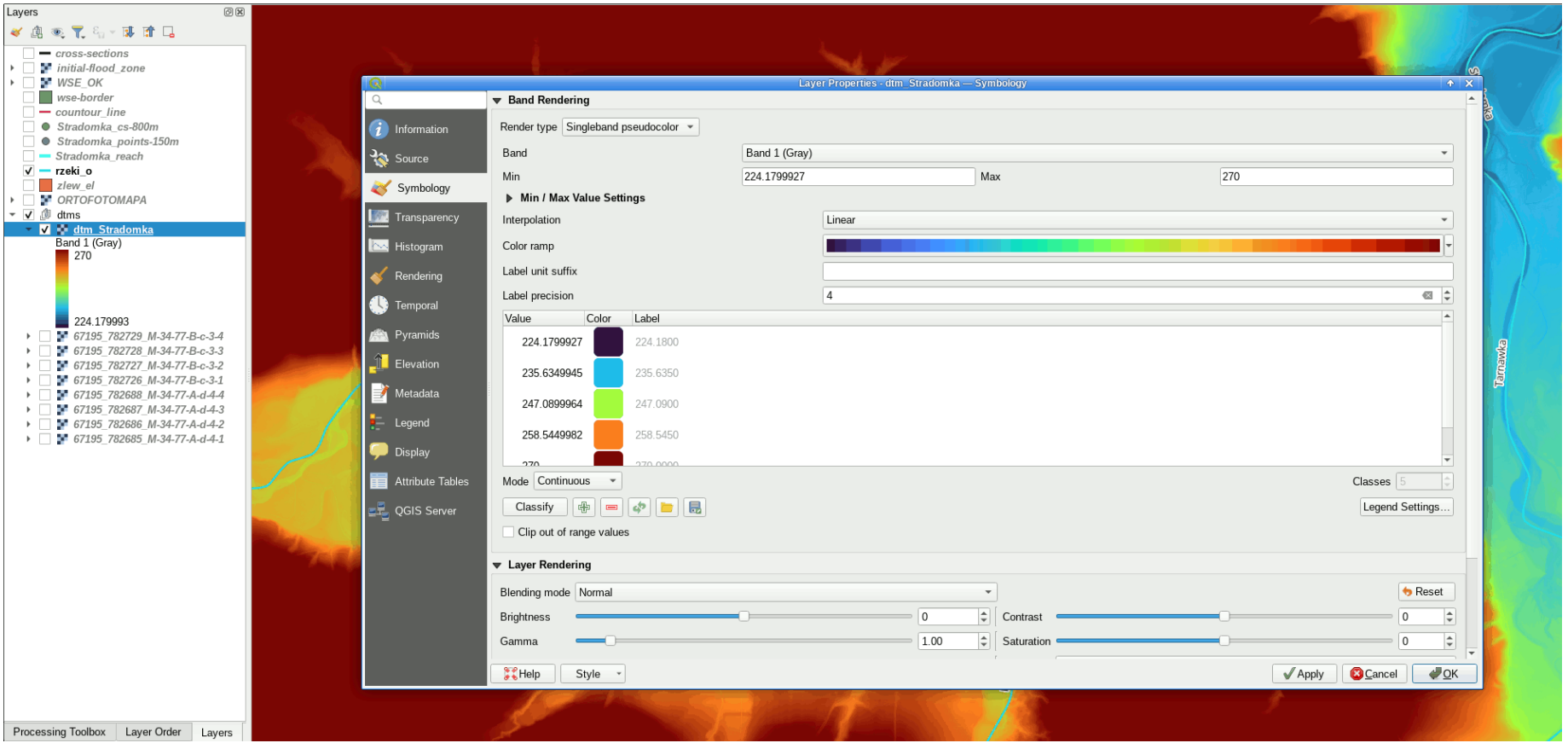
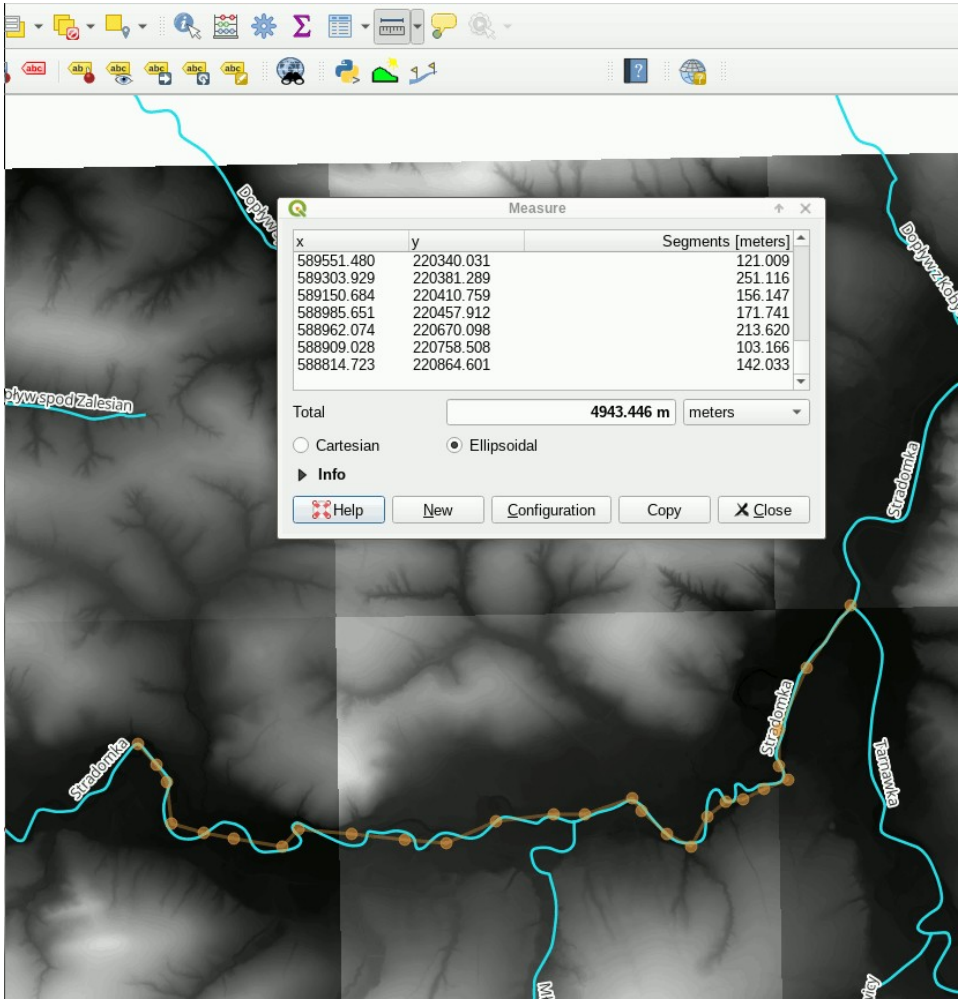
set good legend



Data Processing in GIS – data analysis

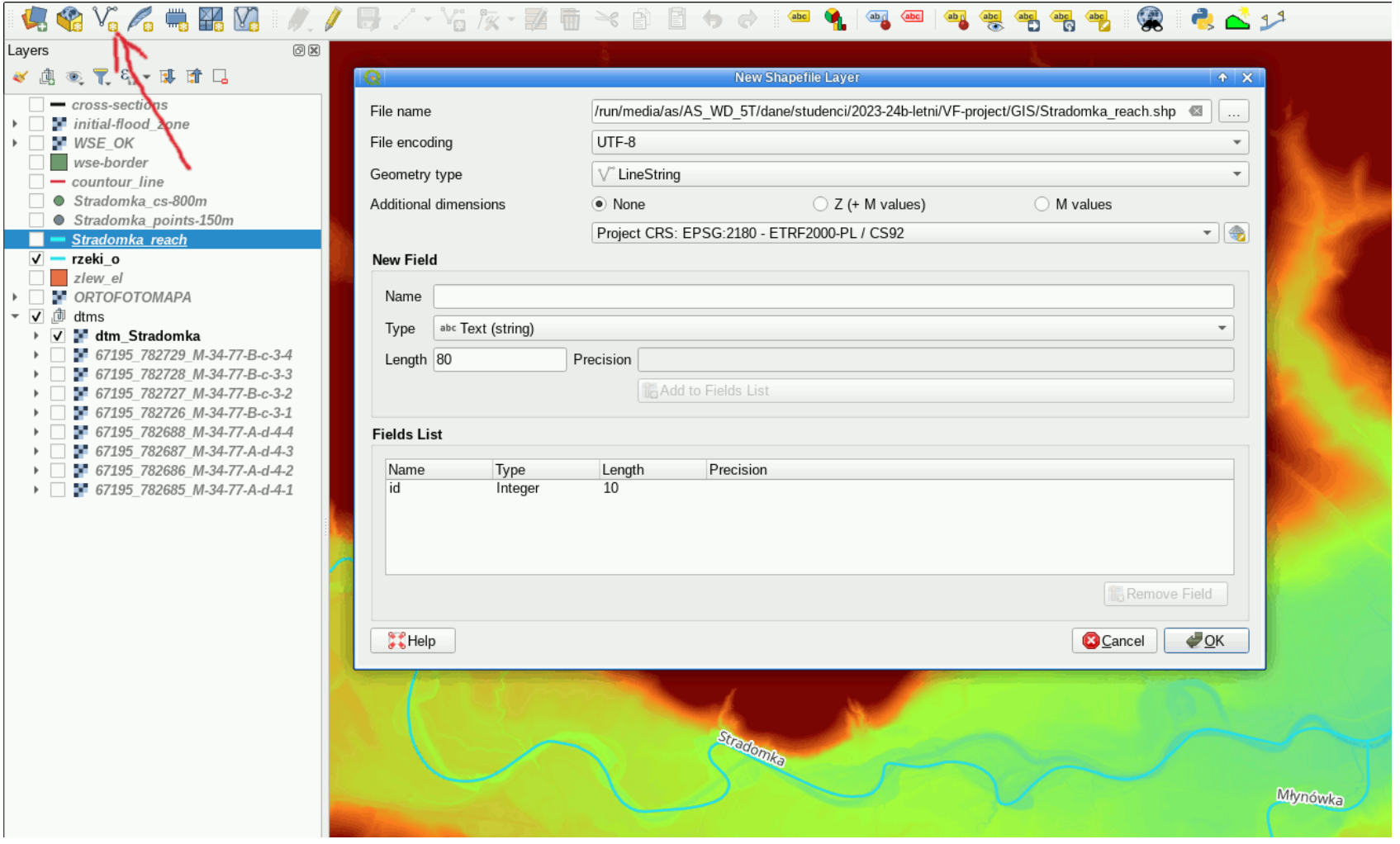


zoom to loaded DTM's

measure the length of some kilometers and choose the river reach

Data Processing in GIS – drawing new objects

Visegrad Fund



create new vector layer

Data Processing in GIS – drawing new objects

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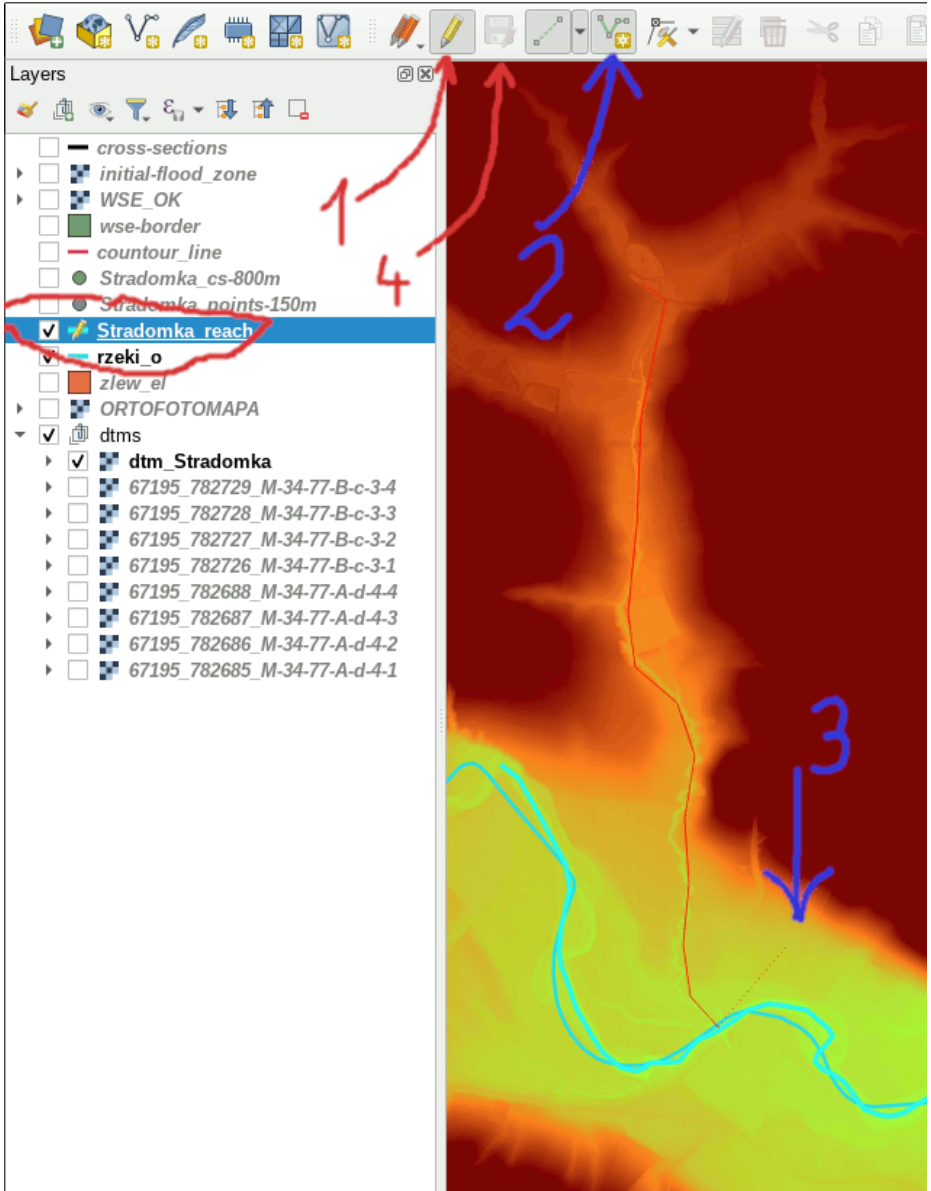
RIVER CHANNEL

1. edit layer
2. toggle drawing
3. draw by left button
   finish by right button
   fill data in table (or left blank)
4. save objects in layer

5 – 1. – switch editing off

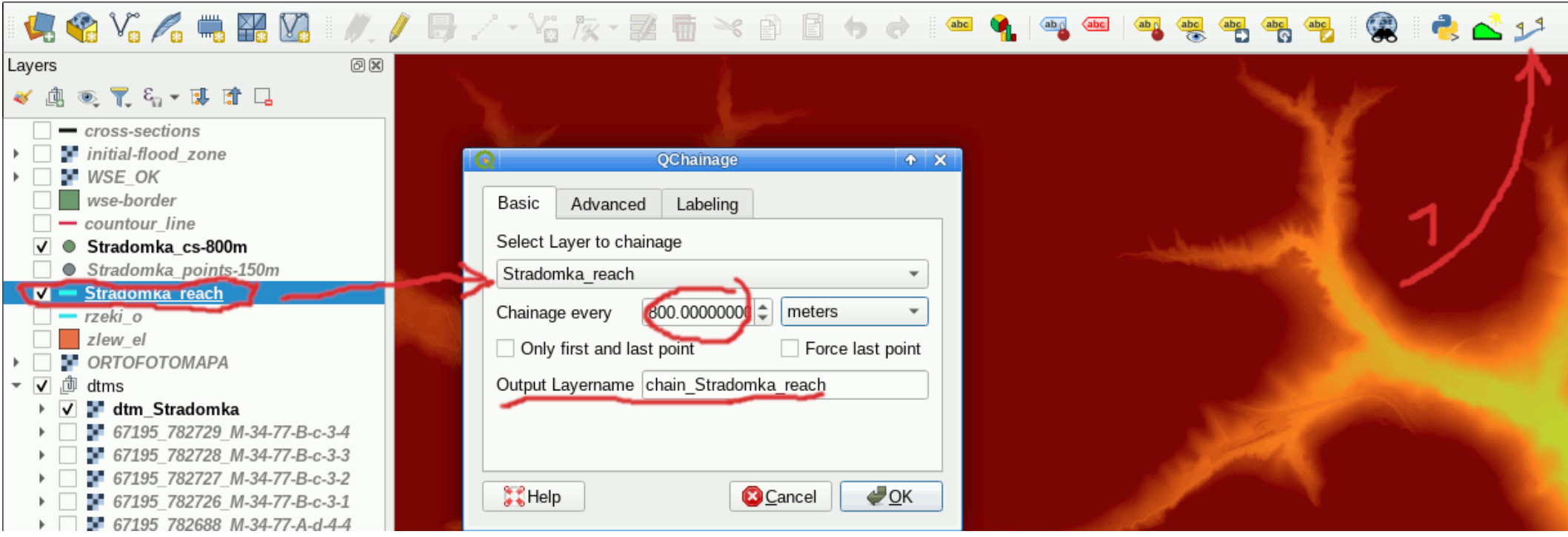
set layer properties



Data Processing in GIS – drawing new objects

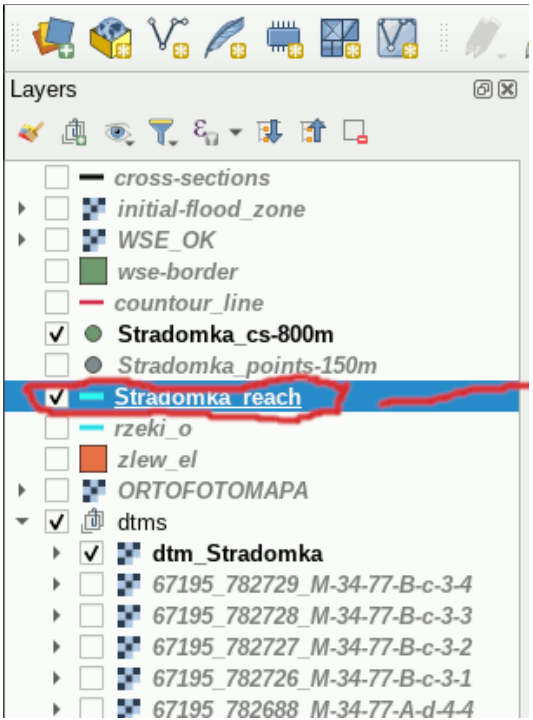
Visegrad Fund

QCHAINAGE PLUGIN



qchainage - measure distance along lines – points on river
- location of cross-sections, - coordinates of river nodes for channel data export

Data Processing in GIS – drawing new objects

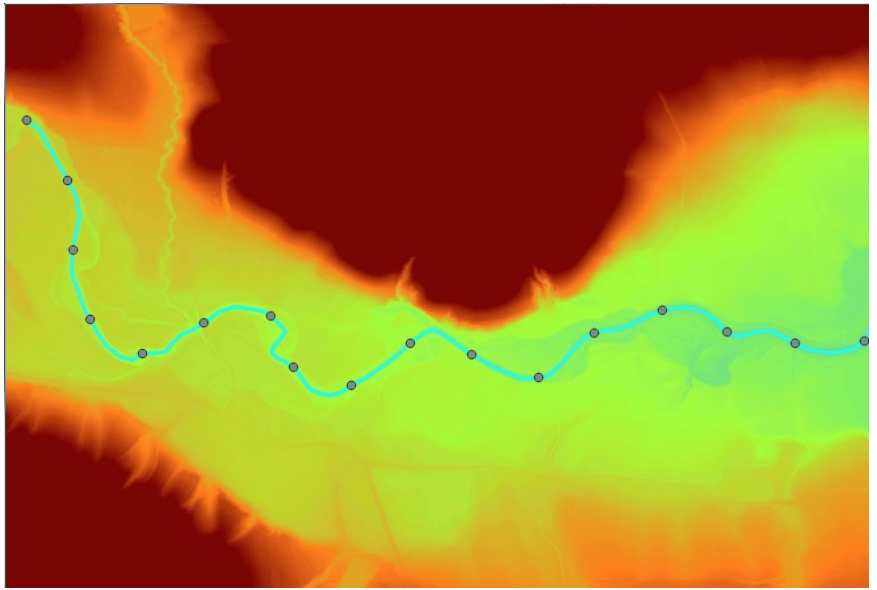


important !!!

in this exercise:
- 150m points layer
is used to reflect the run of the river channel in Mike model

- 800m points layer
is used to import data (water surface elevation) from Mike to cross-section location

Data Processing in GIS – data export



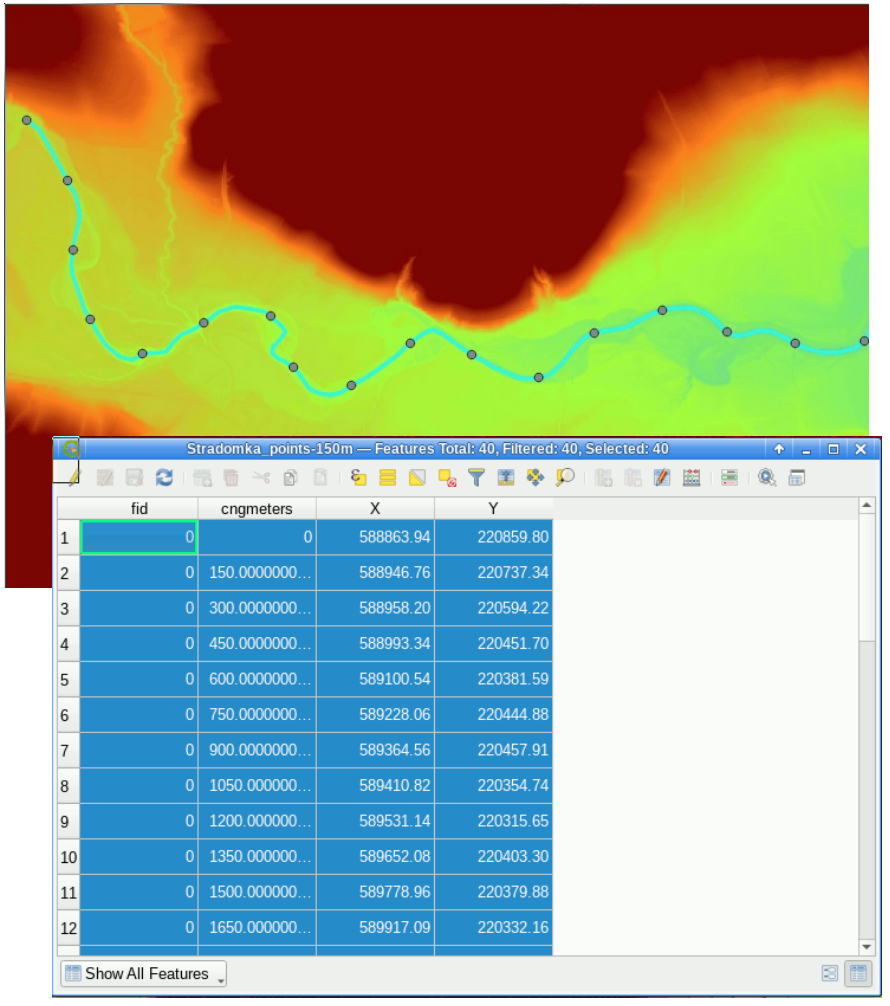
points measured
along lines

in 150m points layer
add X and Y coordinate fields

export x coordinates
to WGS
x(transform($geometry, layer_property(@layer_name, 'crs'),'EPSG:4326'))
to epsg:2180
x(transform($geometry, layer_property(@layer_name, 'crs'),'EPSG:2180'))

for y coordinates replace x with y

Data Processing in GIS – data export



RIVER CHANNEL
(150m point layer)

open layer attribute table

CTRL-A
select all features

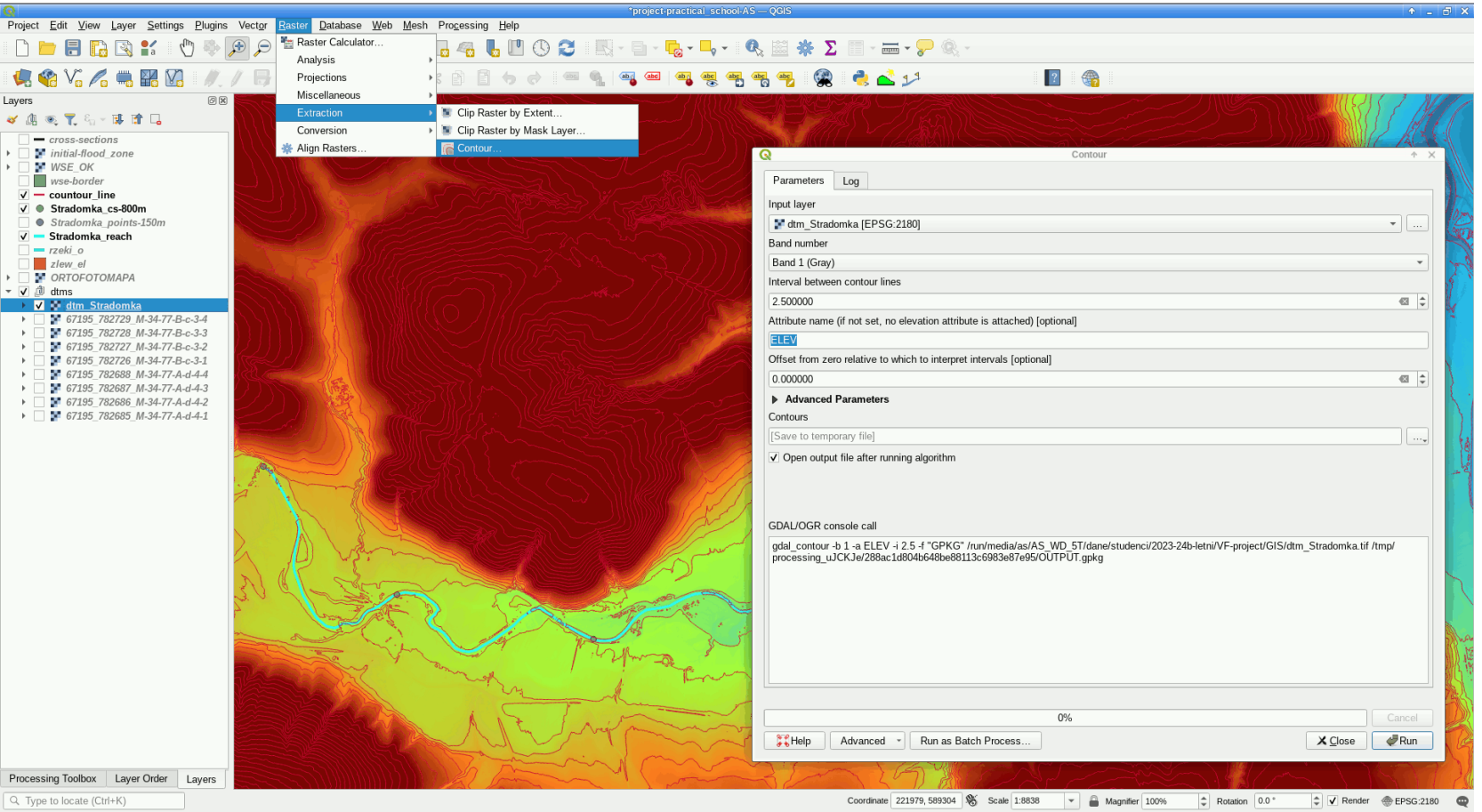
CTRL-C
copy values to clipboard

CTRL-V
paste values to notepad and then to spreadsheet (i.e. MS Excel)

in excel change data order to be ready for import to Mike

Data Processing in GIS – drawing new objects

create contour lines and save them as a vector layer in the project location



Data Processing in GIS – drawing new objects

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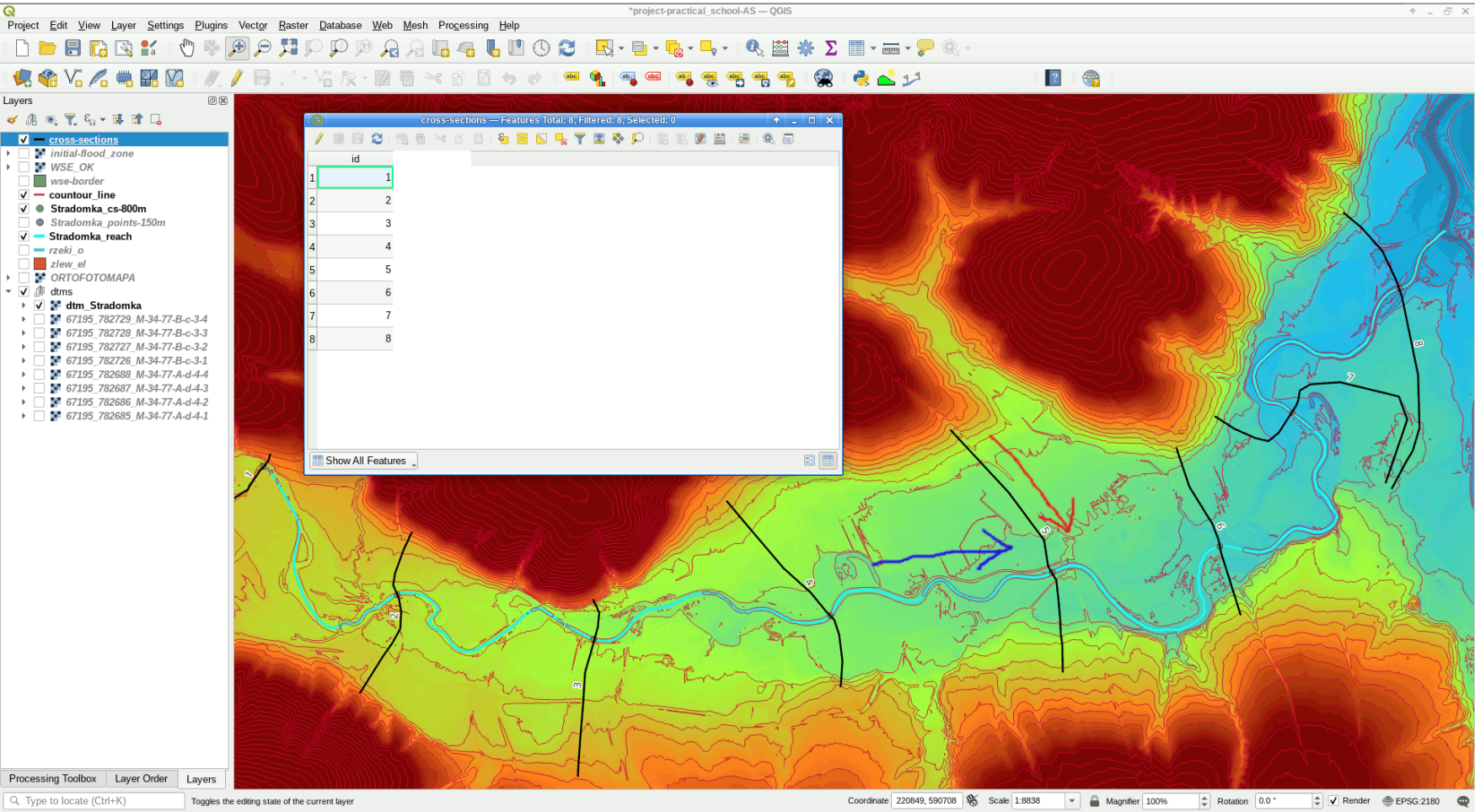
CROSS-SECTIONS



- create new vector layer - polylines
- draw elements from left to right perpendicularly to countour lines
- set numbers of every cross-section
- save layer
- close editing
- save project

Data Processing in GIS – data export

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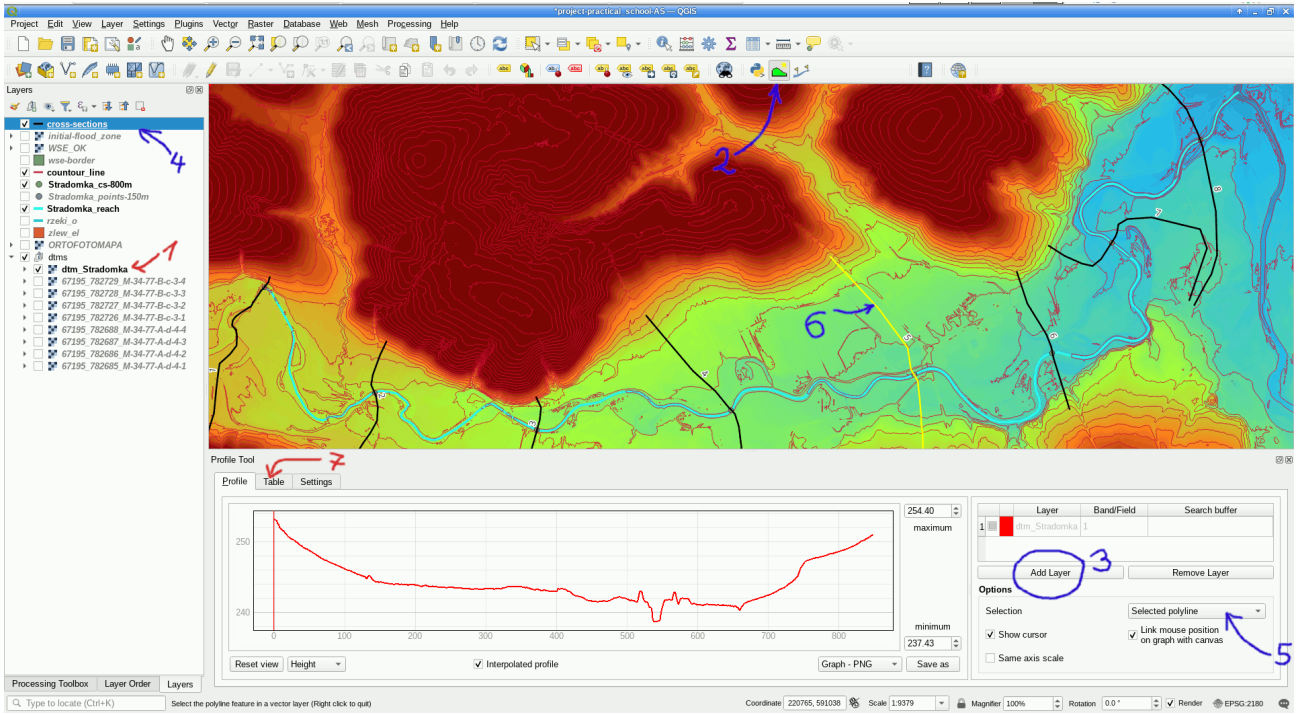
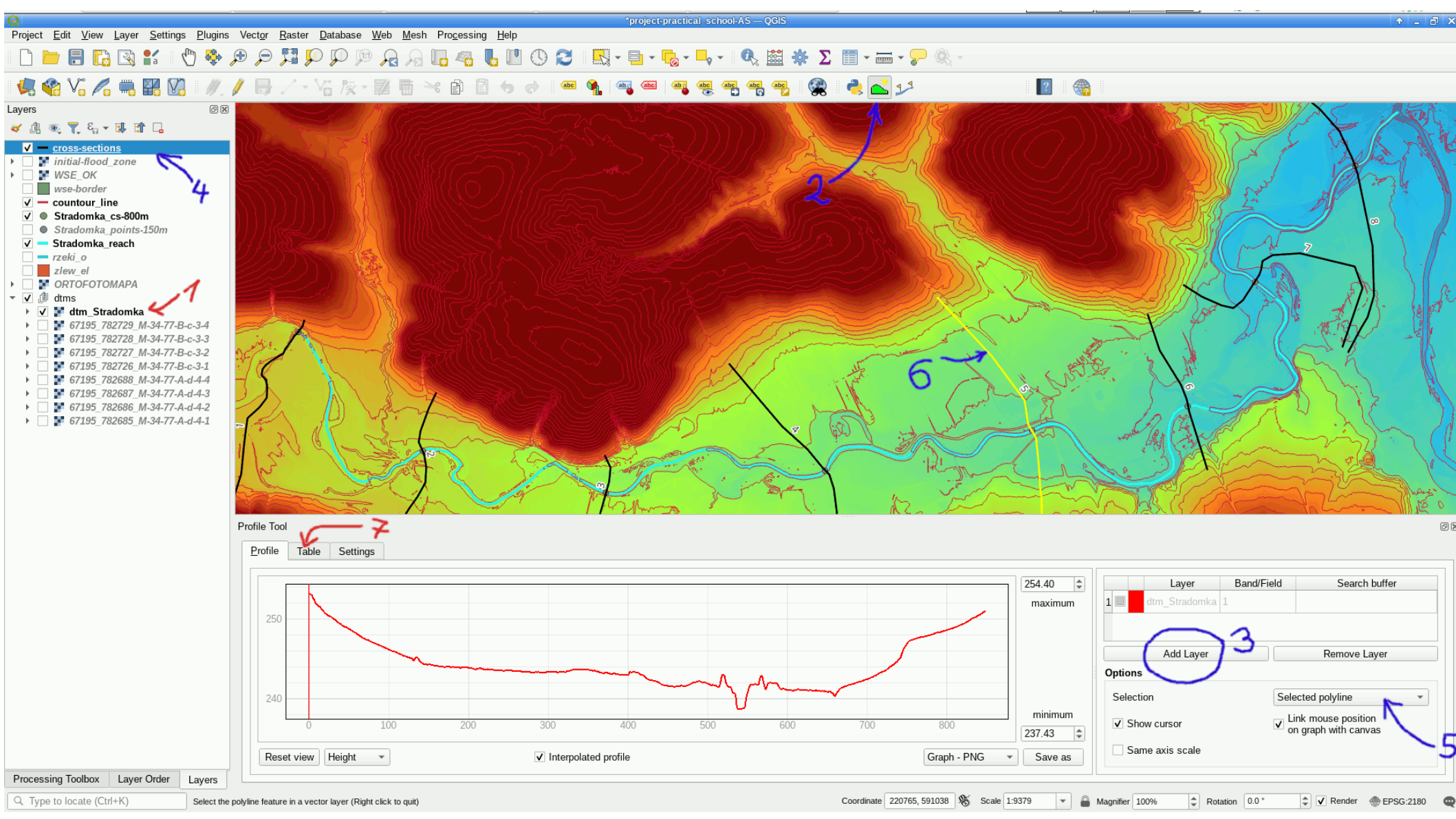
PROFILE TOOL PLUGIN (icon name: Terrain Profile)



1 – select dtm
2 – start plugin
3 – add dtm layer
4 – select cross-section layer
5 – choose picked features
6 – pick cross-section feature
7 – copy table to clipboard

paste data to notepad

repeat points 4 – 7
until all data is copied


*project-practical_school-AS — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Layers
cross-sections
initial-flood_zone
WSE_OK
wse-border
countour_line
Stradomka_cs-800m
Stradomka_points-150m
Stradomka_reach
rzeki_o
zlew_el
ORTOFOTOMAPA
dtms
dtm_Stradomka
67195_782729_M-34-77-B-c-3-4
67195_782728_M-34-77-B-c-3-3
67195_782727_M-34-77-B-c-3-2
67195_782726_M-34-77-B-c-3-1
67195_782688_M-34-77-A-d-4-4
67195_782687_M-34-77-A-d-4-3
67195_782686_M-34-77-A-d-4-2
67195_782685_M-34-77-A-d-4-1
1
2
3
4
5
6
7
Profile Tool
Profile
Table
Settings
254.40
maximum
250
240
0
100
200
300
400
500
600
700
800
minimum
237.43
Reset view
Height
Interpolated profile
Graph - PNG
Save as
Layer
Band/Field
Search buffer
dtm_Stradomka
Add Layer
Remove Layer
Options
Selection
Selected polyline
Show cursor
Link mouse position on graph with canvas
Same axis scale
Processing Toolbox
Layer Order
Layers
Type to locate (Ctrl+K)
Select the polyline feature in a vector layer (Right click to quit)
Coordinate 220765, 591038
Scale 1:9379
Magnifier 100%
Rotation 0.0 °
Render
EPSG:2180

Flow Modeling

(classes by Maciej Wyrębek)

Data Processing in GIS – data import

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To import data from Mike View:

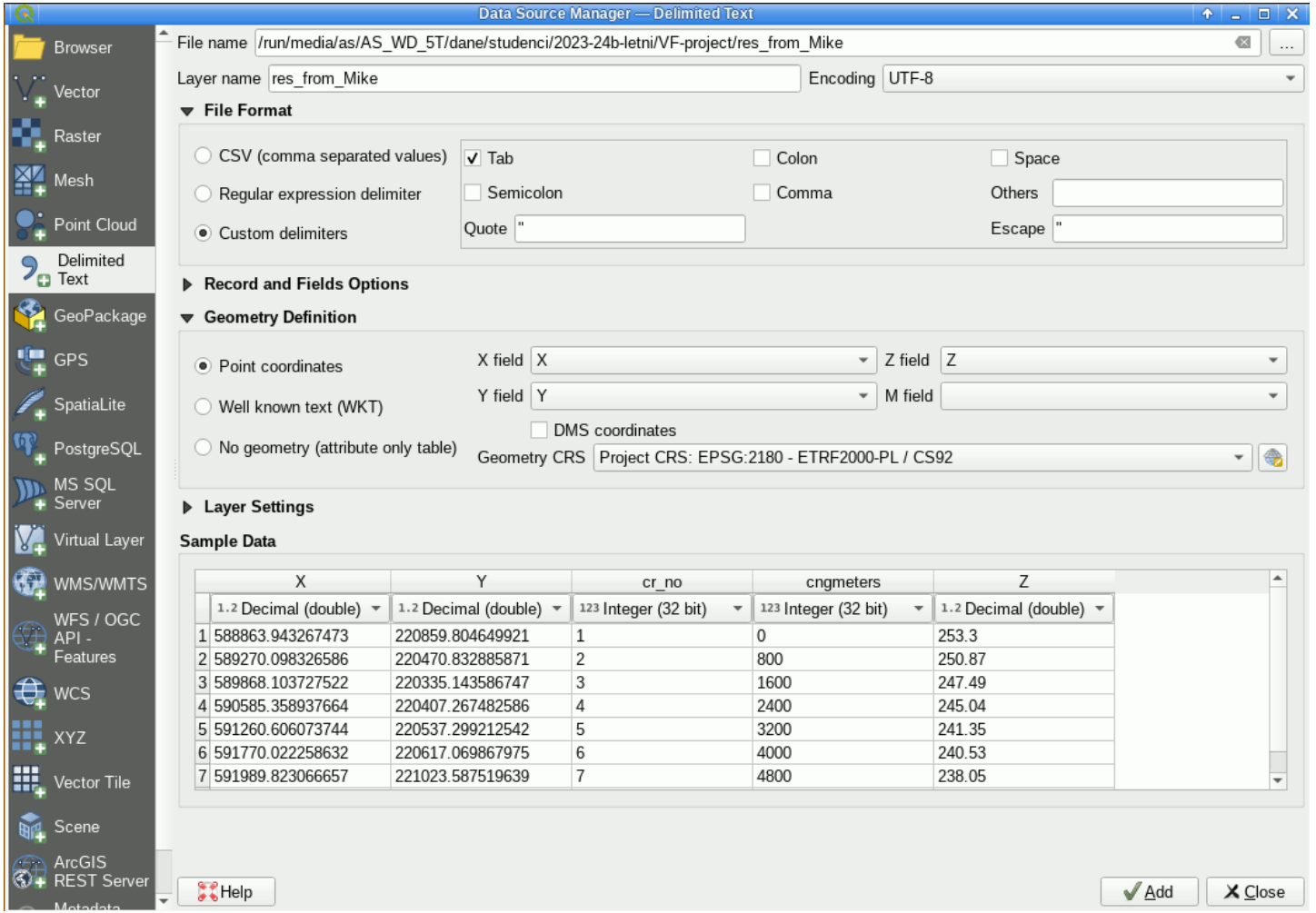
- assign water level elevation in spreadsheet with coordinates of cross-sections points location
  (in this excersise point vector layer of raster 800m)

- import txt or csv data from spreadsheet prepared in order
X Y Z c-s_number,
  where: c-s_number is cross-section number,
  Z – is a water elevation for modeled flood wave

- create buffer layer from points layer

- copy Z values from buffer layer to cross-sections layer
  (spatial join)

Data Processing in GIS – data import



	X	Y	cr_no	cngmeters	Z
	1.2 Decimal (double)	1.2 Decimal (double)	123 Integer (32 bit)	123 Integer (32 bit)	1.2 Decimal (double)
1	588863.943267473	220859.804649921	1	0	253.3
2	589270.098326586	220470.832885871	2	800	250.87
3	589868.103727522	220335.143586747	3	1600	247.49
4	590585.358937664	220407.267482586	4	2400	245.04
5	591260.606073744	220537.299212542	5	3200	241.35
6	591770.022258632	220617.069867975	6	4000	240.53
7	591989.823066657	221023.587519639	7	4800	238.05

import data from file named res_from_Mike

delimiter is tab

geometry definition
X is X, Y is Y Z is Z (water)

set proper CRS

Data Processing in GIS – data import

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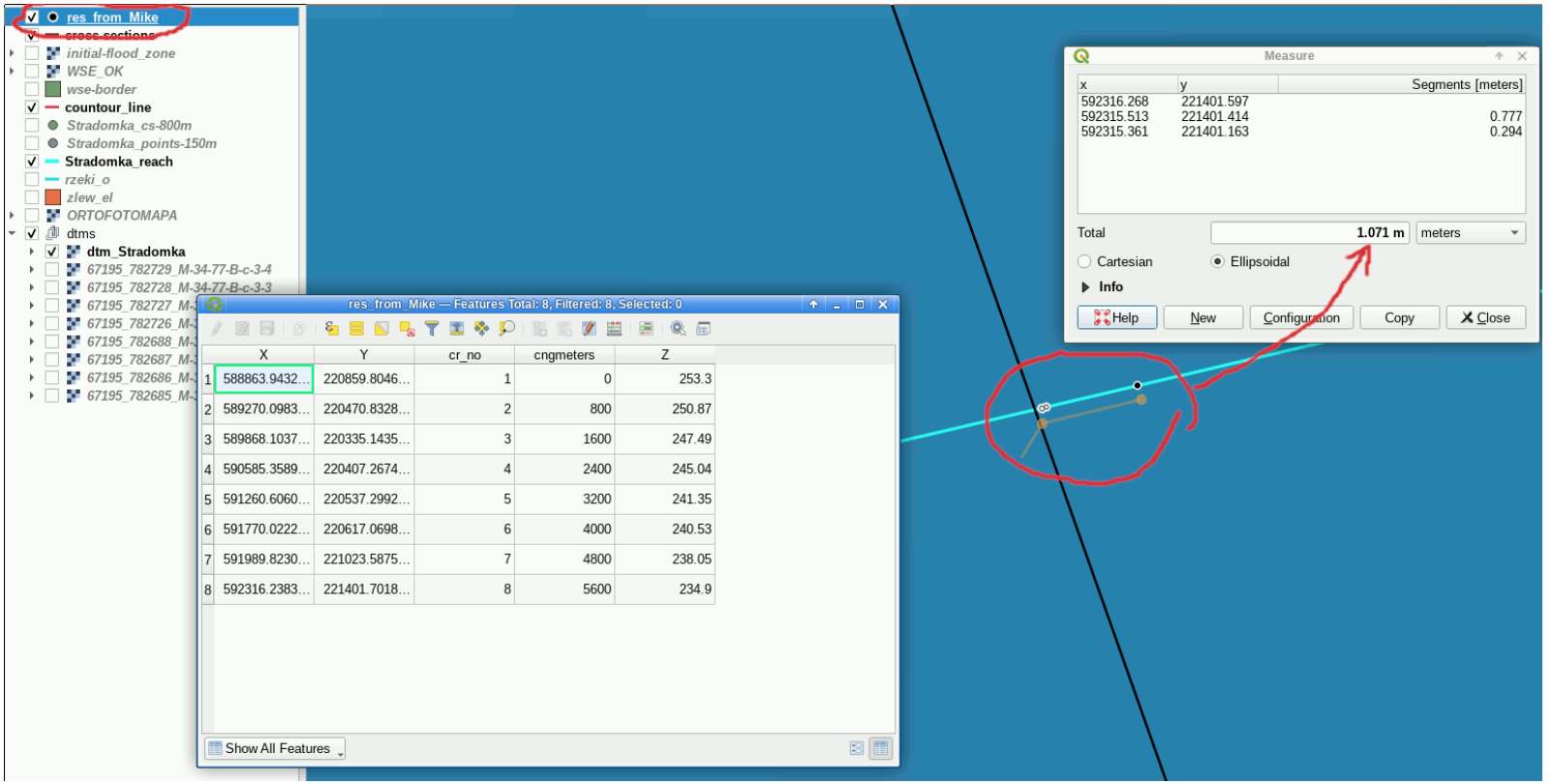
imported layer is a point one



points location
is different then
cross-sections
location

the max difference
can be found
and measured with
Measure

Data Processing in GIS – data import

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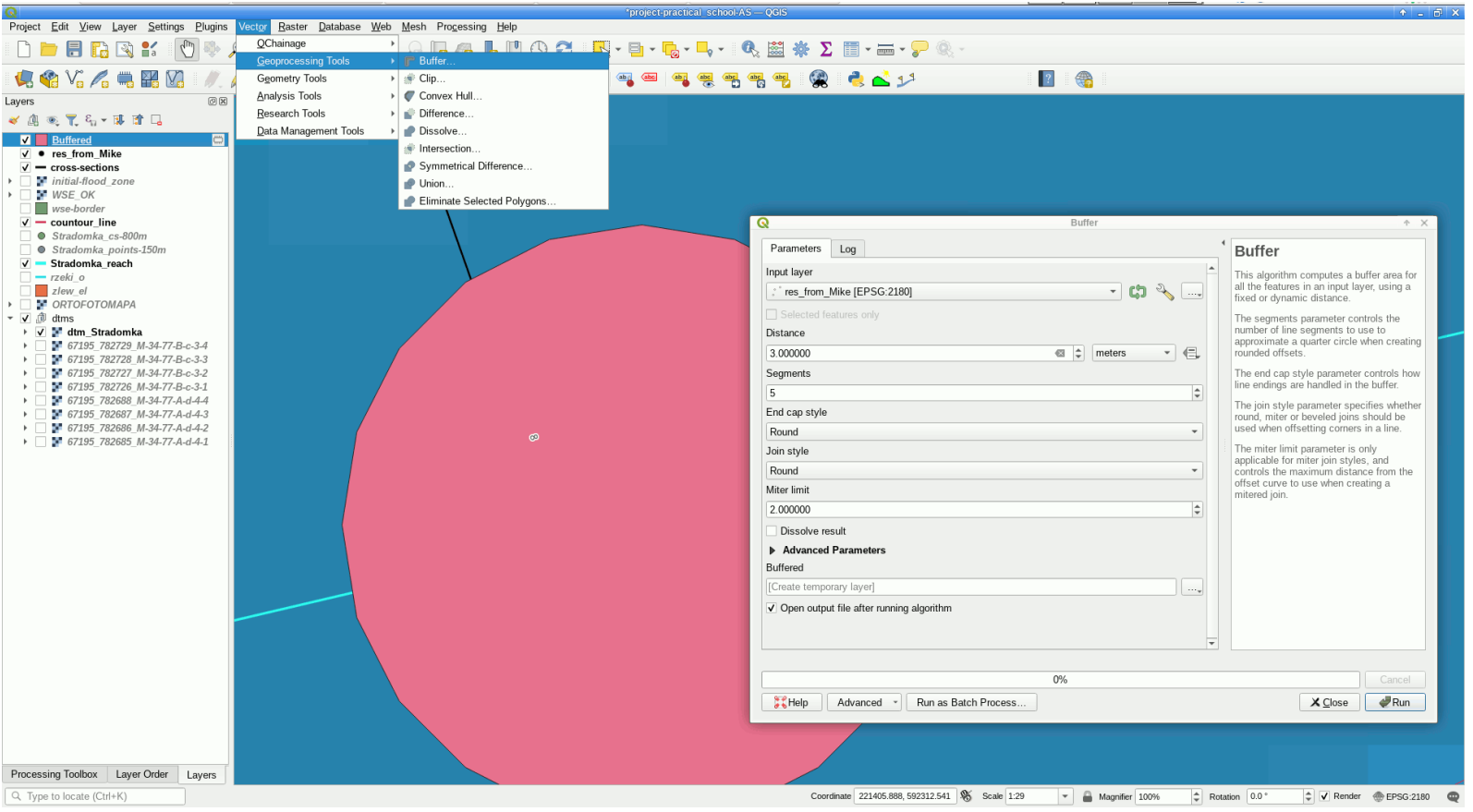
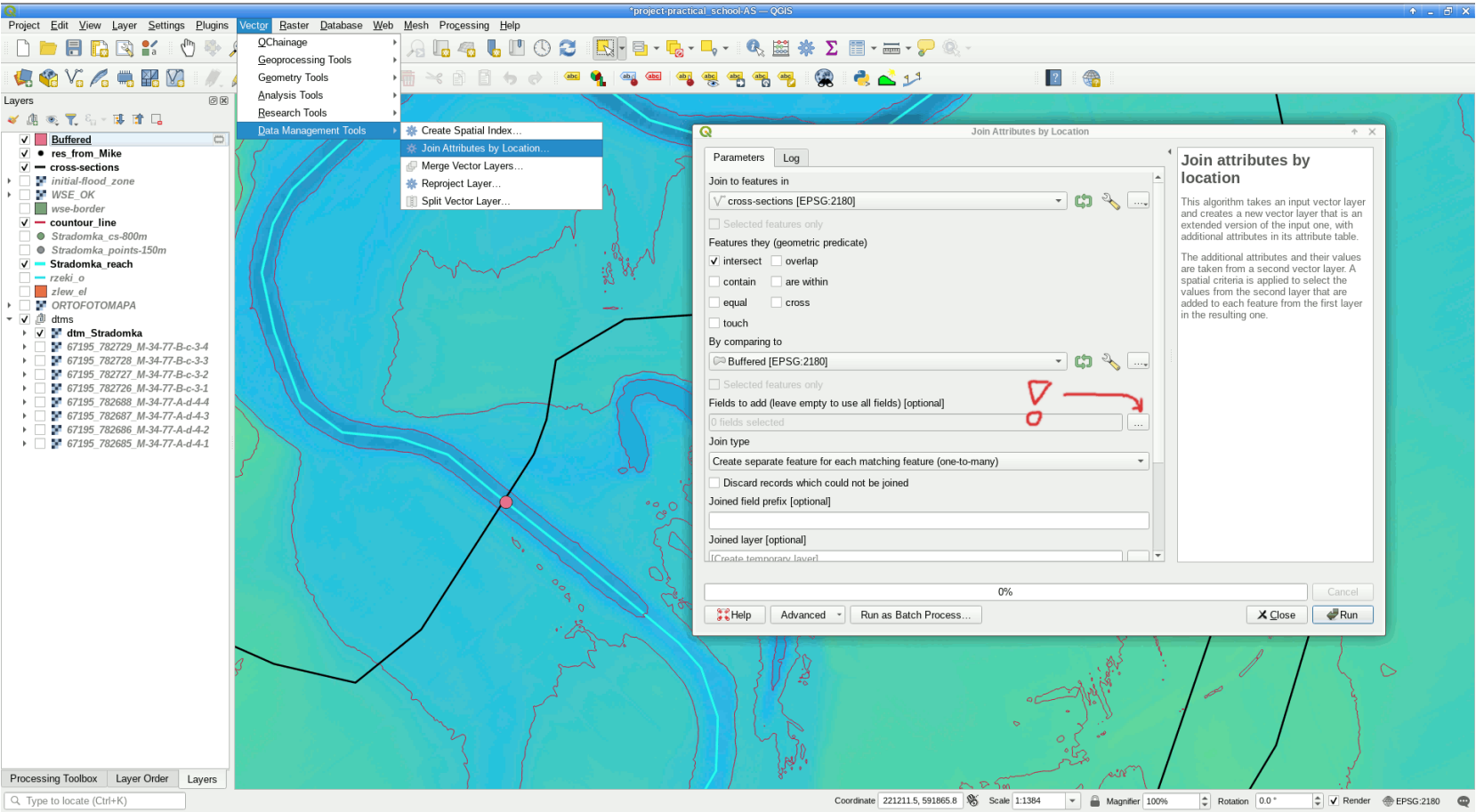


buffer layer is created with radius set to 3 meters

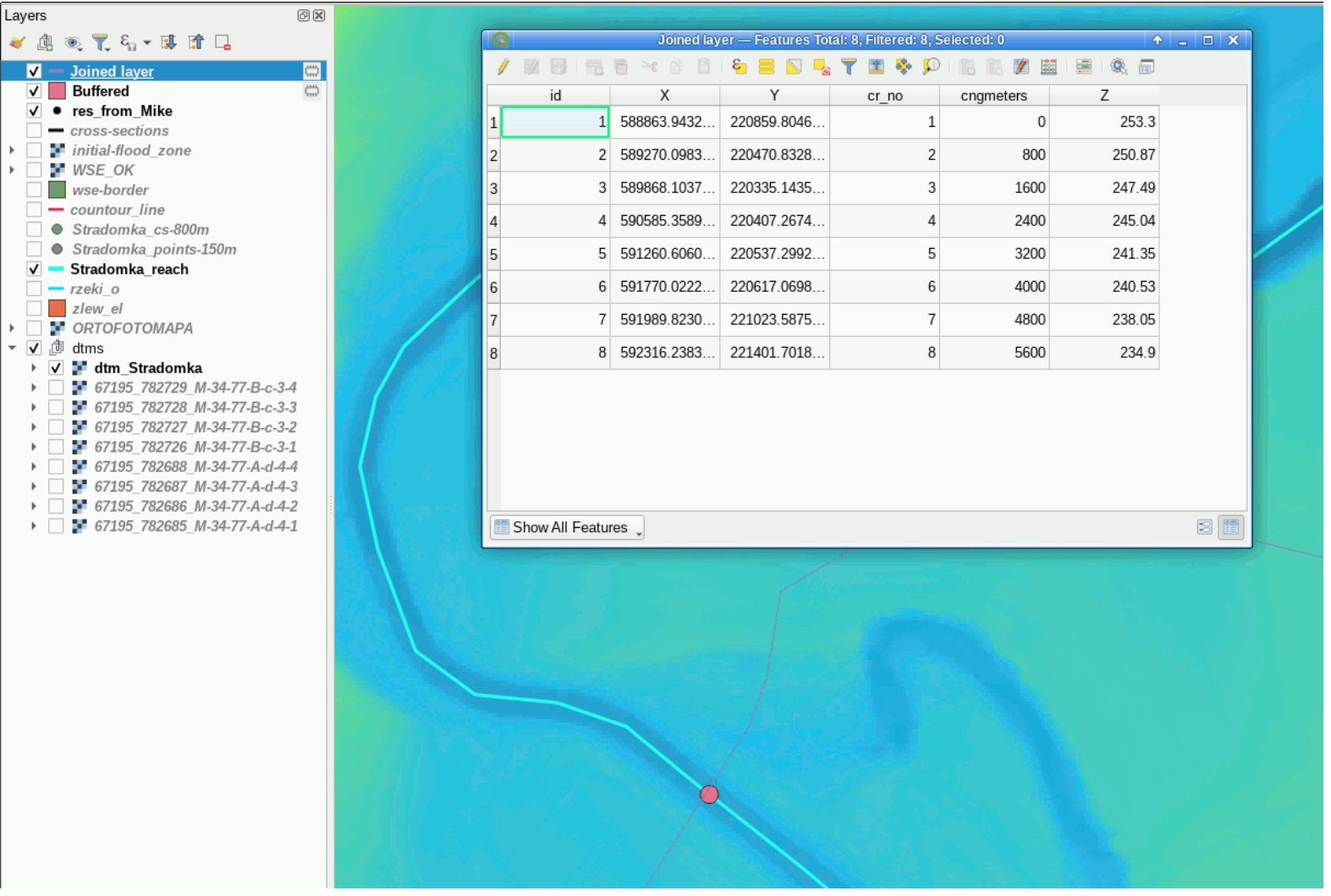
Data Processing in GIS – data import

Visegrad Fund



data collected in layer buffer is copied to layer cross-sections by location

Data Processing in GIS – data import



	id	X	Y	cr_no	cngmeters	Z
1	1	588863.9432…	220859.8046…	1	0	253.3
2	2	589270.0983…	220470.8328…	2	800	250.87
3	3	589868.1037…	220335.1435…	3	1600	247.49
4	4	590585.3589…	220407.2674…	4	2400	245.04
5	5	591260.6060…	220537.2992…	5	3200	241.35
6	6	591770.0222…	220617.0698…	6	4000	240.53
7	7	591989.8230…	221023.5875…	7	4800	238.05
8	8	592316.2383…	221401.7018…	8	5600	234.9

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data collected in layer buffer is copied to layer cross-sections by location

it’s worth to export this as a vector layer

This data can be used to interpolate water surface elevation between cross-sections

the TIN interpolation is used on the base of Z values

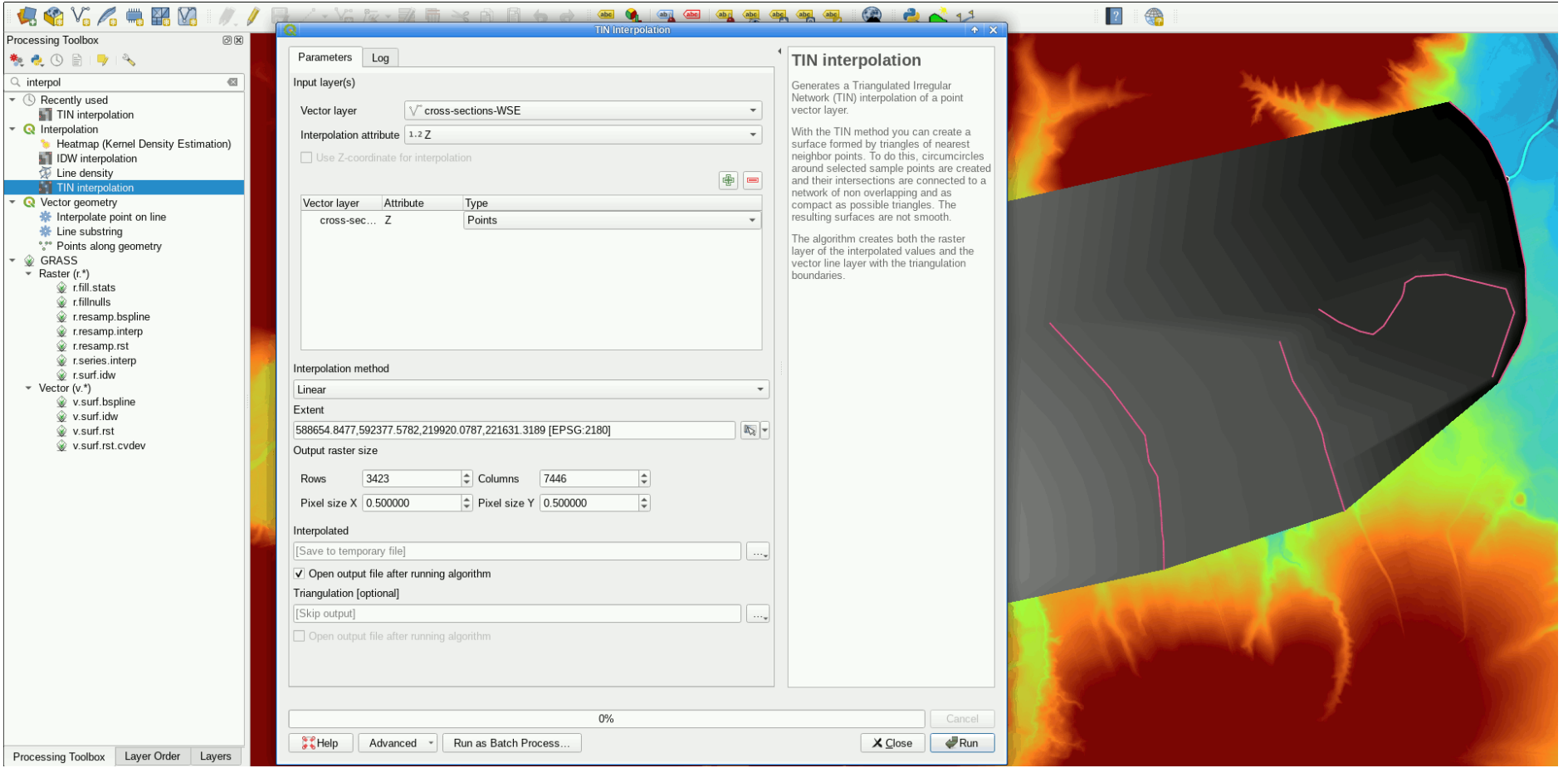
the borders and CRS of the new raster are taken from the cross-sections vector layer

it’s important to properly set the created raster resolution (here set to 0.5 m)

details can be found at the next slide ...

Data Processing in GIS – data import

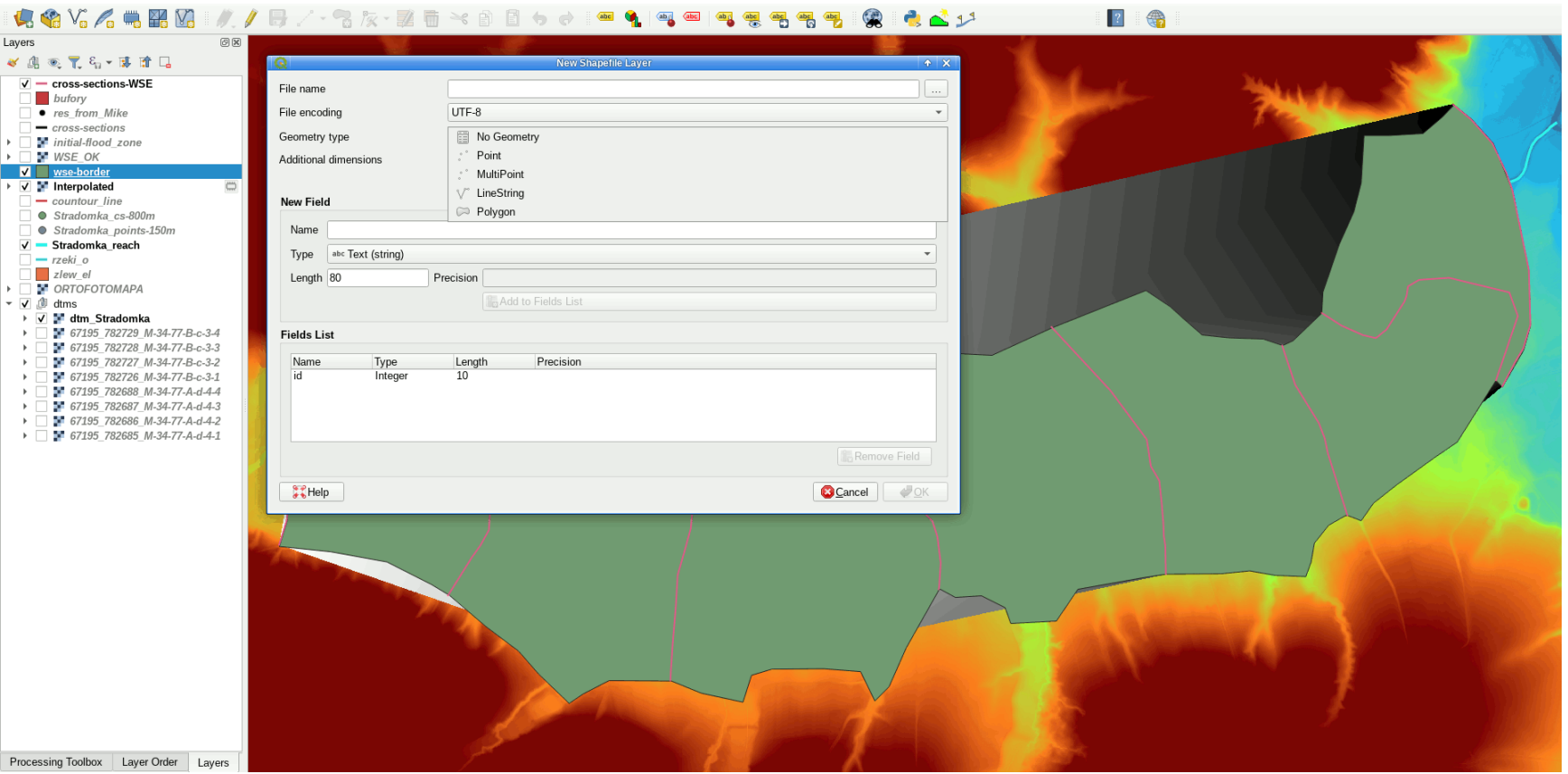
Visegrad Fund



the borders of the raster flow outside the cross-sections range – it has to be corrected

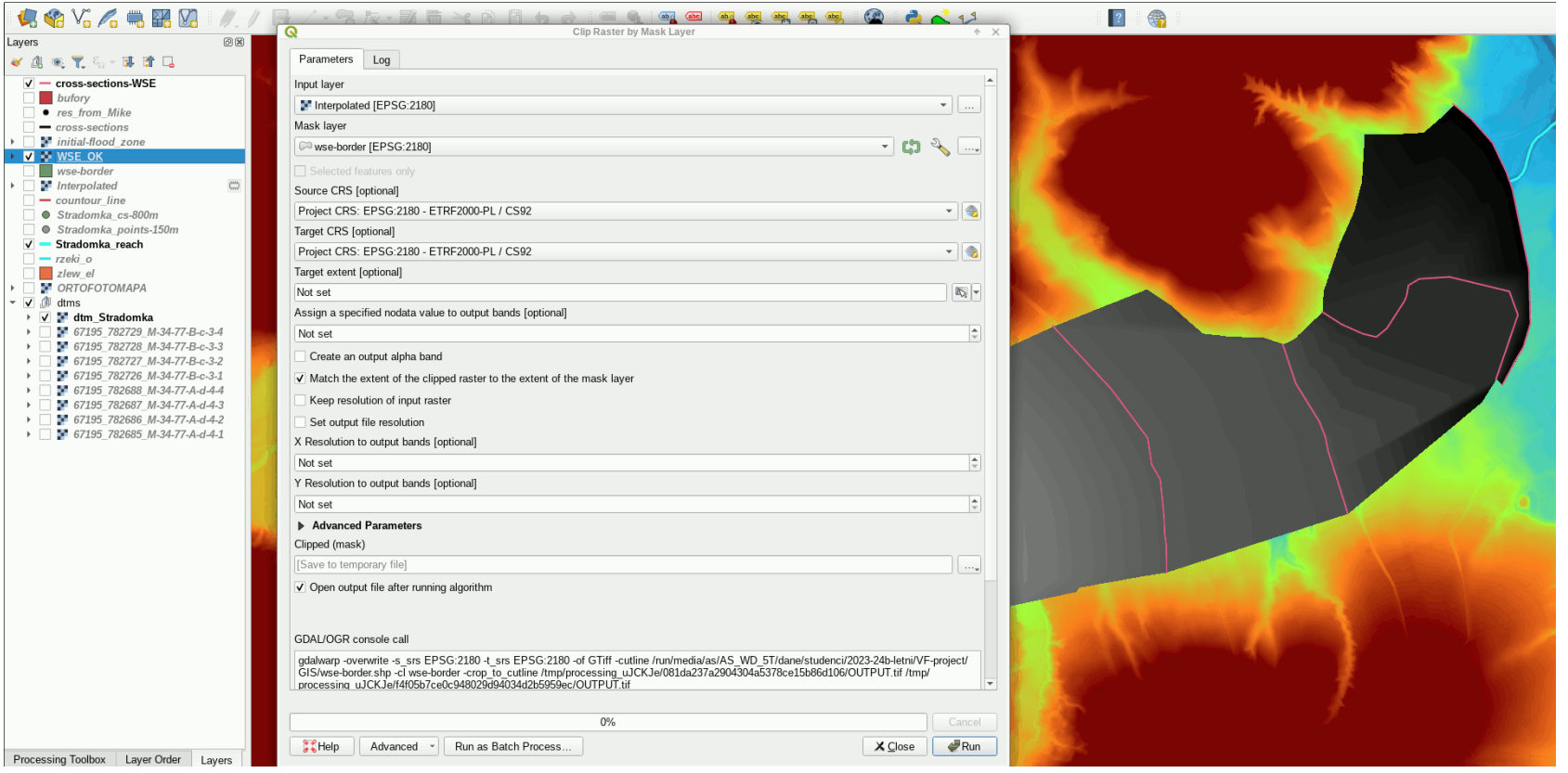
Data Processing in GIS – data import

Visegrad Fund



new
vector polygon
layer is created
to draw
the proper
borders of the
WSE raster

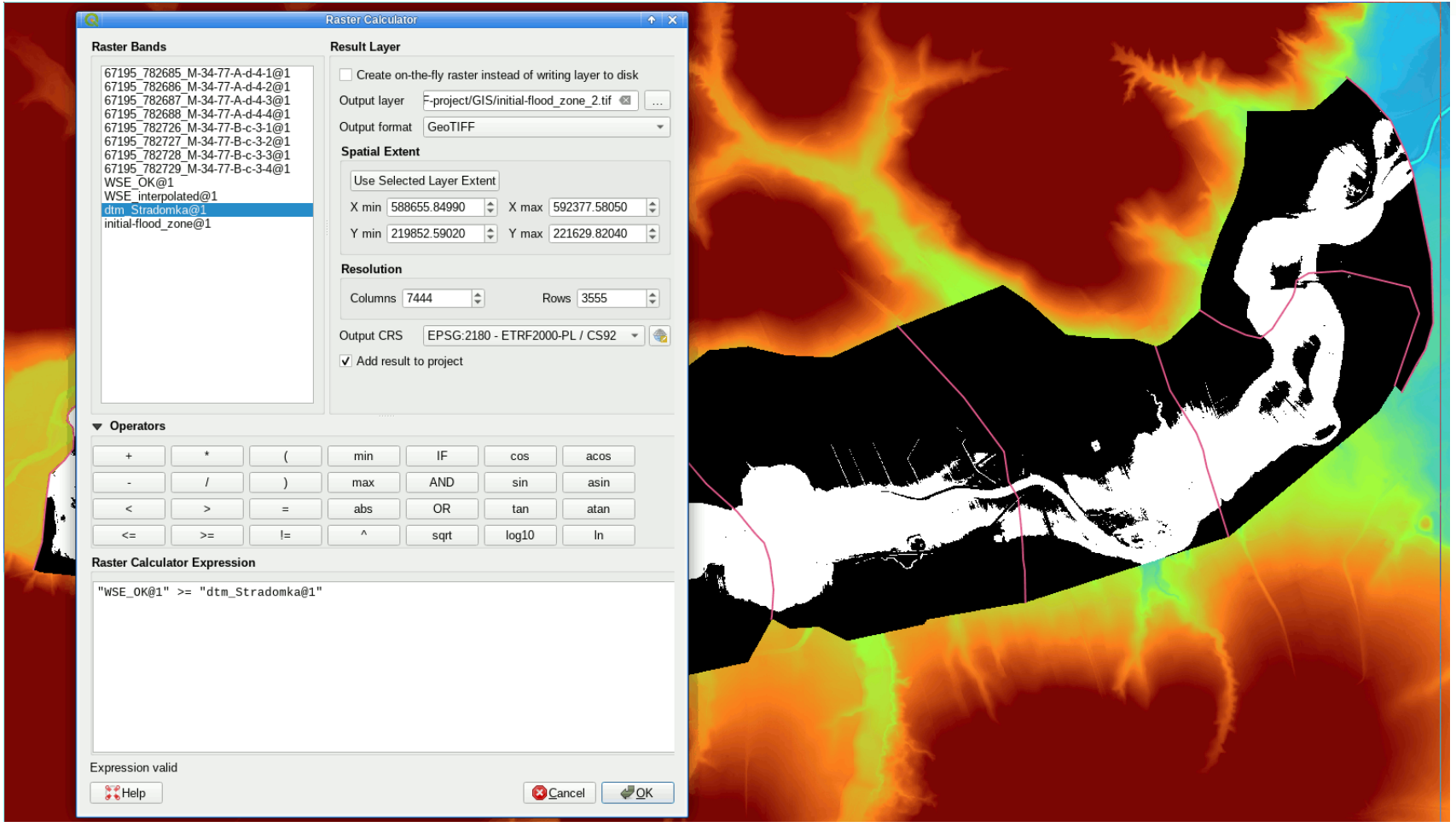
Data Processing in GIS – data import



the raster can be shrink by the “clip raster by mask layer” procedure

Data Processing in GIS – generating flood zones

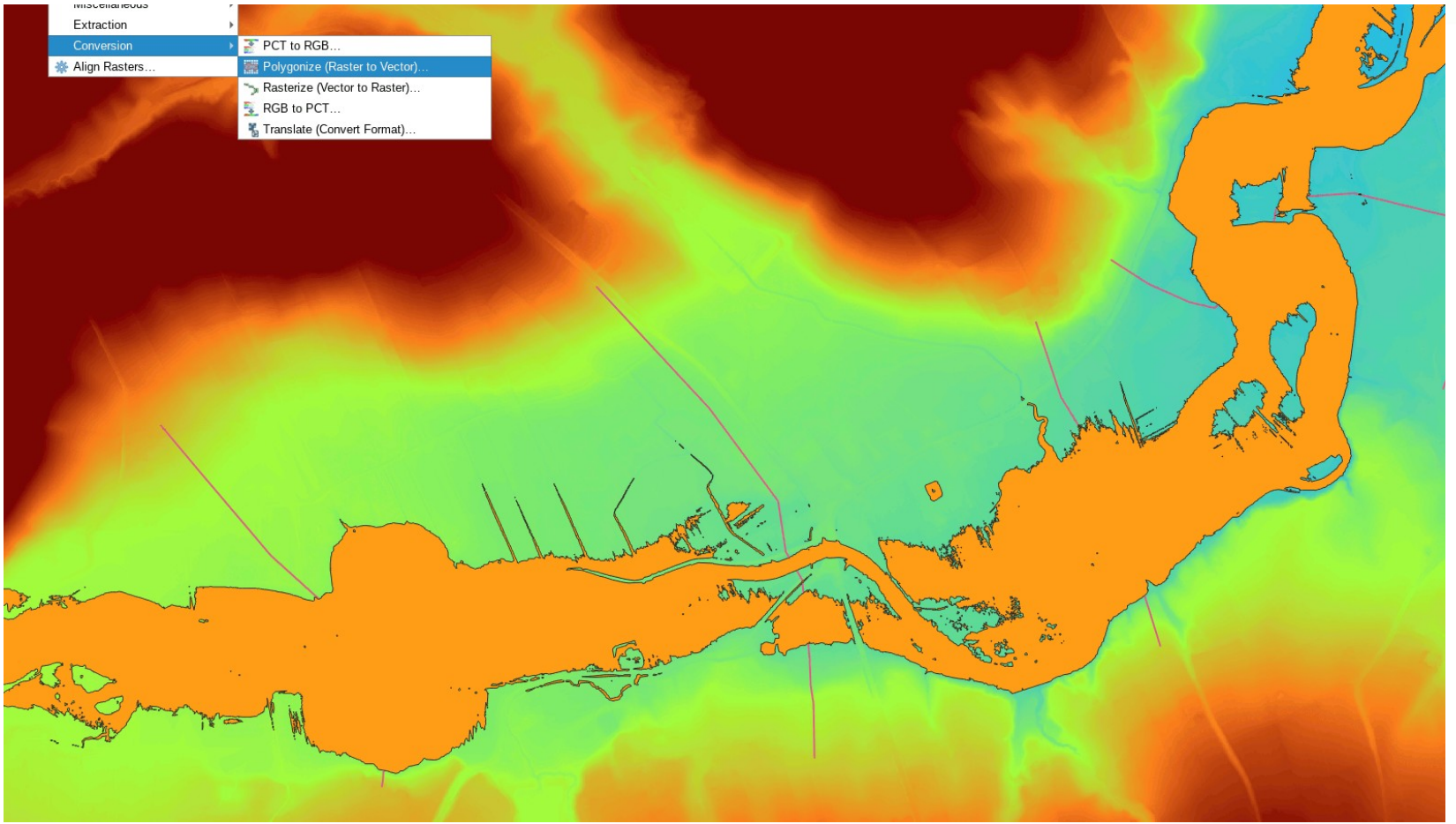
Visegrad Fund



The raster of flood zones can be generated in raster calculator with the expression comparing the raster of water surface elevation to the raster of DTM model

Data Processing in GIS – generating flood zones

Visegrad Fund



The vector layer can be created with the Raster to vector procedure

THANK YOU