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Post processing of CARFFGS products with QGIS



WMO OMM

World Meteorological Organization

Organisation météorologique mondiale

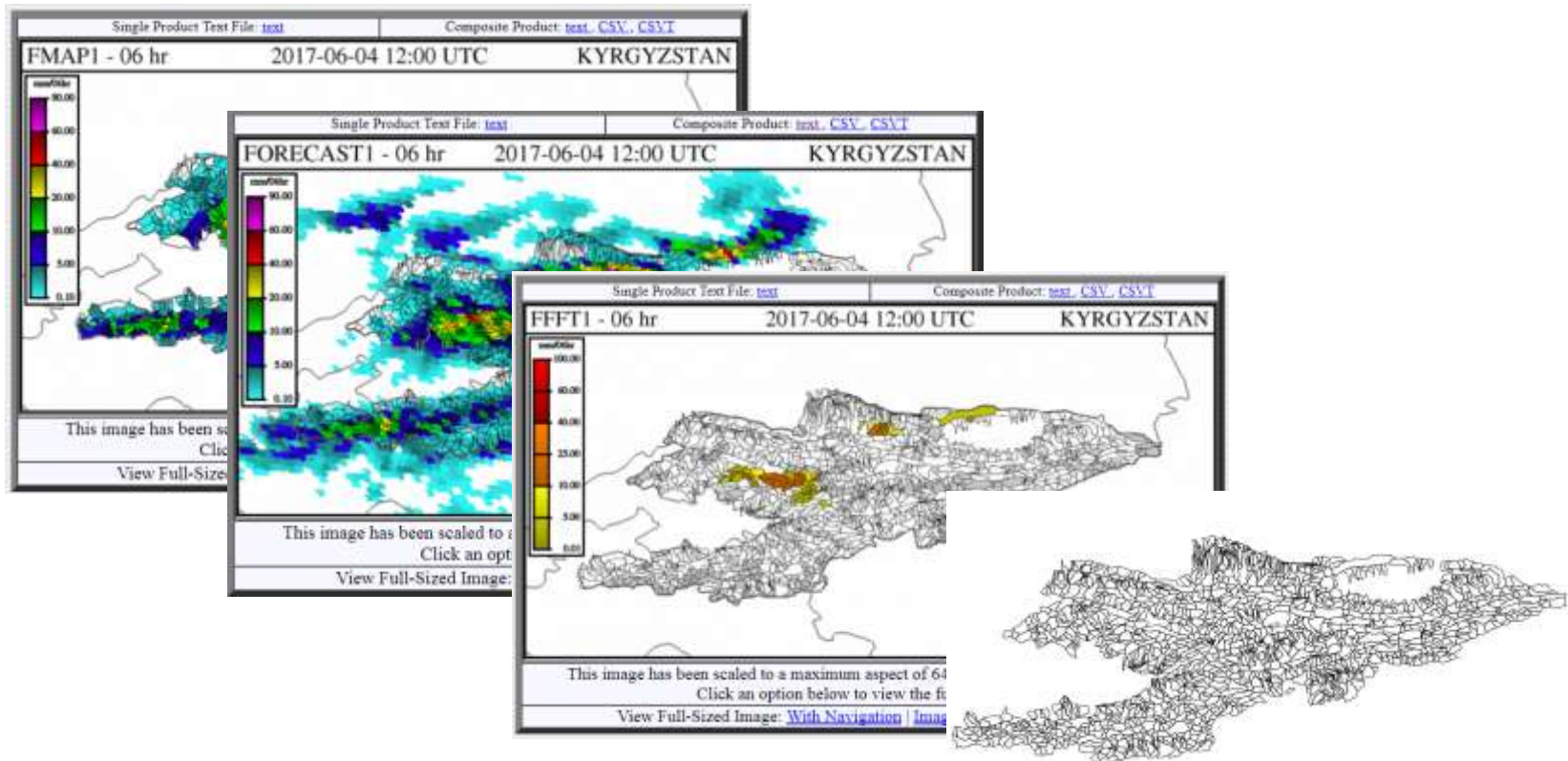
Post-processing of products with GIS

- GIS is designed to support spatial decision-making, which is also very important for issuing flash flood warnings.
- The CARFFGS Product console displays products for each sub-basin but does not provide any geographical information (e.g. topography, cities, rivers, roads, administrative boundaries, etc.)
- Using GIS software and CARFFGS products, forecaster can determine the precise flash flood location, produce maps for flash flood bulletins, studies, etc.
- Based on experience, the in-country forecaster can also use GIS to make adjustments to FFGS products for various subbasins and time durations.

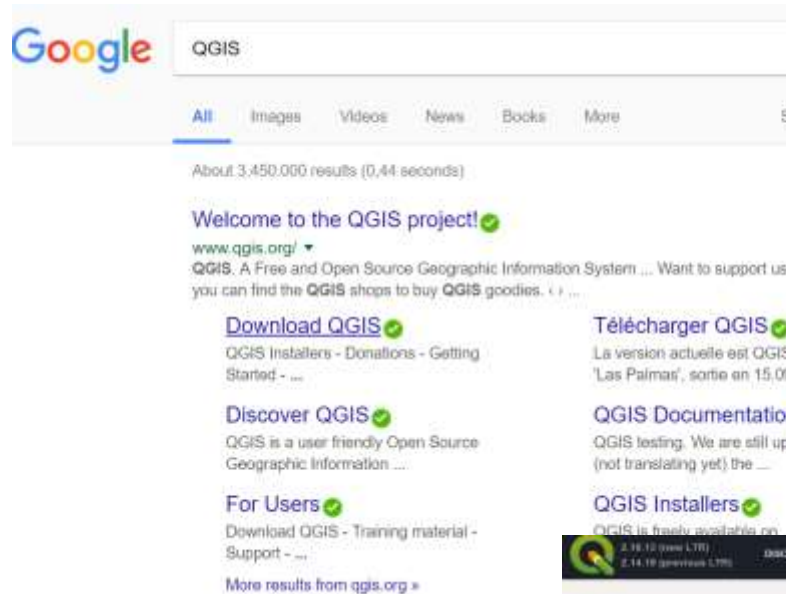


Introduction

- This presentation will guide you, step-by-step, how to join CARFFGS data to a sub-basin shapefile so that you can quickly start making basic maps for flash flood bulletins, using free, open-source QGIS software.



Downloading and Installing QGIS



Google search results for "QGIS". The search bar shows "QGIS" and the results indicate "About 3,450,000 results (0,44 seconds)". The top result is "Welcome to the QGIS project!" with a green checkmark, linking to "www.qgis.org/". Below this are several links: "Download QGIS" (with a green checkmark), "Discover QGIS" (with a green checkmark), and "For Users" (with a green checkmark). Each link has a brief description of the page it leads to.



QGIS 2.18.13 (new LTR) / 2.14.19 (previous LTR)

DISCOVER QGIS FOR USERS GET INVOLVED DOCUMENTATION Search

Download QGIS for your platform

The current version is QGIS 2.18.13 'Las Palmas' and was released on 15.09.2017. QGIS is available on Windows, MacOS X, Linux and Android. Binary packages (installers) for current stable version 2.18 can be downloaded here.

INSTALLATION DOWNLOADS ALL RELEASES SOURCES

- Download for Windows
- Download for Mac OS X
- Download for Linux
- Download for BSD
- Download for Android



QGIS 2.18.12 (new LTR) / 2.14.19 (previous LTR)

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Download QGIS for your platform

The current version is QGIS 2.18.13 'Las Palmas' and was released on 15.09.2017. QGIS is available on Windows, MacOS X, Linux and Android. Binary packages (installers) for current stable version 2.18 can be downloaded here.

INSTALLATION DOWNLOADS ALL RELEASES SOURCES

 QGIS-OSGeo4W-2.18.13-1-Setup-x86_64 10/10/2017 10:02 Application 395,478 KB



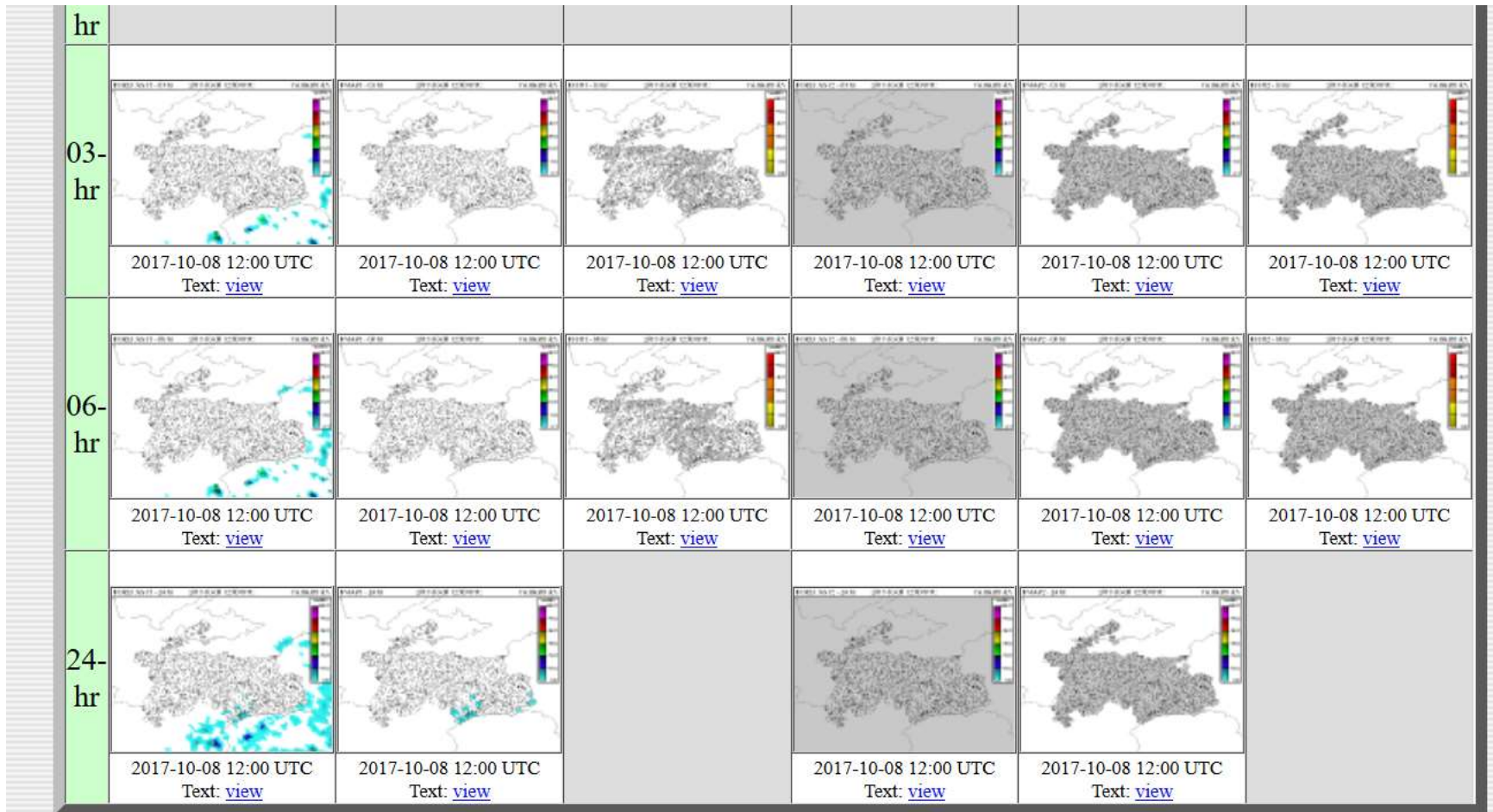
Download for Windows

Latest release (checked on features):

-  QGIS Standalone Installer Version 2.18 (12 MB) [x64](#)
-  QGIS Standalone installer Version 2.18 (84 kB) [x86](#)

Long term release repository (great stable) [is not the latest release!](#)

CARFFG System Forecaster Console



[HOME](#) |
 [About CARFFG Real-Time Product Console](#) |
 [Product Descriptions](#) |
 [Processing Logs](#) |
 [Server Monitor](#) |
 [Static Resources](#) |
 [Dashboard](#)



CARFFG System Static Resources

CARFFG - Central Asia Regional Flash Flood Guidance System

The CARFFG System is presently being prepared for on-site deployment. During this preparation, the interface and displayed data contents availability may be occasionally interrupted.

[Return to Main](#)

Static Resources and Reference Materials

Category	Item	Resource Link	Description
GIS Data Layers	CARFFG Sub-Basin Shapefiles All Layers (58M)	CARFFG All Shapefiles	A zipped archive (*.zip) of the component files for all shapefile layers from boundaries for all CARFFG export regions. This is a single download file that includes *all* of the individual archives offered below.
GIS Data Layers	REGIONAL Sub-Basin Shapefiles (30M)	CARFFG REGIONAL Shapefile	A zipped archive (*.zip) of the shapefile component files that provide basins boundaries for the REGIONAL export region.

Software Download	Quantum GIS (129MB)	QGIS v.1.8.0-2	A free, GUI-based GIS software package available for Windows (available for Linux platforms too). This GIS package may be used to visualize FFGS reference shapefiles and to merge FFGS CSV composite product files to those shapefiles for interactive forecaster review and modification. QGIS may also be used for visual overlay of additional GIS resources, if available, such as stations, roads, cities, populations, provincial boundaries, etc. For more information about this software, visit the QGIS web site .
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Free Geospatial Data

ESRI OPEN DATA

<https://hub.arcgis.com/pages/open-data>

ArcGIS Hub Community Initiatives Open Data

Open Data

[/open.data/](https://open.data/)

Open data that can be freely used, re-used and redistributed by anyone (Open Definition)

Share Open Data in Minutes

As part of your ArcGIS Online subscription, you can share your authoritative open data. Use your existing ArcGIS Online groups to identify data to share, then quickly set up public-facing webmaps for people to easily find and download your data in a variety of map formats. Your new datasets are protected to the secure and safe.



Browse by Categories



Safe

Crime
Disaster
Emergency Response



Prosperous

Demographics
Economy
Education



Sustainable

Climate
Energy
Infrastructure



Healthy

Agriculture
Disease
Health-Care



Liveable

Culture
Housing
Transportation



Well-Run

Boundaries
Financial
Planning & Land Use



Free Geospatial Data

Natural Earth
Free vector and raster map data at 1:10m, 1:50m, and 1:110m scales

Home Features Downloads Blog Forums Corrections About

Map Gallery

50m-admin-0-countries

Natural Earth is a public domain map dataset available at 1:10m, 1:50m, and 1:110 million scales. Featuring tightly integrated vector and raster data, with Natural Earth you can make a variety of visually pleasing, well-crafted maps with cartography or GIS software.

Natural Earth was built through a collaboration of many volunteers and is supported by NACIS (North American Cartographic Information Society), and is free for use in any type of project (see our [Terms of Use](#) page for more information).

[Get the Data](#)

Convenience Neatness Counts GIS Attributes

COUNTRYNAME	SCALE/RANK	FEATURE/CLASS	SOVEREIGNTY
Algeria	1:3000000000	Countries	Algeria
Aland	1:3000000000	Countries	Finland
Albania	1:3000000000	Countries	Albania
Algeria	1:3000000000	Countries	Algeria

NATURAL EARTH DATA
<http://www.naturalearthdata.com/downloads/>

Lakes + Reservoirs



Rivers, Lake Center



Land



Coastline



Free Geospatial Data

USGS
science for a changing world

USGS Home
Contact USGS
Search USGS

EarthExplorer

Page Expires in 1:59:13

Home Login Register **USGS** Feedback Help

Search Criteria Data Sets Additional Criteria Results

1. Enter Search Criteria
To narrow your search area: type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the [help documentation](#)), and/or choose a date range.

Address/Place Path/Row Feature Circle

Show Clear

Coordinates Predefined Area Shapefile KML

Degree/Minute/Second Decimal

No coordinates selected.

Use Map Add Coordinate Clear Coordinates

Date Range Result Options

Search from: mm/dd/yyyy to: mm/dd/yyyy

Search months: (All)

Data Sets Additional Criteria Results

Search Criteria Summary (Show) Clear Criteria

Map Satellite

46° 22' 58" N, 69° 1' 08" E Options Overlays

Kazakhstan

Georgia Armenia Azerbaijan Turkmenistan Uzbekistan Kyrgyzstan Tajikistan

USGS Earth Explorer
<https://earthexplorer.usgs.gov/>

Free Geospatial Data

United Nations Environment Programme
<http://geodata.grid.unep.ch/>

United Nations Environment Programme
 environment for development
Environmental Data Explorer

select a dataset

Number of entries found: 8

Data Set Type: All types of data sets

ENVIRONMENTAL GOVERNANCE	Data Set Type	Extent	Covered Time	Download protected?	Data Provider
Claimed Exclusive Economic Zone (EEZ)	National	World	2000		WRI
Claimed Exclusive Economic Zone (EEZ)	Subregional	World	2000		WRI
Claimed Exclusive Economic Zone (EEZ)	Regional	World	2000		WRI
Large Marine Ecosystem (LME)	Geospatial	World	2002		NOAA/NGDC
RESOURCE EFFICIENCY					
Exclusive Fishing Zone (EFZ)	National	World	2000		WRI
Exclusive Fishing Zone (EFZ)	Subregional	World	2000		WRI
Exclusive Fishing Zone (EFZ)	Regional	World	2000		WRI
GENERAL					
Administrative Boundaries - First Level	Geospatial	World	1990-99		WHO
Administrative Boundaries - First Level (ESR)	Geospatial	World	1988		ESRI
Continental Shelf Area	National	World	2000		WRI



The Environmental Data Explorer is the authoritative source for data sets used by UNEP and its partners in the Global Environment Outlook (GEO) report and other integrated environment assessments. Its online database holds more than 500 different variables, as national, subregional, regional and global statistics or as geospatial data sets (maps), covering themes like Freshwater, Population, Forests, Emissions, Climate, Disasters, Health and GDP. Display them on-the-fly as maps, graphs, data tables or download the data in different formats.

- getting started
 - gallery
 - tutorial & user guide
- links
 - contact
 - data set list
 - data providers
 - rip data visualisation work
 - GEO collaborating centers
 - GEO core indicators
 - GEO data archives
 - GEO homepage
 - GEO regions & subregions
 - new "infographics" Posters
 - user agreement
 - websites

announcements
 Type "indicator" in the search box to see the current

Free Geospatial Data

Global Administrative Areas
Boundaries without limits

Download Known problems About Contact

Home

Download

Country

Kazakhstan

File format

- ESRI file geodatabase
- ESRI file geodatabase
- Shapefile**
- Geopackage (SpatiaLite)
- R (SpatialPolygonsDataFrame)
- Google Earth .kmz
- ESRI personal geodatabase

is longitude/latitude and the WGS84 datum.

Global Administrative Areas
<http://www.gadm.org/>

Global Administrative Areas
Boundaries without limits

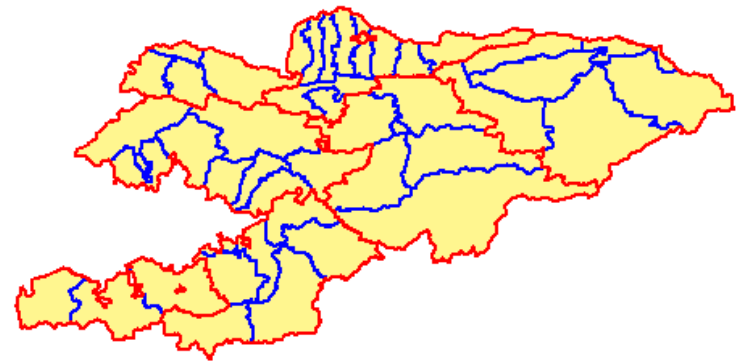
Download Known problems About Contact

Home

Download

Country: Kyrgyzstan

Format: shapefile



ADDING SUB-BASIN SHAPEFILE

QGIS 2.18.7

The screenshot shows the QGIS 2.18.7 interface. The top menu bar includes Project, Uredi, Prikaz, Sloj, Postavke, Dodaci, Vektor, Raster, Baza podataka, Web, Processing, and Pomoć. The toolbar contains various icons for file operations, navigation, and processing. The 'Add Vector Layer' dialog is open, showing the 'Tip izvora' (Source type) section with 'Datoteka' (File) selected. The 'Encoding' is set to 'System'. The 'Izvor' (Source) section has a 'Dataset' field and a 'Traži' (Browse) button. A file explorer window is open, showing the contents of the 'EXPORT_SHAPEFILES' folder. The file 'carffg_basins_02_kyrgyzstan_operational_3sec_20140304.shp' is selected. The 'Otvori' (Open) button is highlighted.

1 or Ctrl + Shift + V

2

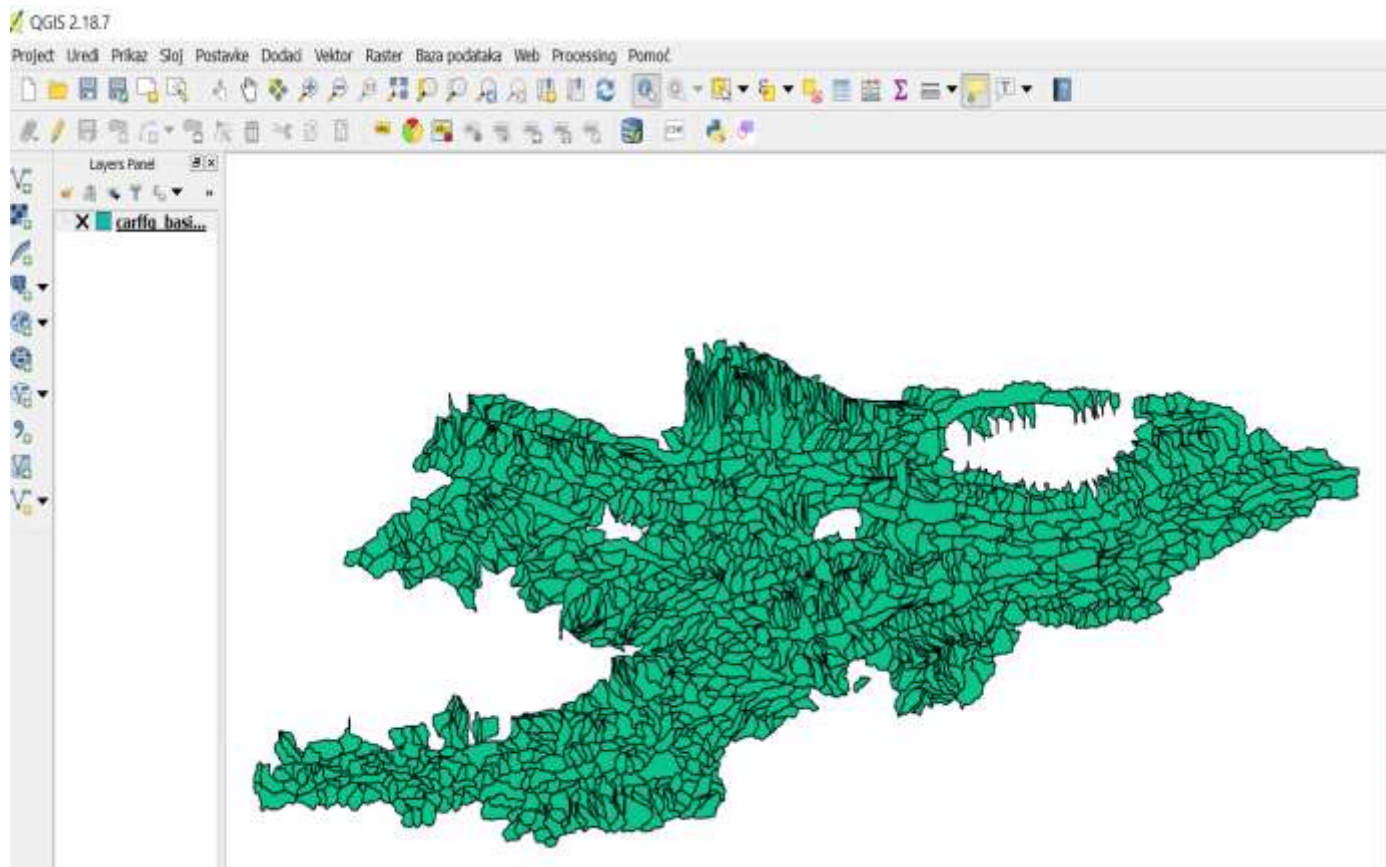
3

4

1. Once in QGIS, first load the shapefile by clicking the Add Vector Layer button
2. Click Browse and then find your shapefile (sub-basins) and Open it (3 & 4).



Guidance for Preparation of Flash Flood Warnings



You should now see the geometry of the sub-basins displayed in the map window and the filename in the Layers panel.



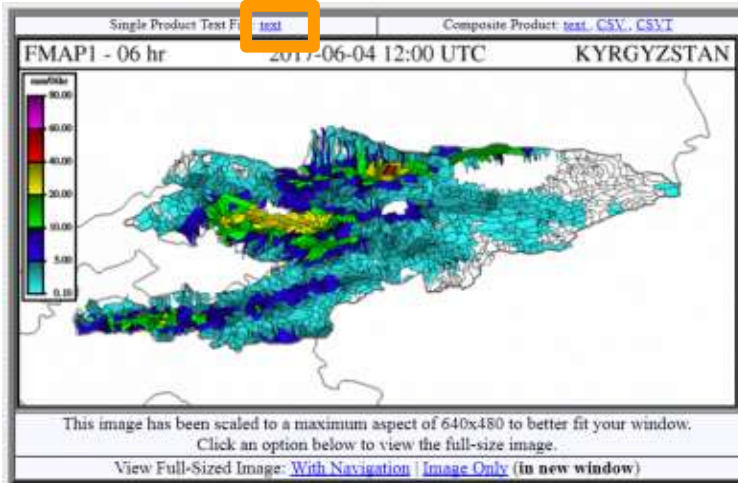
FFGS Products

Product	01 hr	03 hr	06 hr	24 hr	4 day	Numerical Data
MWGHE Precipitation	+	+	+	+		+
GHE Precipitation	+	+	+	+		+
Gauge MAP			+	+		+
Merged MAP	+	+	+	+		+
ASM			+			+
FFG	+	+	+			+
IFFT	+	+	+			+
PFFT	+	+	+			+
ALADIN Forecast	+	+	+	+		
FMAP	+	+	+	+		+
FFFT	+	+	+			+
Gauge MAT			+			+
Latest IMS SCA				+		+
SWE			+			+
Melt				+	+	+



CARFFGS Data Transfer

1



```

BASIN 06FMAP12017060412
1000608062 0.06
1000608063 0.00
1000608064 0.00
1000608065 0.00
1000608066 2.61
1000609637 0.04
1000609638 0.00
1000609639 0.00
1000609657 0.00
1000609658 0.00
1000609659 0.00
1000609660 1.60
1000609661 0.78
1000609662 0.37
1000609663 0.34
1000609664 0.03
1000609665 0.08
1000609731 0.00
1000609734 4.54
1000610064 29.28
1000610195 0.00
1000610196 0.24
1000610197 0.25
1000610198 1.08
1000610199 0.26
1000610200 0.03
1000610201 0.37
1000610202 0.00
1000610203 0.14
    
```

2

Ctrl + A
Ctrl + C

3

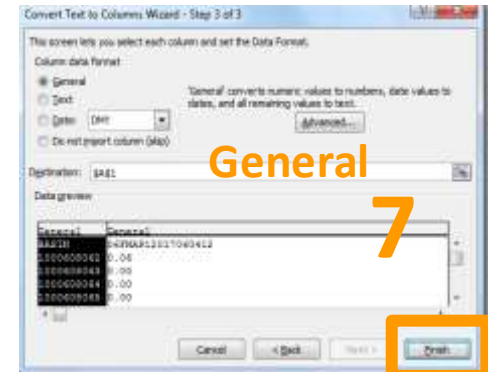
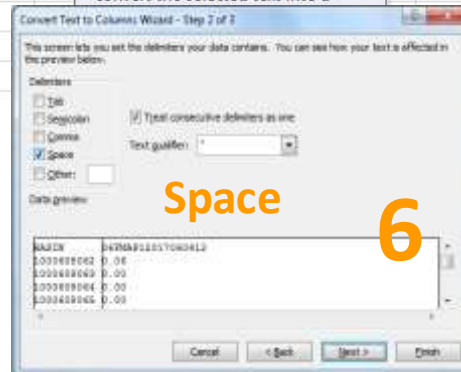
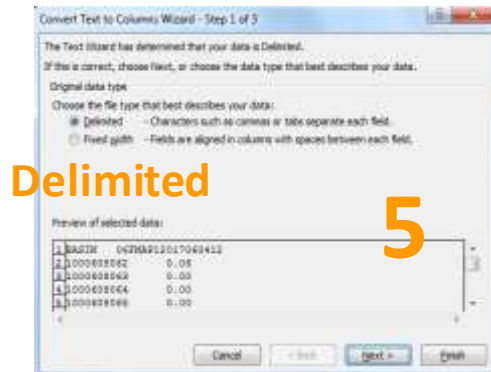
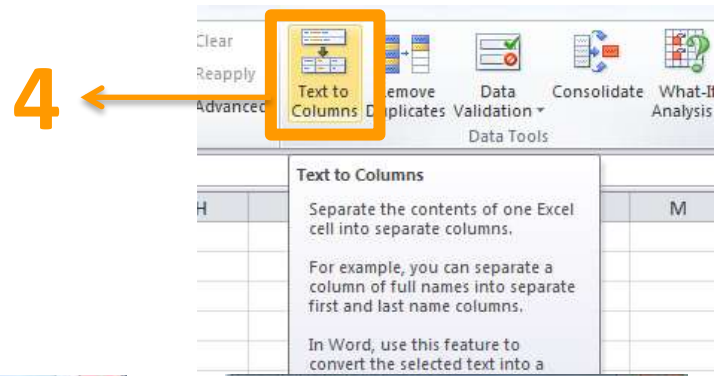
Ctrl + V

	A	B	C
1	BASIN 06FMAP12017060412		
2	1000608062	0.06	
3	1000608063	0.00	
4	1000608064	0.00	
5	1000608065	0.00	
6	1000608066	2.61	
7	1000609637	0.04	
8	1000609638	0.00	
9	1000609639	0.00	
10	1000609657	0.00	
11	1000609658	0.00	
12	1000609659	0.00	
13	1000609660	1.60	
14	1000609661	0.78	
15	1000609662	0.37	
16	1000609663	0.34	
17	1000609664	0.03	
18	1000609665	0.08	
19	1000609731	0.00	
20	1000609734	4.54	

1. Click on the Single product **text**
2. On the following page, copy data by pressing Ctrl + A (Select all data) and Ctrl + C (Copy)
3. In Excel sheet – right click and paste the values (or hold Ctrl + V to paste the values)



CARFFGS Data Transfer

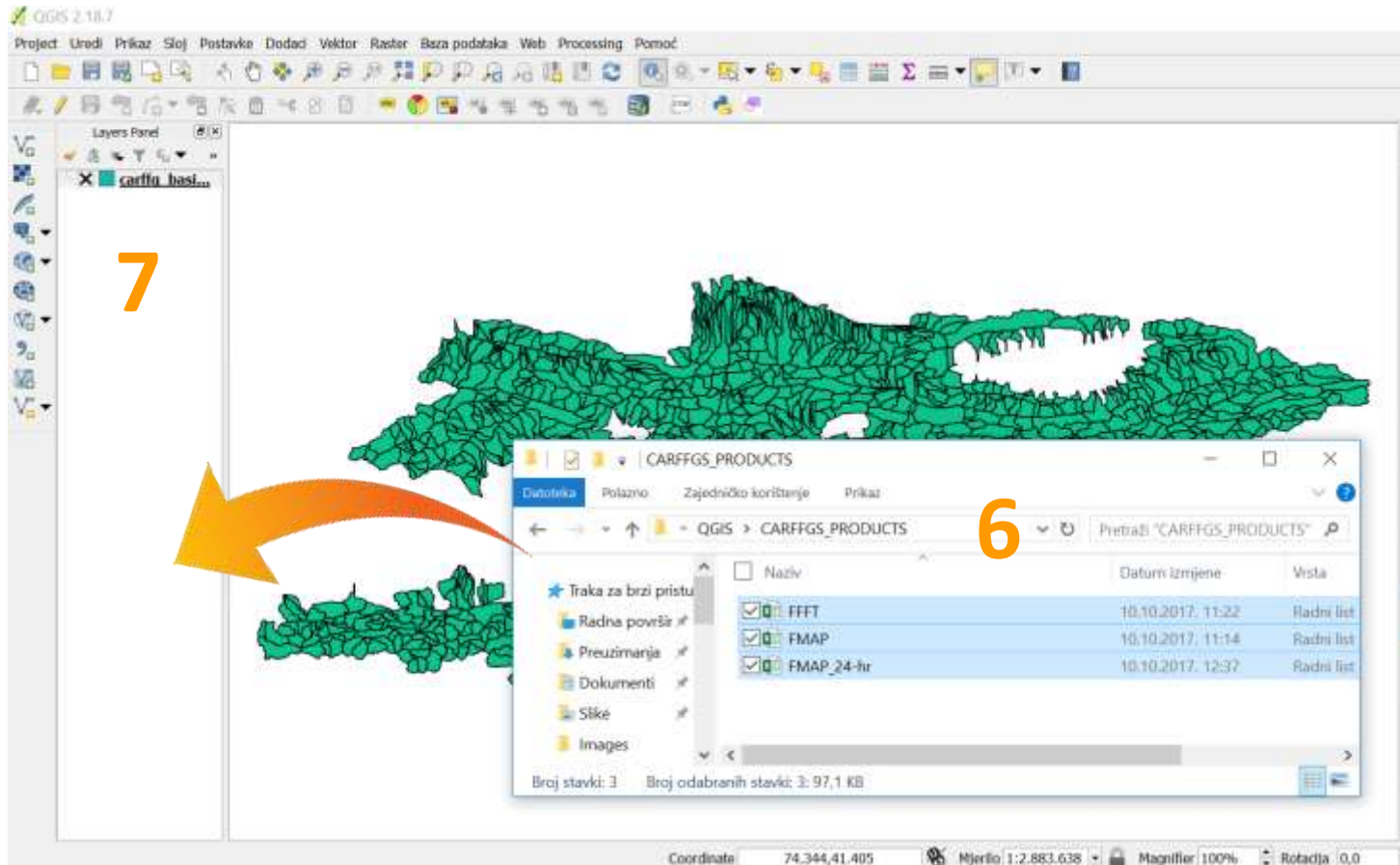


4. Convert text to columns (3 steps)

5. At the end, we will have 2 columns: Sub-basin's ID and CARFFG product's values



CARFFGS Data Transfer



6. Drag and drop excel files into the QGIS Interface



Joining data to shapefiles

Joining works by adding fields from data table to the shapefile's attribute table based on matching values found in the key columns (Sub-basin's ID).

8

Look at the shapefile's attribute table by right clicking on the layer name (Sub-basins) and selecting **Open attribute table.**

	cat	value	label
1	202	1000807432	
2	207	1000807427	
3	295	1000807378	
4	204	1000807433	
5	159	1000807430	
6	146	1000807439	
7	288	1000808538	
8	217	1000807465	
9	220	1000807464	
10	72	1000710156	
11	307	1000808539	
12	297	1000807379	
13	845	1000808617	
14	197	1000807426	
15	887	1000809378	
16	862	1000809377	

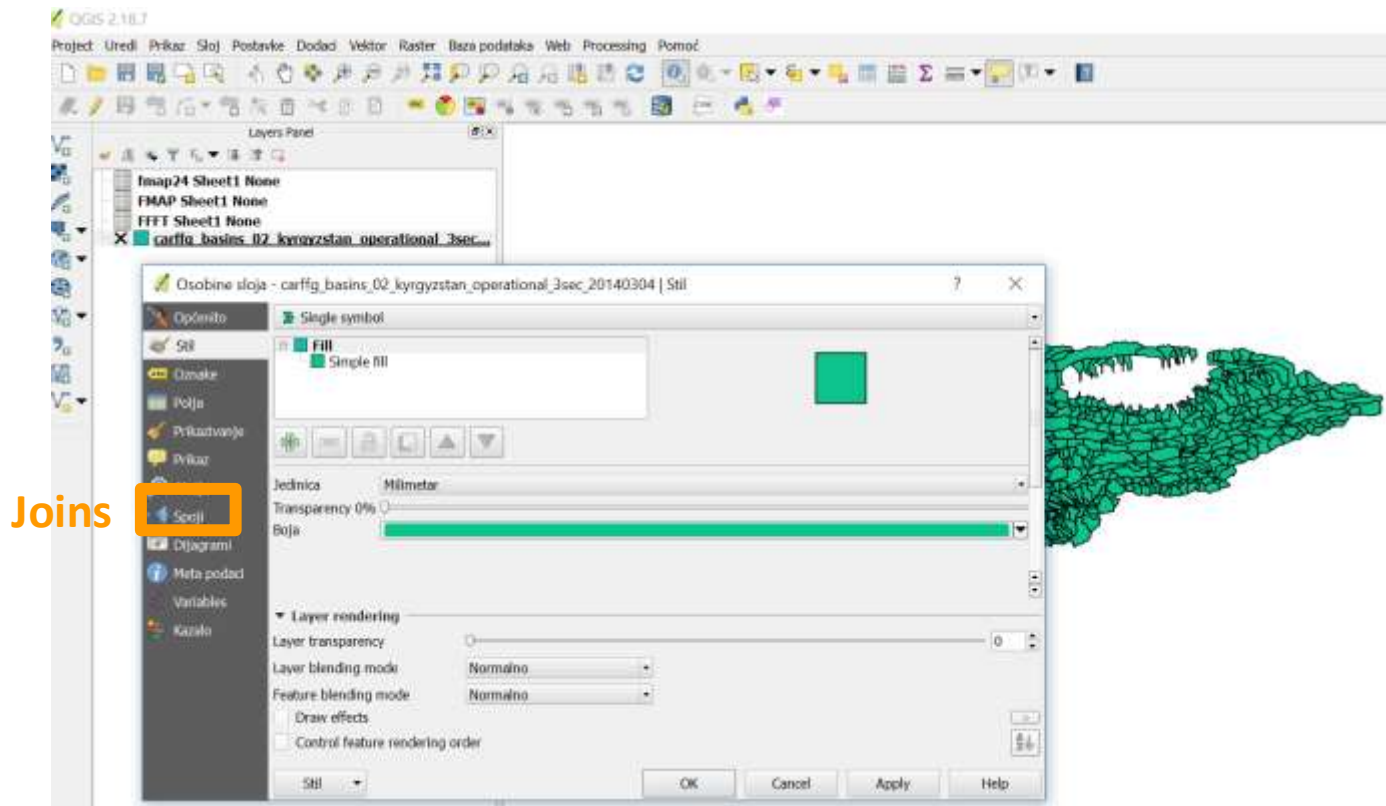
9. Here you can view your shapefile's data table and determine which field should be used for the join. The **VALUE** field is what we want in this example.

10. Close the attribute table.

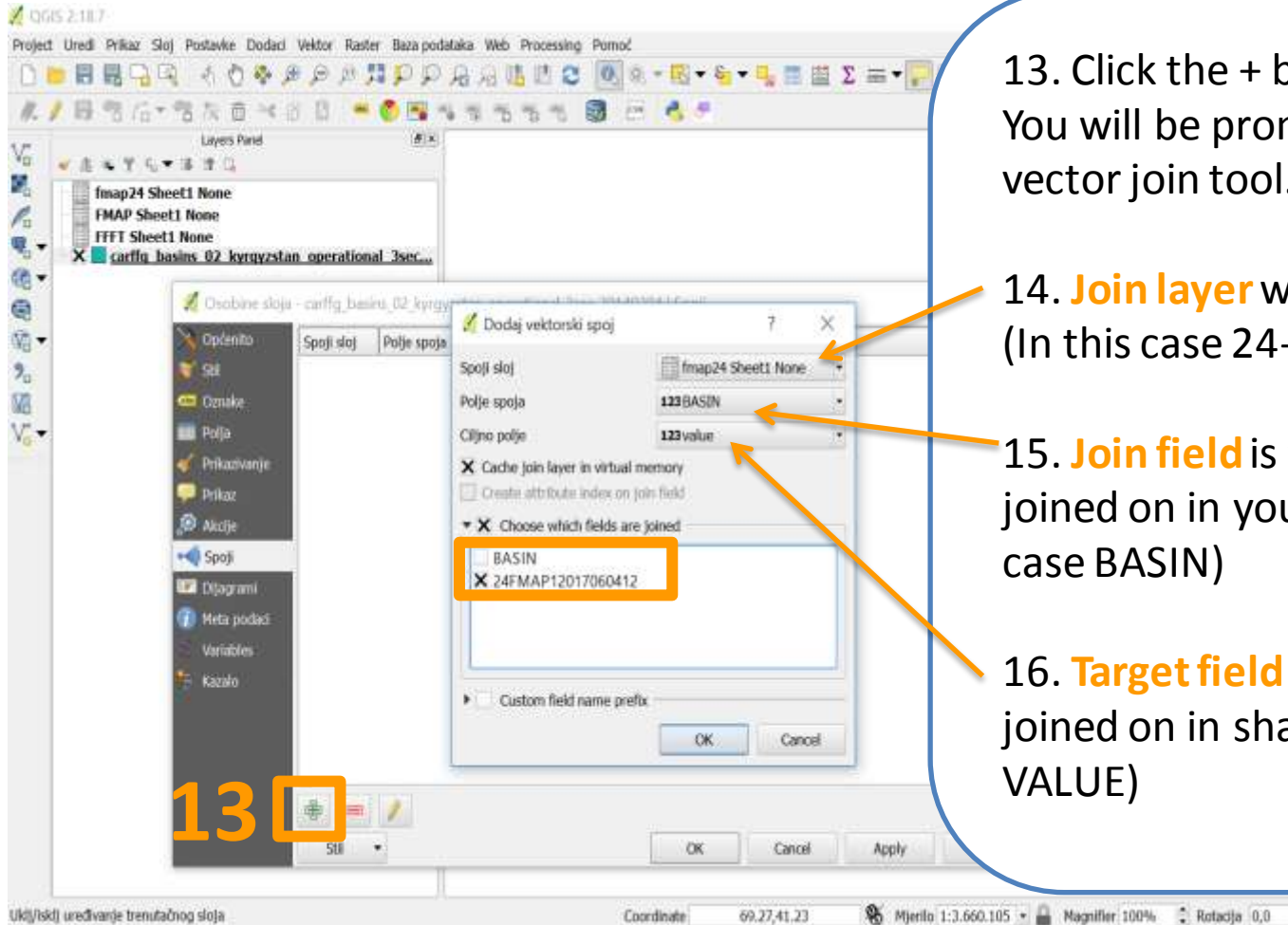


Joining data to shapefiles

11. Open the shapefile's Properties by double-clicking on the layer name.
12. Go to the Joins tab.



Joining data to shapefiles



13. Click the + button to add a join. You will be prompted with the Add vector join tool.

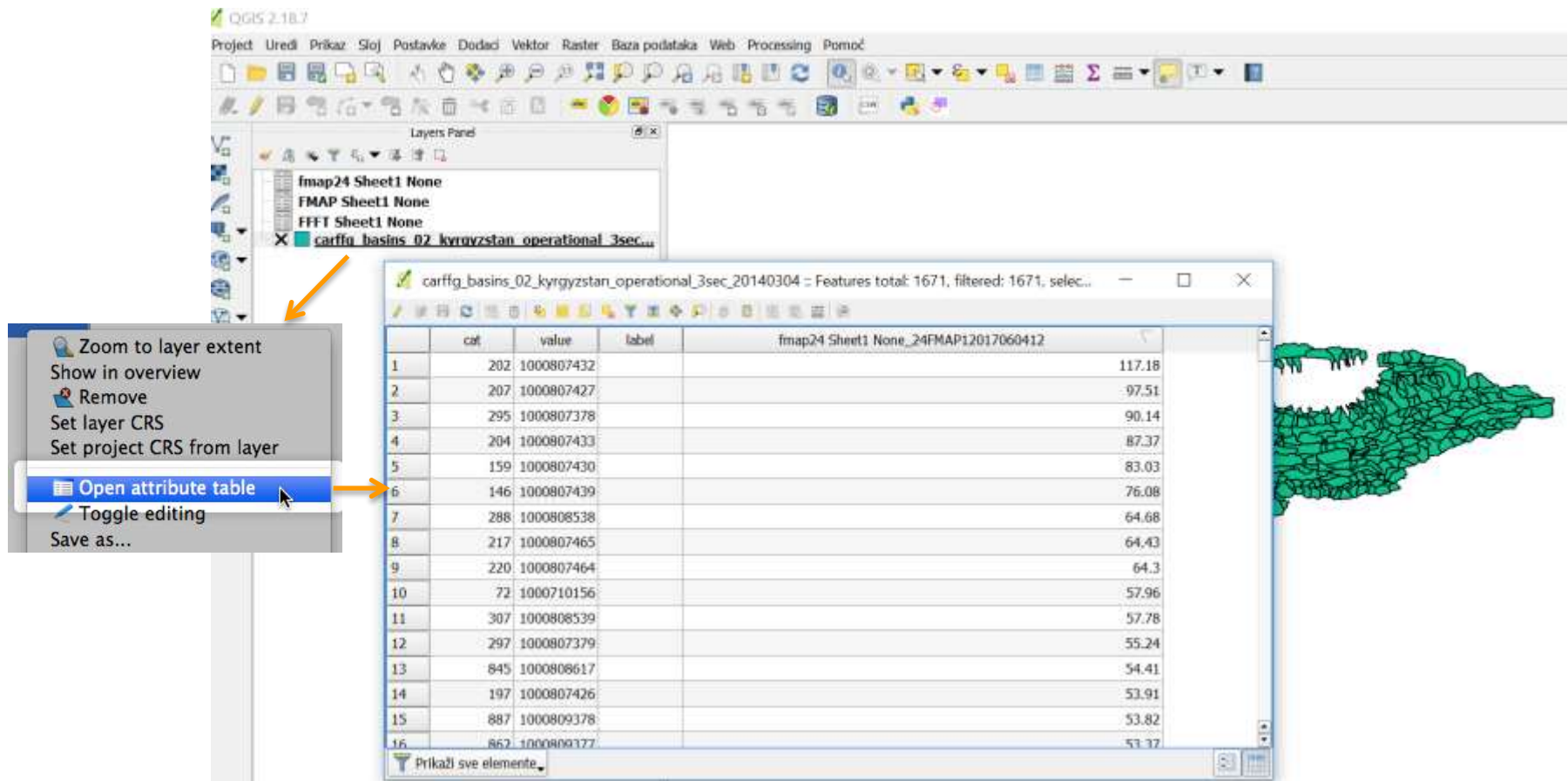
14. **Join layer** will be your data table (In this case 24-hr FMAP table)

15. **Join field** is the key field to be joined on in your Excel table (In this case BASIN)

16. **Target field** is the key field to be joined on in shapefile (In this case VALUE)



Joining data to shapefiles



carffg_basins_02_kyrgyzstan_operational_3sec_20140304 : Features total: 1671, filtered: 1671, selec..

	cat	value	label	fmap24 Sheet1 None_24FMAP12017060412
1	202	1000807432		117.18
2	207	1000807427		97.51
3	295	1000807378		90.14
4	204	1000807433		87.37
5	159	1000807430		83.03
6	146	1000807439		76.08
7	288	1000808538		64.68
8	217	1000807465		64.43
9	220	1000807464		64.3
10	72	1000710156		57.96
11	307	1000808539		57.78
12	297	1000807379		55.24
13	845	1000808617		54.41
14	197	1000807426		53.91
15	887	1000809378		53.82
16	862	1000809377		53.37

17. Open the shapefile's attribute table once again and check that your data has been properly joined (Right click on Shapefile).

*Note that this join is temporary for now. To make a permanently joined shapefile you must save a new copy.



Exporting joined shapefile

18. Right click the shapefile and select Save as

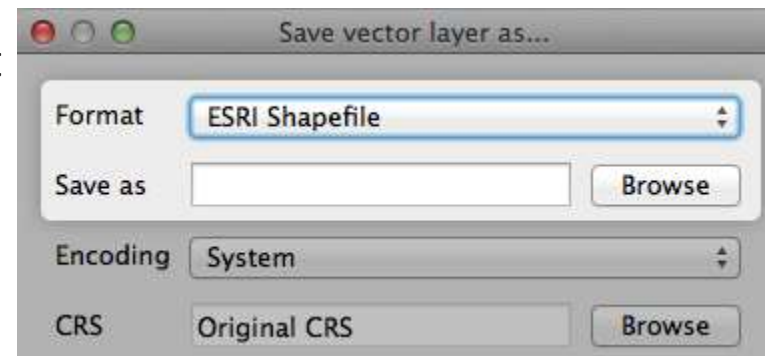
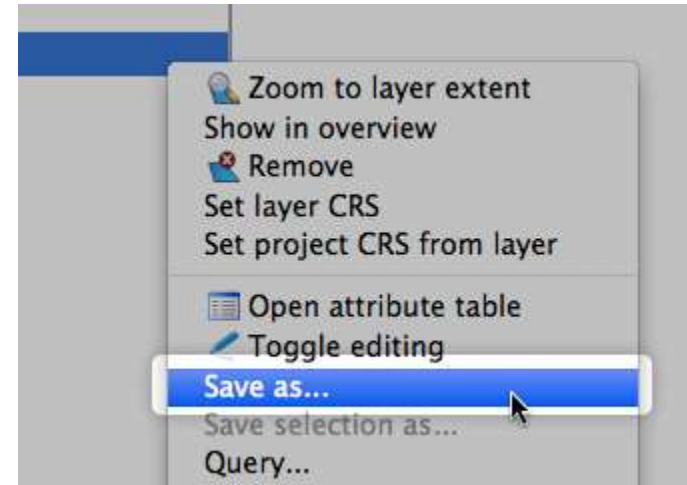
19. Format should be ESRI Shapefile. Everything else can be left as is.

20. Choose a filename and location for your new shapefile and click OK.

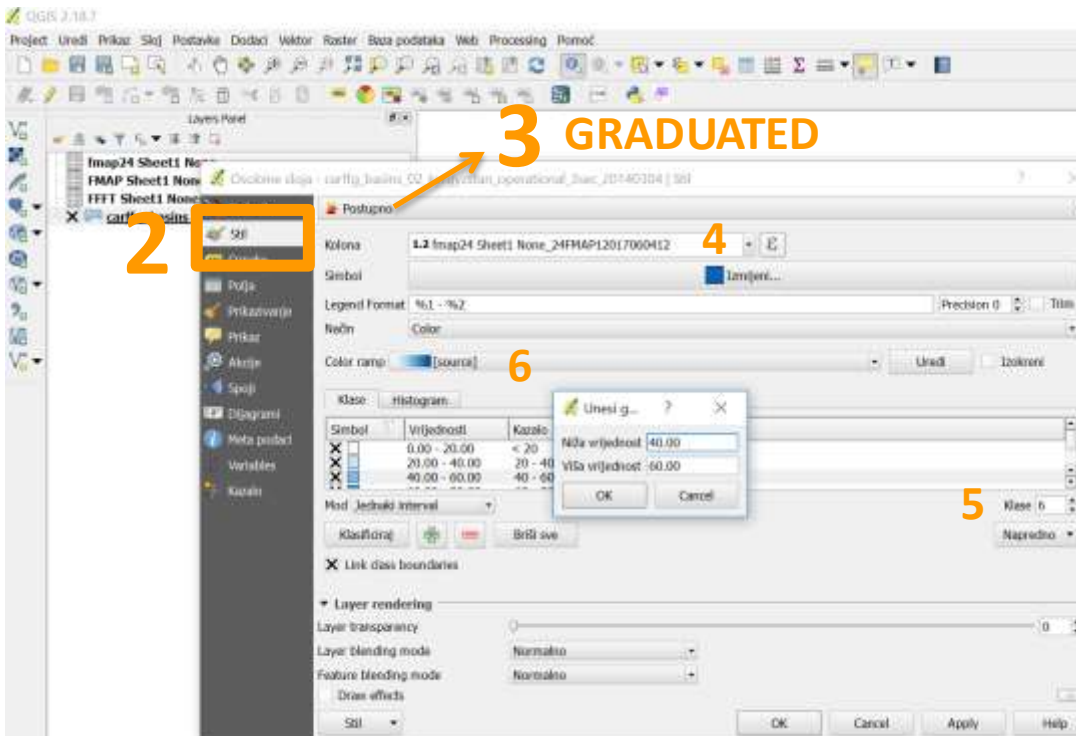
This newly created shapefile now has both the geometry and the data. It should consist of at least four files with the same name but different extensions (.shp, .shx, .dbf, .prj)*.

These must remain together.

* Shapefile shape format (.shp)
Shapefile shape index format (.shx)
Shapefile attribute format (.dbf)
Shapefile projection index format (.prj)



Classification



1. Right click on the layer again and choose Properties.

2. Go to Style tab.

3. Click on the dropdown that says Single Symbol and change it to **Graduated**.

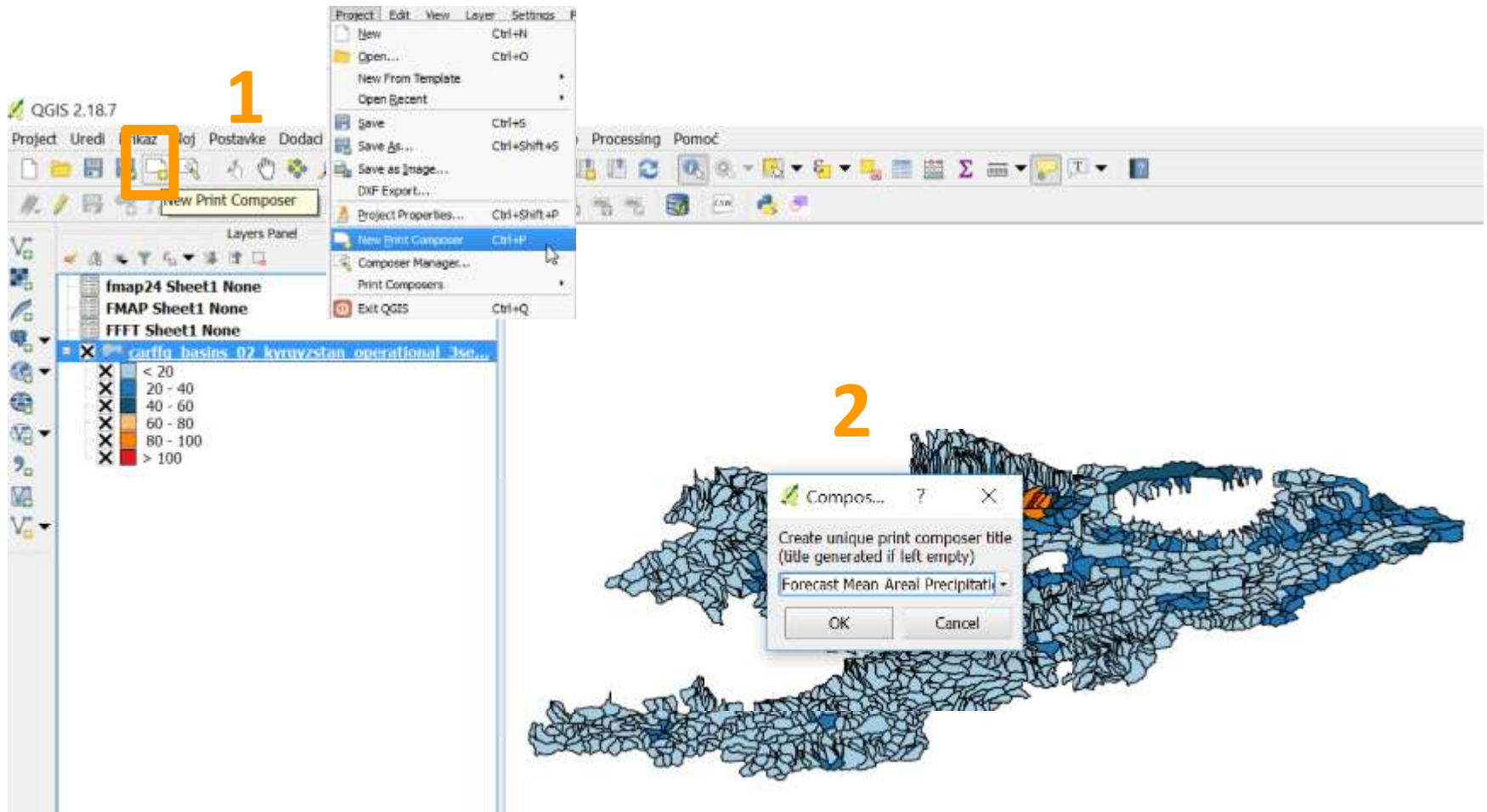
Graduated symbology type allows you to break down the data in a column in unique classes and choose a different style for each of the classes.

4. Choose **24-hr FMAP** values as the Column

5. Choose 6 as the classes and clicking on values you can modify class bounds.

6. Choose a color ramp of your choice and click Classify at the bottom.
7. Click OK.

Making a Map



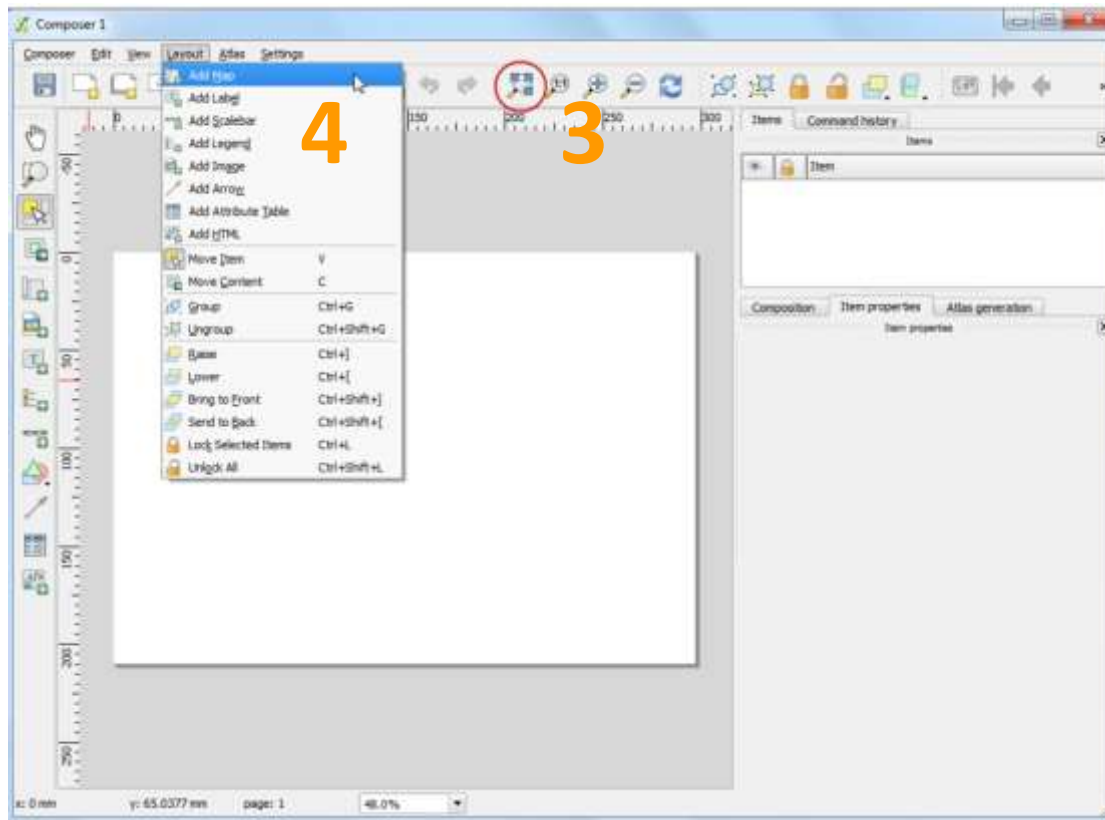
1. Go to Project > New Print Composer
2. You will be prompted to enter a title for the composer



Making a Map

3. In the Print Composer window, click on Zoom full to display the full extent of the Layout.

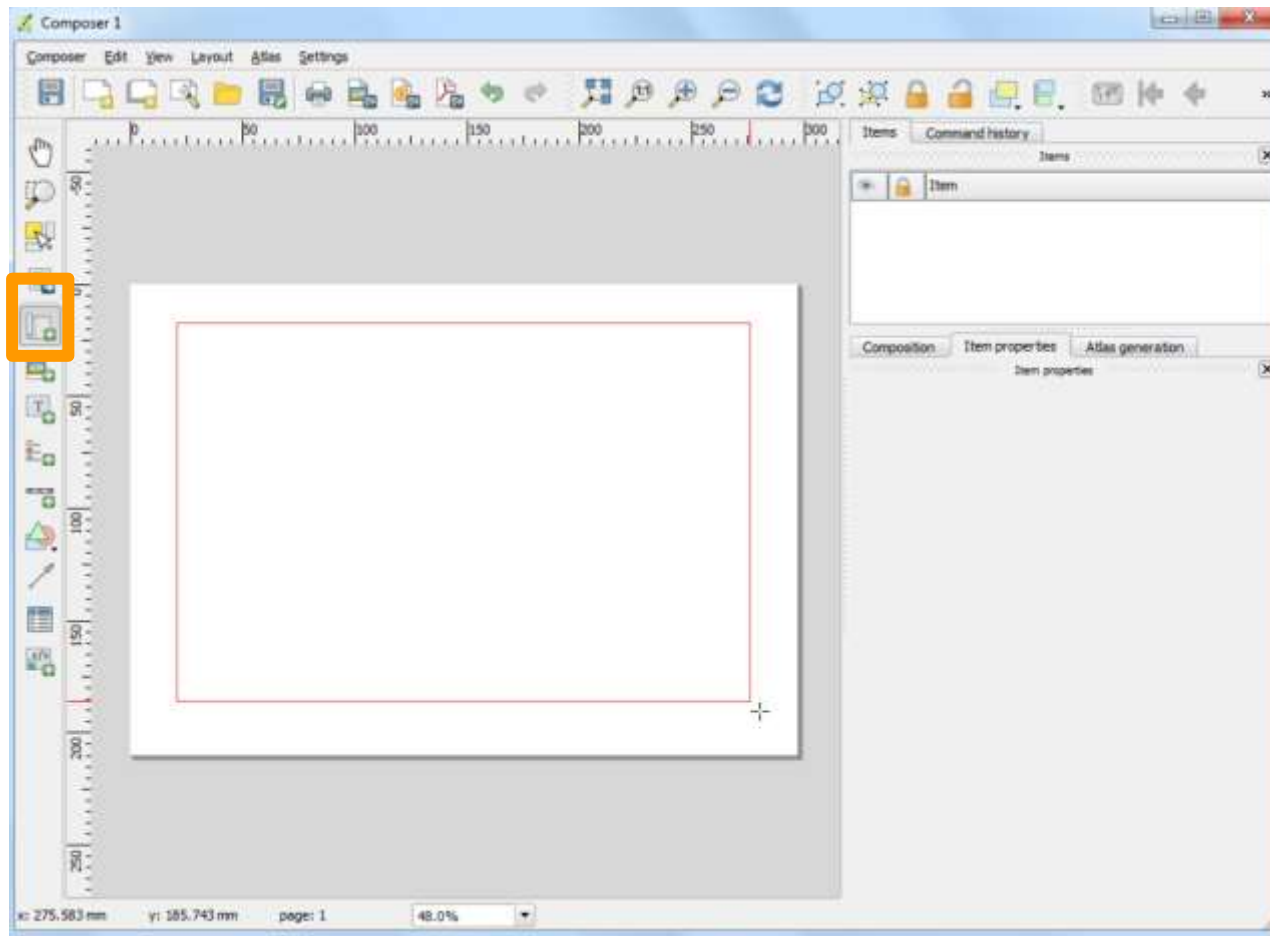
4. Now we would have to bring the map view that we see in the QGIS Canvas to the composer. Go to Layout ► Add Map.



Making a Map

5. Once the Add Map button is active, hold the left mouse button and drag a rectangle where you want to insert the map.

5



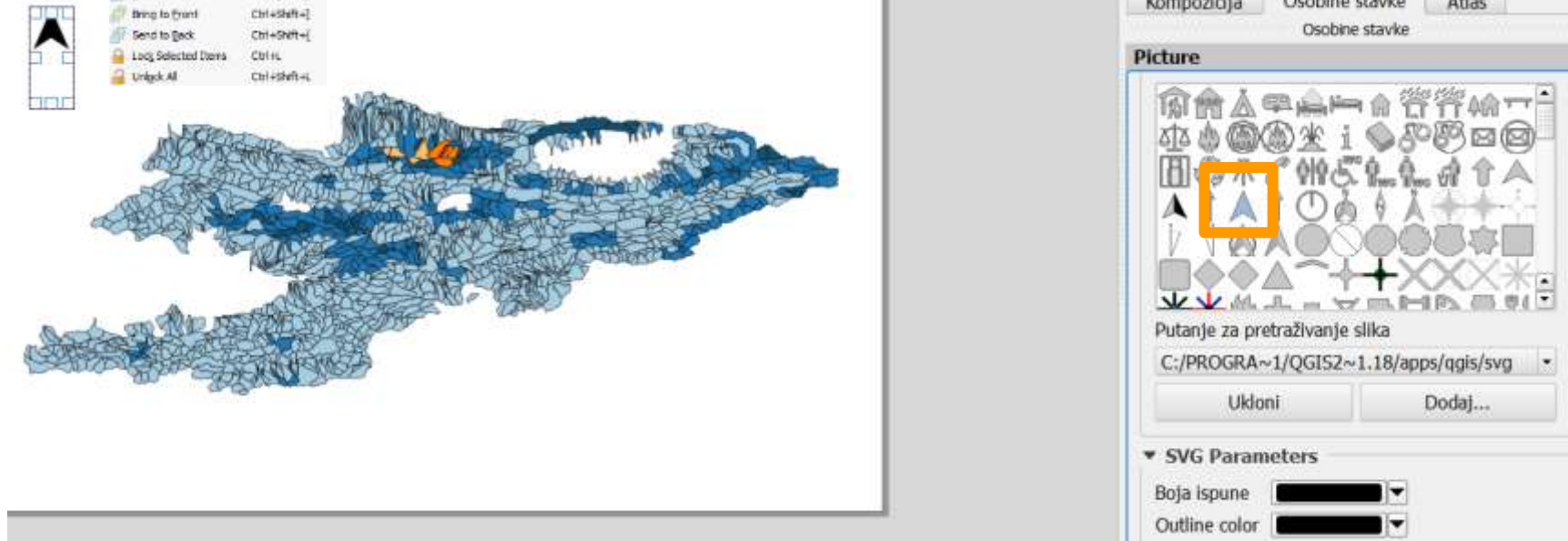
Making a Map

6




To put North the arrow Click Layout ▸ Add Image.

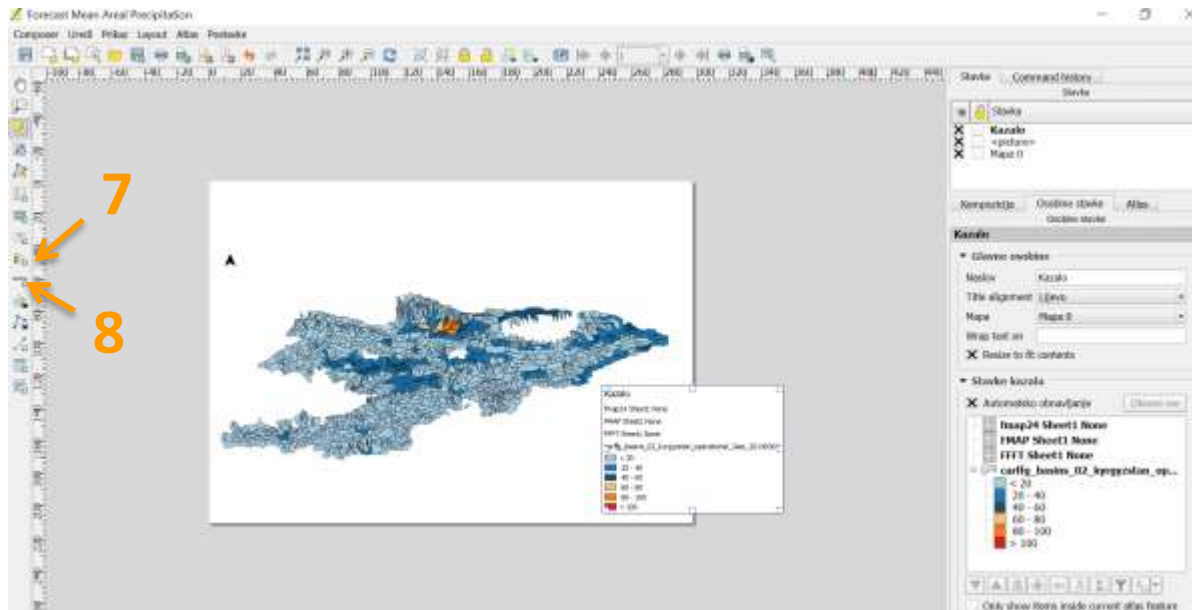
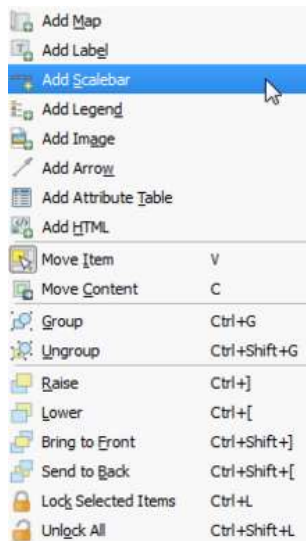
ITEM PROPERTIES




Holding your left mouse button, draw a rectangle on the top-right corner of the map canvas. On the right-hand panel, click on the Item Properties tab and expand the Search directories section and select the North Arrow image of your liking.

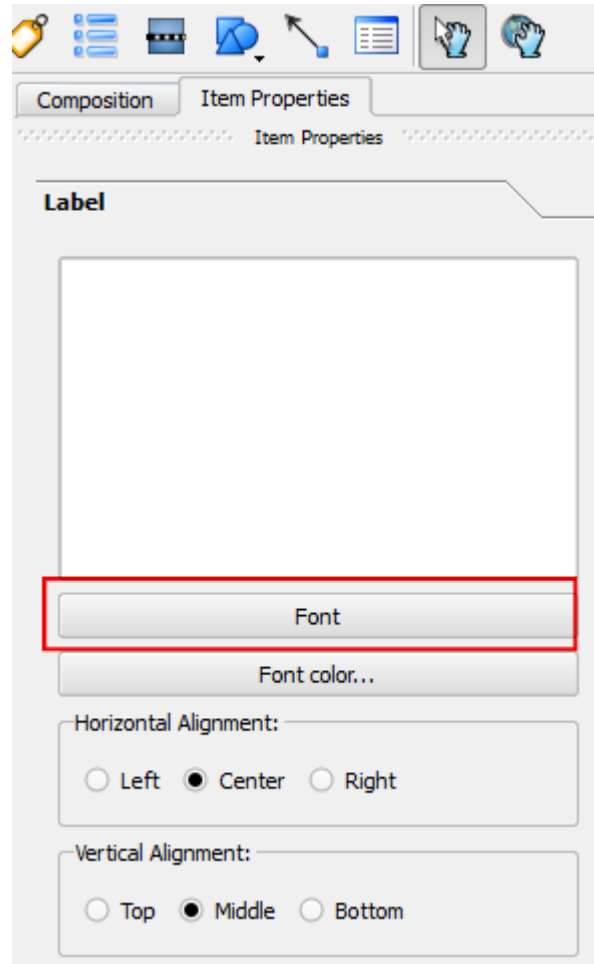
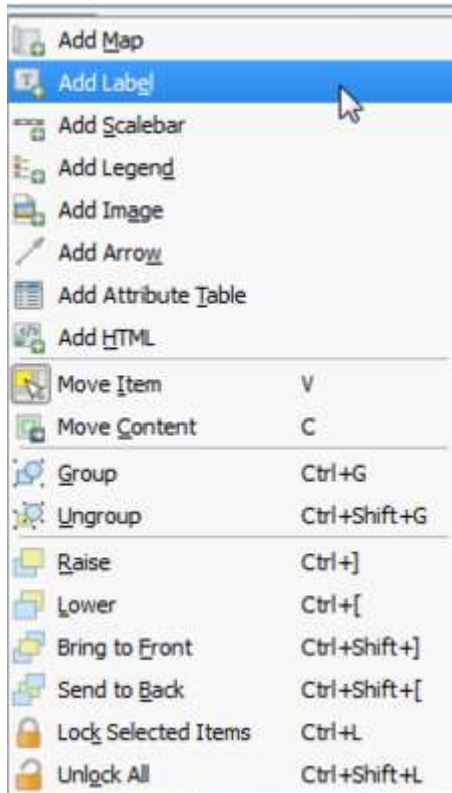
Making a Map

7. To add a map legend, click the  Add new legend icon, place the element with the left mouse button on the Print Composer canvas and position and customize the appearance in the legend Item Properties tab.



8. To add a scale bar, click the  Add new scalebar icon (or Click on Layout ▶ Add Scalebar), place the element with the left mouse button on the Print Composer canvas and position and customize the appearance in the scale bar Item Properties tab.

Making a Map

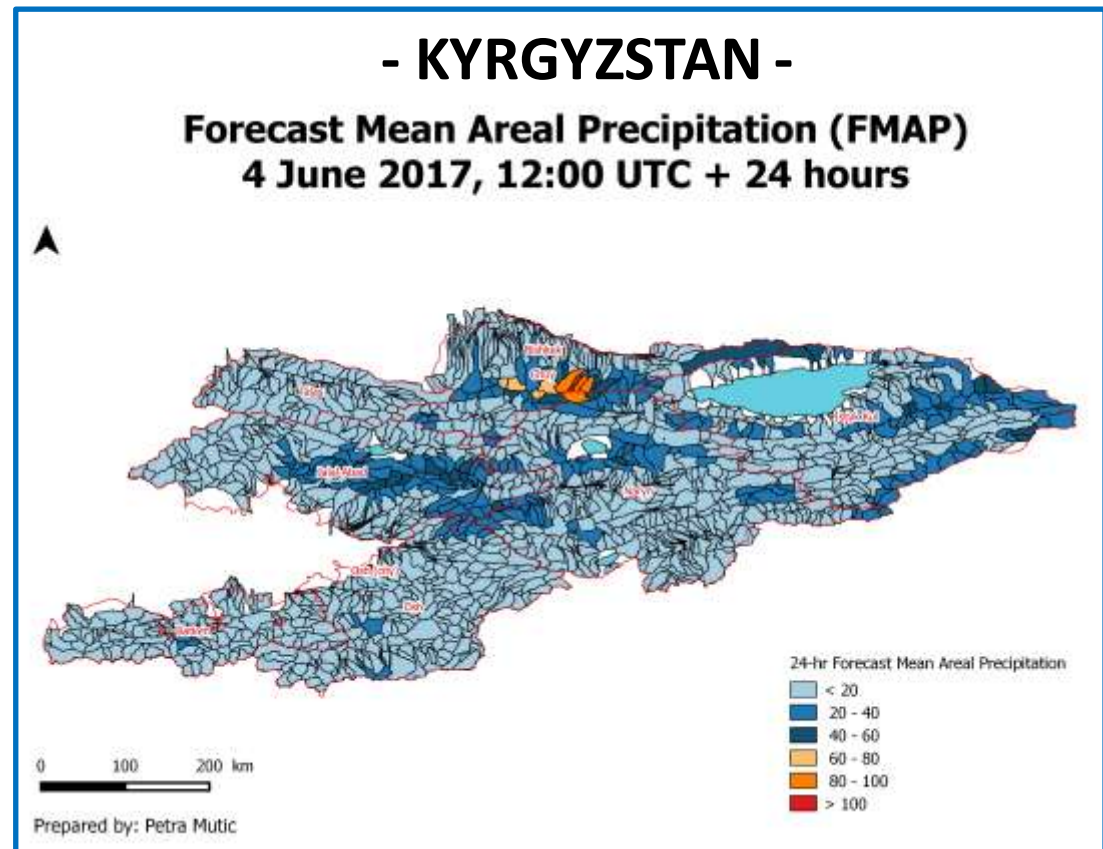
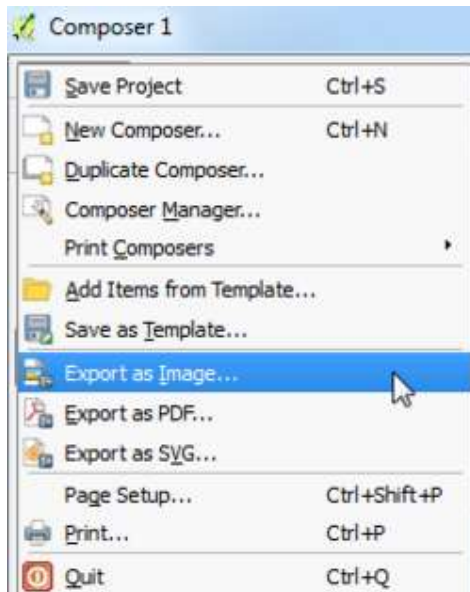


9. To add label on a map, click on Layout ▶ Add Label.

Click on the map and draw a box where the label should be. In the Item Properties tab, expand the Label section and enter the text.

Making a Map

10. Once you are satisfied with the map, you can export it as Image, PDF or SVG. For this tutorial, let's export it as an image. Click Composer ▶ Export as Image



Shapefile to KML

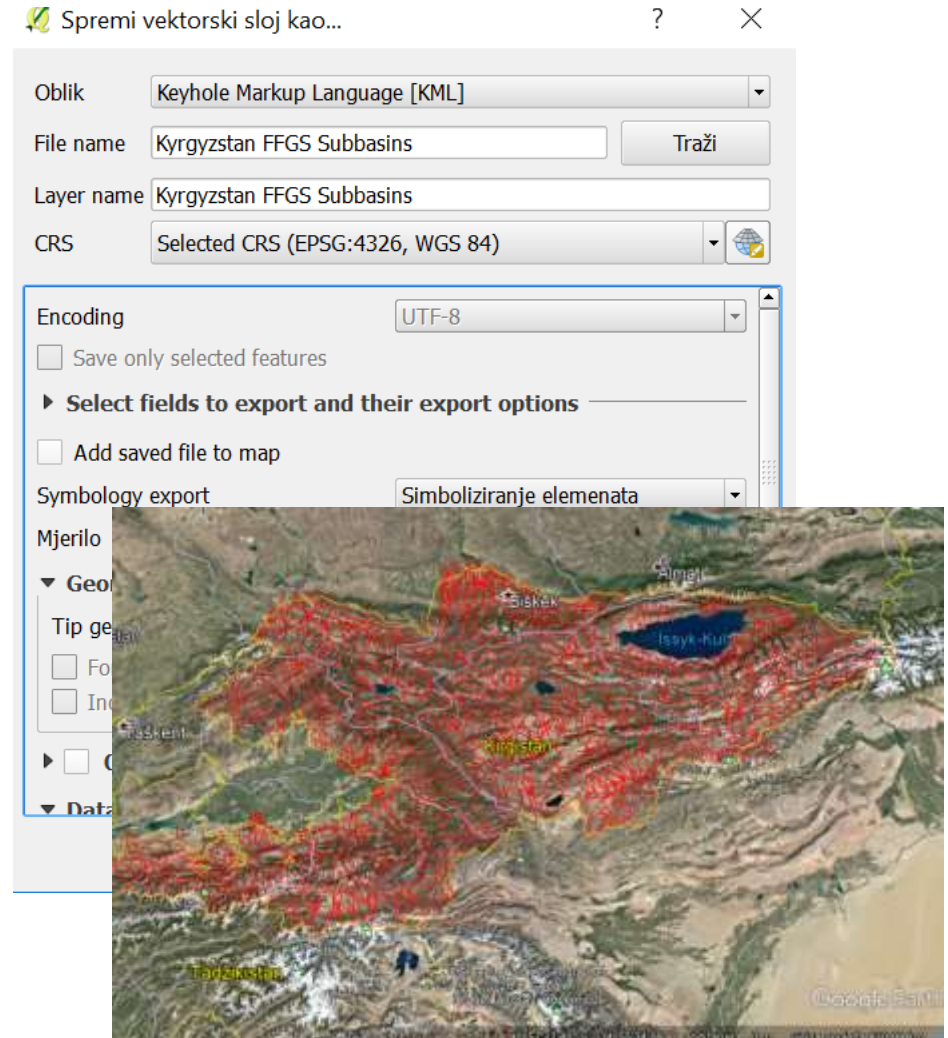
Shapefile is ESRI based Vector file, while KML or Keyhole Markup Language is file which models and stores geographic features for display in Google Earth or Google maps.

To convert .shp to KML:

Right click on the name of shapefile layer and select save as (or You can select layer from the menu, and click on save as).

In the **Save vector layer as** window, select the format from the drop down box as **Keyhole Markup Language (KML)** and browse the folder in which you want to save the KML file .

Name it and Press OK.



Thank you

Petra Mutic

pmutic@wmo.int

Paul Pilon

ppilon@wmo.int

Ayhan Sayin

asayin@wmo.int



WMO OMM

World Meteorological Organization

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For more information please visit:

<http://www.wmo.int/ffgs>

<http://www.hrcwater.org>