



COMMUNITY BASED SUSTAINABLE FOREST MANAGEMENT FOR WATER RESOURCE CONSERVATION

TECHNICAL GUIDELINE

Patrol Database Management and Reporting in QGIS

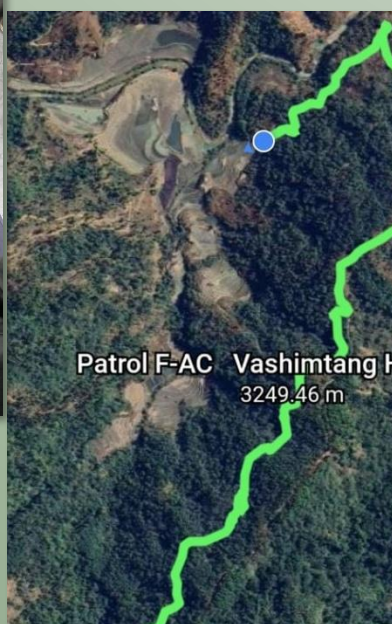


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1 Concept

1.1 Concept description

A patrol data base system was developed based on local reporting needs, local capacities and already established field methods. The trainings provided to community forest patrols, DPMU, PMU and Forest Department staff during the assignment were aligned with this concept. The system builds on 1) patrol field data collection by forest patrol teams using the phone Field Area Measure application (patrol tracklogs), patrol sheets for patrol metrics and observations and pictures, 2) data storage and processing using a systematic folder system and Microsoft Excel at the DPMU level and 3) integration of patrol data in a QGIS¹ for analysis and reporting at the PMU level. Capacities for system operation, building and maintenance has been developed at all levels during the assignment. Two simple reporting templates have been developed.

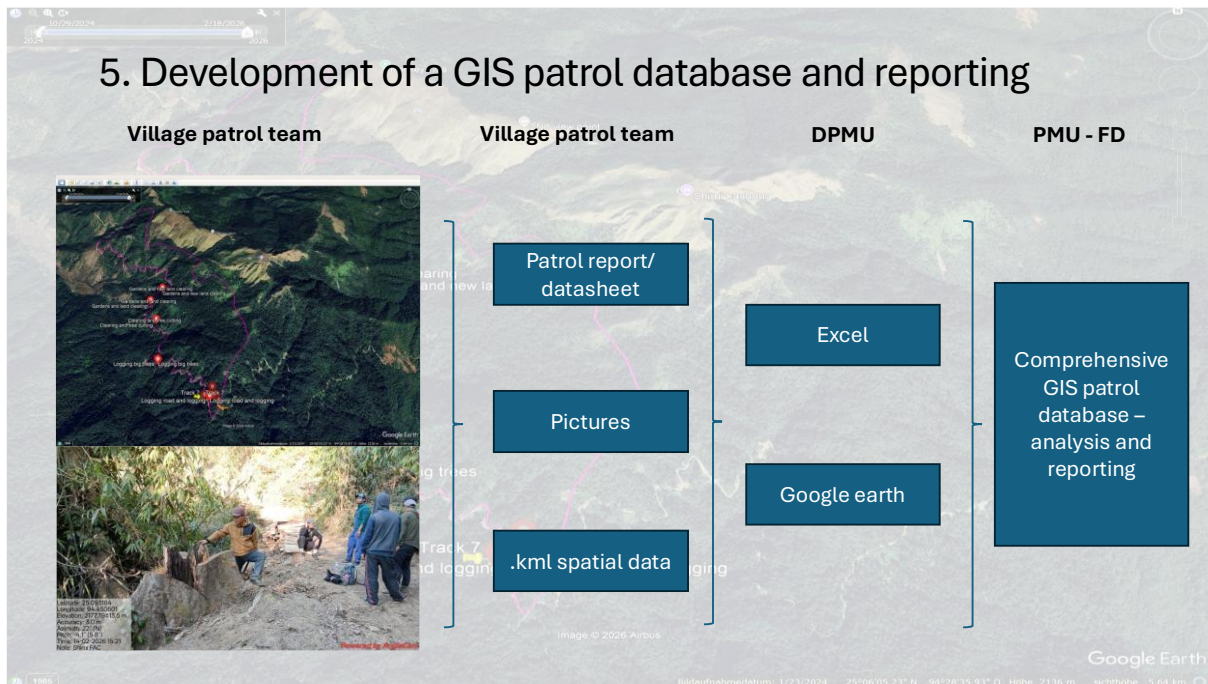
Table 1 Core elements of the patrol and database system

Purpose/ Principle	Responsibility	Outputs
Basic data collection methods ² adequate for the local context and capacities	Village Forest Patrols and WRCCs, Forest Department	Raw FAC/ RAC field data from regular patrolling of the areas
Systematic patrol data storage	DPMU (+ PMU GIS specialist oversight)	A sophisticated folder system and patrol IDs assigned to each patrol data batch
Raw data processing in Excel for QGIS compatibility and use	DPMU (+ PMU GIS specialist oversight)	Excel datasets of patrol data fit for use in QGIS
Integration of patrol data in a comprehensive QGIS database	PMU (+ FD)	An integrated database featuring all patrol and patrol spatial data
GIS analysis and reporting	PMU (+ FD)	Simple but comprehensive reports of patrol efforts, violations and follow up

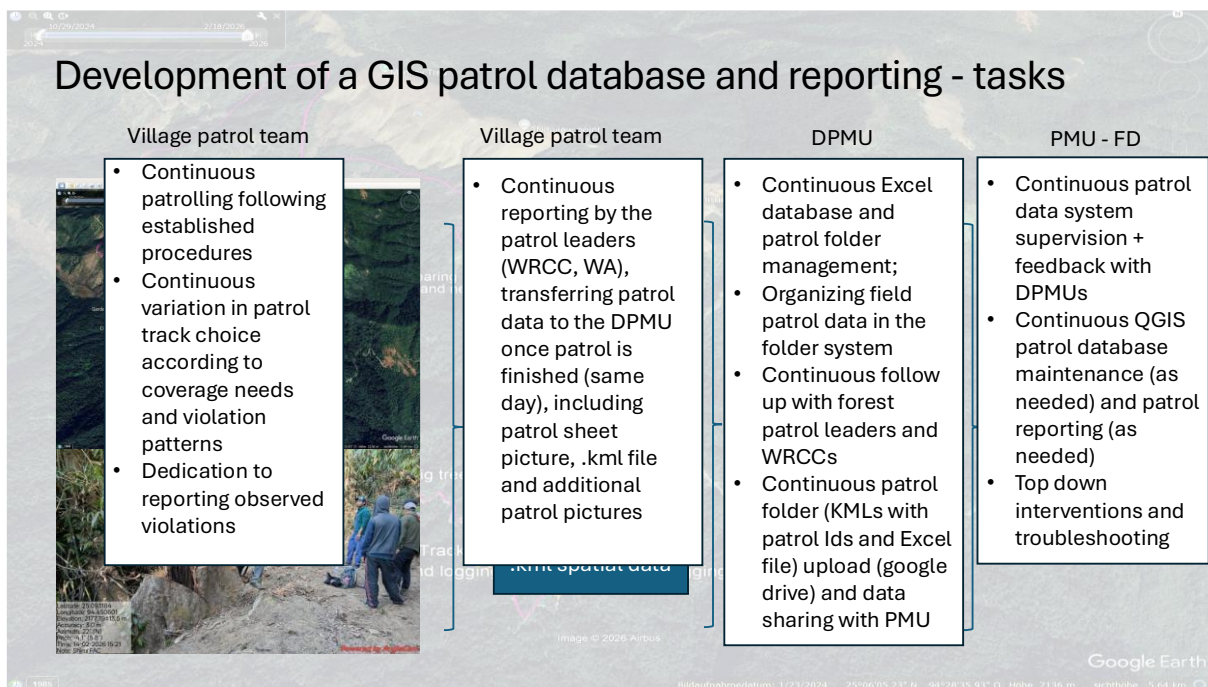
¹ Open source GIS software fit for purpose

² Already established in project course prior to assignment

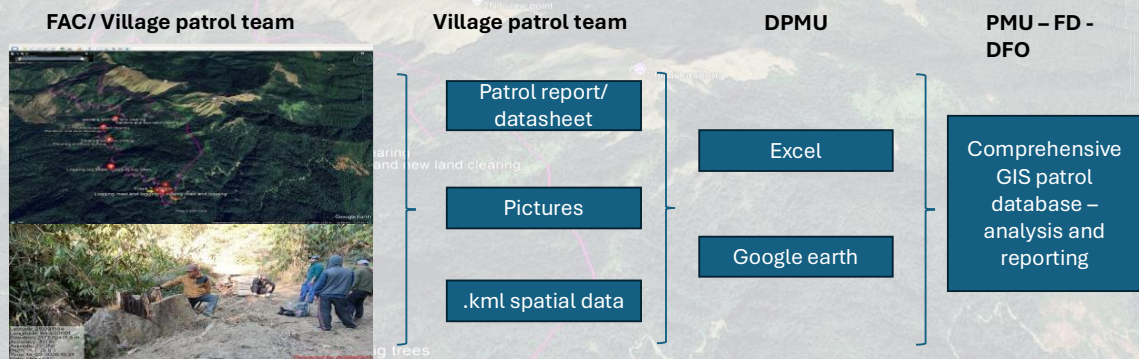
5. Development of a GIS patrol database and reporting



Development of a GIS patrol database and reporting - tasks

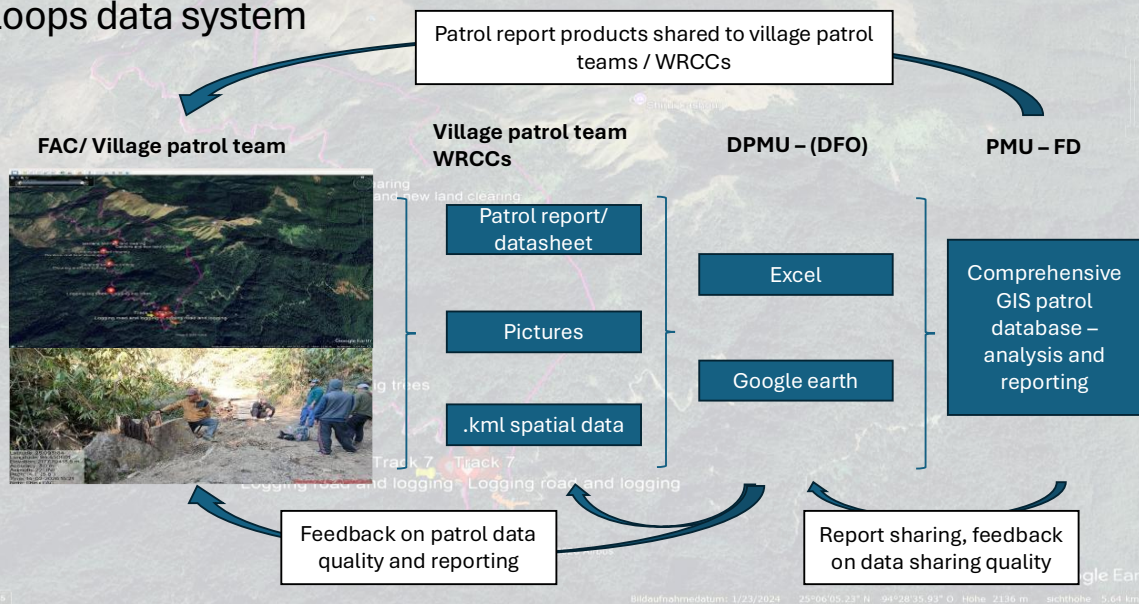


Development of a GIS patrol database and reporting – feedback loops



- Establish strong feedback loops between segments of the patrol system: 1) data and information flows, 2) violation reporting and handling
- Ensure that neither village forest patrol teams, DPMU, DFO and PMU- PDO work in isolation
- Patrol system with multiple components and associated responsibilities

Development of a GIS patrol database and reporting – feedback loops data system



Reporting



KFW

Quarterly Patrol Report

Ukhrul District – COSFOM

Quarter X
PMU - >Name<

11.2025 – 01.2026
Reporting date 20.02.2026

Ukhrul district
Cosfom villages

FAC/ RAC

Community patrols

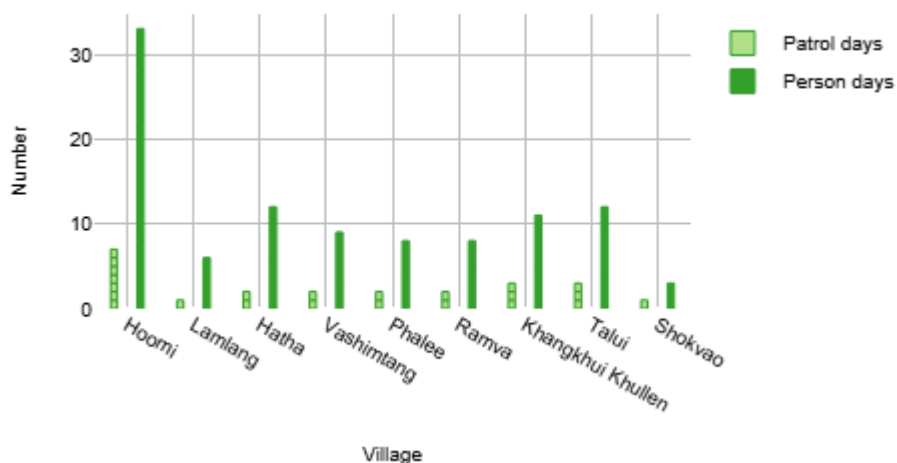
Ukhrul

Patrol effort

Number of
patrol days
Number of man
days

Village	Patrol days	Person days
Hoomi	7	33
Lamlang	1	6
Hatha	2	12
Vashimtang	2	9
Phalee	2	8
Ramva	2	8
Khangkhui Khullen	3	11
Talui	3	12
Shokvao	1	3

Patrols by
village



1.2 Terminology patrol data system

Term	Level	Definition
Raw patrol data	WRCCs, DPMU	Includes the raw patrol data available at the WRCC level, including patrol tracklogs (stored on handphones of the patrol leaders), pictures (stored
Processed patrol data	DPMU, PMU	Patrol sheet data are processed at the DPMU level with all information provided by the patrol datasheet stored in Excel. .kml spatial data are processed at the PMU level (GIS expert)
Village patrol database	DPMU, DFO	Layer 1 patrol database (named “Forest patrols”) consisting of a folder system that contains the raw village patrol data stored in a organized Desktop computer folder system. The folder system contains 1) a folder with processed patrol sheet information in a single Excel file, and 2) a folder termed “Village database” containing a folder for each of the villages, containing a folder with assigned ID for each conducted patrol, storing raw patrol data (.kml tracklog file, patrol sheet picture, additional pictures of violations, the patrol team, ..) The database is stored on the DPMU desktop computer as well as online in a google drive accessible to PMU
QGIS (integrated) patrol database	PMU, FD	Layer 2 patrol database integrating the processed patrol Excel file and .kml patrol tracklog data in a single GIS platform for the purpose of analysis and reporting

1.3 Roles and responsibilities

Structure	Responsibility	Tasks
DPMU	Retrieve raw patrol data	Continuous and weekly follow up with village patrol teams to retrieve patrol data: patrol tracklog .kml files, patrol sheet (and violation sheet) pictures, additional supportive pictures (patrol team and violations)
	Storage of raw patrol data	Allocate the patrol data to the patrol folder system

	Assign patrol IDs to raw patrol data	Assign patrol IDs following the established format to unique patrol folders and all raw patrol data files
	Patrol sheet transcription into Excel	Transcribe the patrol sheet information into the established Excel patrol database
	Assign patrol IDs to treated patrol sheet data	Associate the Patrol IDs to each of the conducted patrols in the Excel patrol database
	Provide feedback to village forest patrol teams, coach and troubleshoot	Provide regular feedback to village forest patrol teams; print patrol reports (made available by PMU GIS expert) and share and discuss with WRCCs and village forest patrol teams
PMU	Extract relevant patrol data from Excel patrol database	Regularly extract data from to feed into the main integrated QGIS patrol database
	Convert .kml patrol tracklogs into GIS shapefiles	Regular conversion of raw .kml patrol tracklog data into GIS shapefiles. Through the assigned patrol IDs Excel data are associated with patrol tracklog shapefiles
	Run patrol reports	Run patrol reports (patrol summary and village reports) in regular time intervals and as needed
	Maintain oversight and coach DPMUs in database maintenance tasks	
	Make patrol reports available	Patrol reports are shared with the FD, DFO and DPMU
FD	Maintain oversight of patrol databases and patrol reporting	
	Use patrol reports for management decisions and follow up on violations and village forest patrolling	

1.4 Folder system – data storage

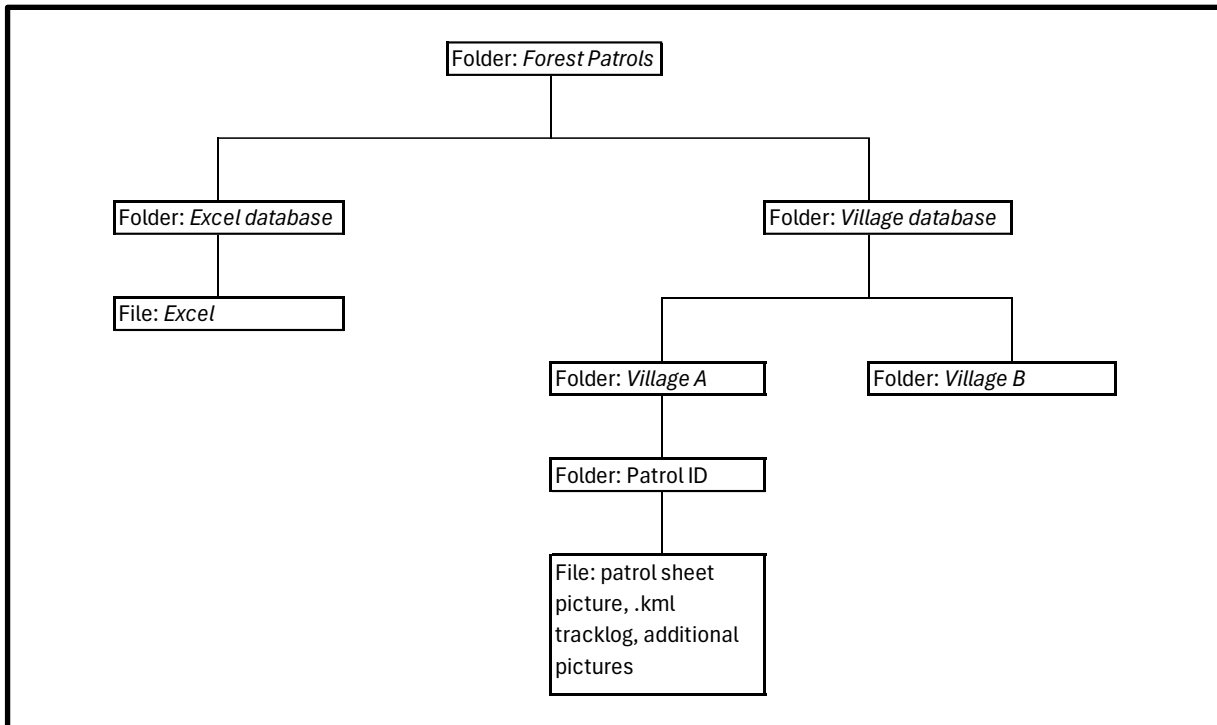
All raw patrol data shared by village forest patrol teams, processed by DPMU and PMU are stored systematically in an organized folder system. This is essential to keep patrol records orderly, maintain oversight, extract or synthesize data for analysis and reporting purposes.

Village patrol database DPMU: The folder system to store raw and processed patrol data follows this hierarchy (see below) and is stored on the DPMU Desktop computer as well as in the DPMU google drive shared with the PMU. The patrol folder is named the Patrol_ID as assigned to the

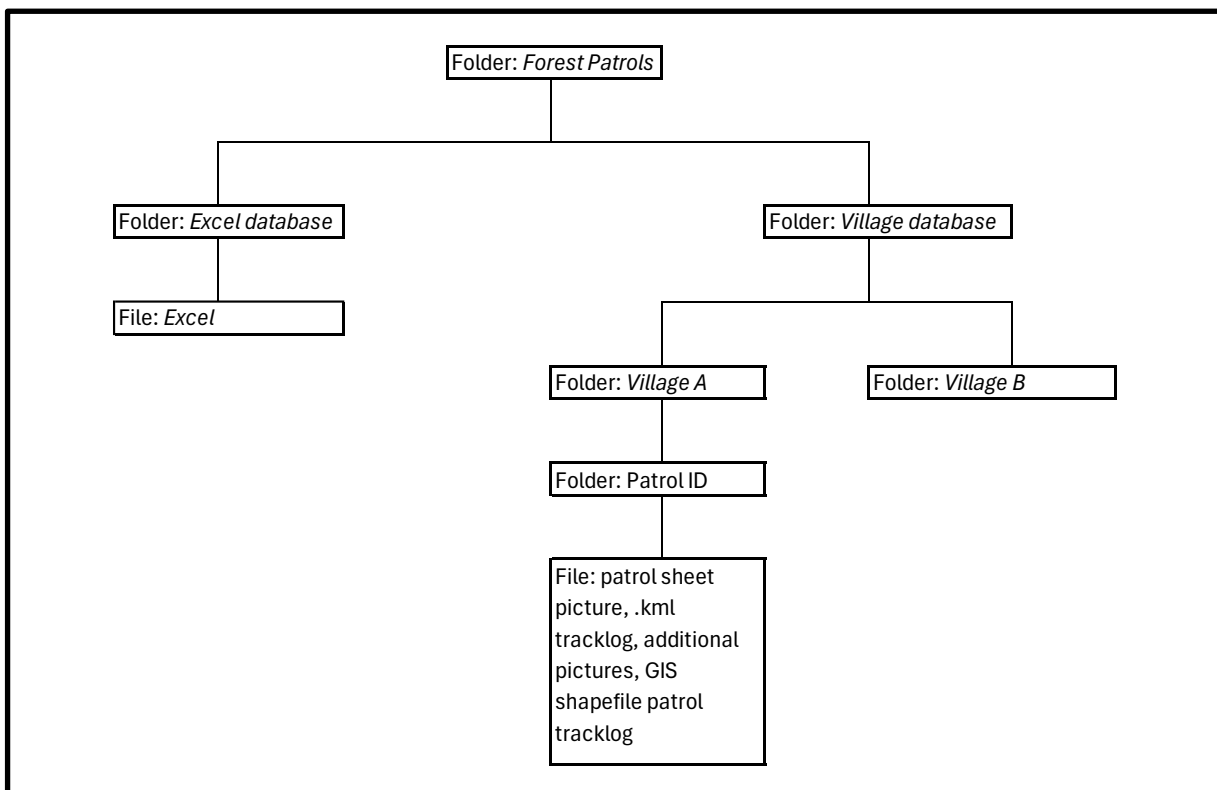
patrol by the DPMU following this format (also see Table 2):

Year_Quarter_MonthStartdate_Village.

The .kml patrol tracklog file allocated to the patrol folder as well as the patrol sheet picture also are named with the Patrol_ID (Year_Quarter_MonthStartdate_Village)



Village patrol database PMU: The PMU GIS specialist keeps this system and adds a GIS shapefile to all single patrol folders

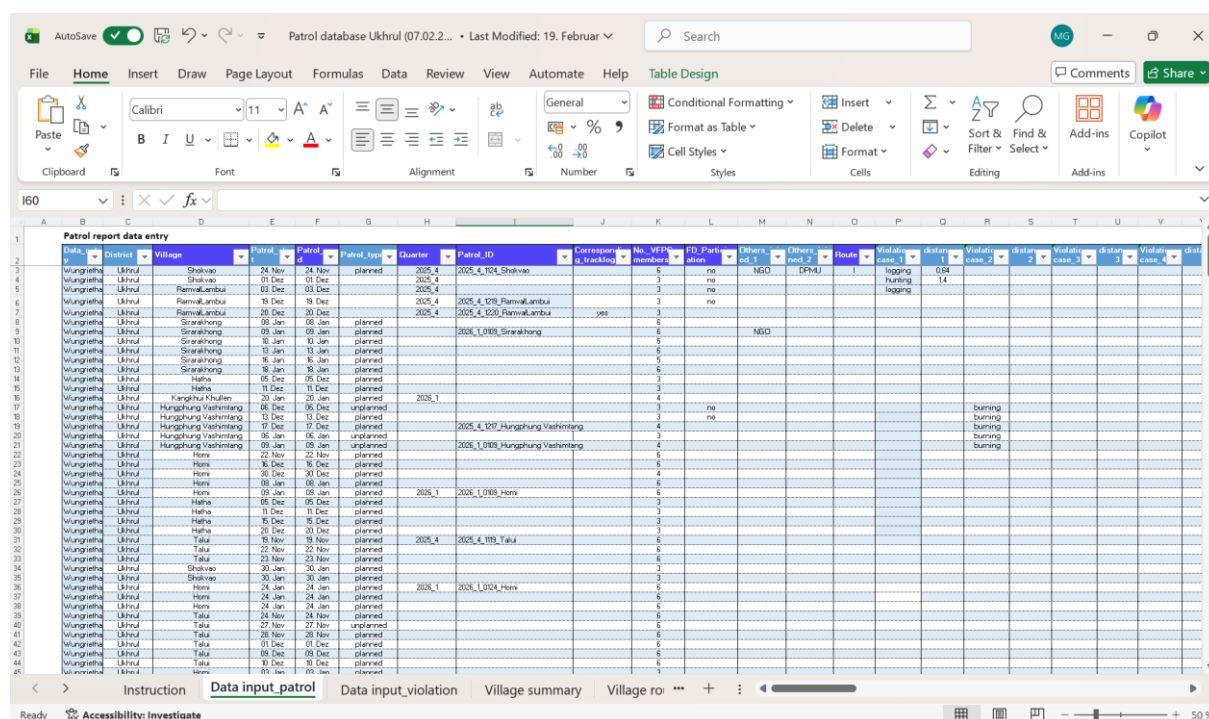


2 Field patrol data handling – DPMU

2.1 Outputs from village patrol teams

2.2 Patrol data transcription to Microsoft Excel

At the DPMU level, patrol sheet data from the village forest patrols are digitized in Excel through manual data entries. Two Excel spreadsheets are populated with data from the patrol sheets. The Excel spreadsheet “Data input_patrol” containing all main patrol metrics from the patrol sheets looks like this. Each row represents one patrol.



Some important notes on the columns to populate with data³:

Table 2 Columns in the Excel patrol data spreadsheets

Column	Description
Village	Standardized in a drop down menu, village name of patrol group
Quarter	Standardized in a drop down menu, Quarter in which patrol was conducted

³ Most of fit self-explanatory and trained with the DPMU

Patrol_ID	Bottleneck field and hence very important. The DPMU assigns a unique Patrol_ID to each conducted patrol. The Patrol_ID, as a unique marker, is used later to join Excel data to GIS shapefiles in QGIS and at PMU level. Format: Year_Quarter_MonthStartdate_Village The format and village name (including spelling) are standardized across the Excel database
Corresponding_tracklog	This is a yes or no field, and assigned a yes = when tracklog from patrol is available and a no = when tracklog from the patrol is not available
FD_Participation	This is a yes or no field, and assigned a yes = when FD staff participated in patrol and a no = when not
No_Violations	Number of violations detected during patrol, automatic sum from following columns
No_Logging	Number of logging observations detected during the patrol, manually filled in counts by DPMU
And so on	

The Excel spreadsheet “Data input_violation” containing all distinct violation records looks like this. Each row represents one violation.

Village	Quarter	Patrol_ID	Type_Violation	Violation_ID	Distance
Shokvao	2025_4	2025_4_1124_Shokvao	logging	2025_4_1217_Shokvao_1	0,64
Hungphung Vashimtang	2026_1	2026_1_0109_Hungphung Vashimtang	burning	2026_1_0109_Hungphung Vashimtang_1	
Shangching	2026_1	2026_1_0131_Shangching	burning	2026_1_0131_Shangching_1	
Shangching	2026_1	2026_1_0131_Shangching	grazing	2026_1_0131_Shangching_2	
Shangching	2026_1	2026_1_0131_Shangching	logging	2026_1_0131_Shangching_3	

Some important notes on the columns to populate with data.

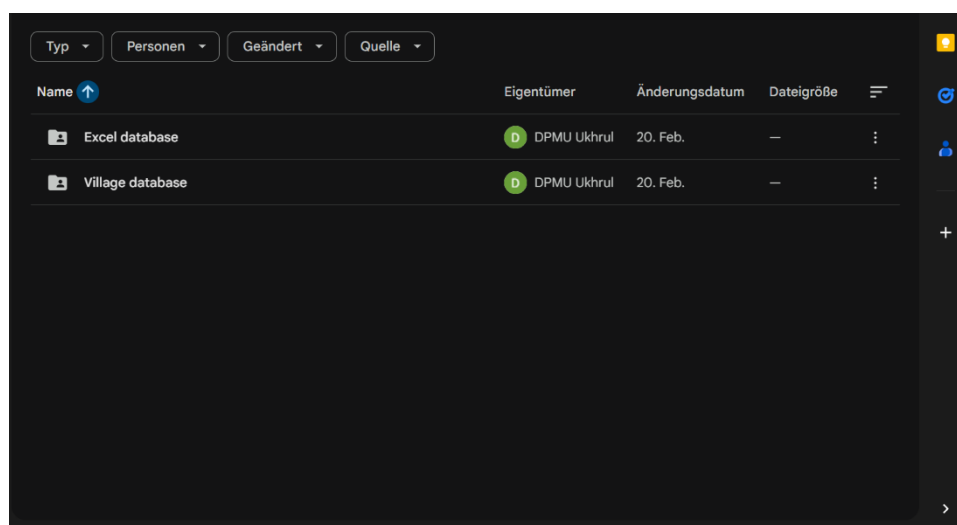
Column	Description
--------	-------------

Patrol_ID	This is the general Patrol_ID indicating on which patrol the violation was detected
Type_Violation	Relates to the categories to describe violations just like in the Data input_patrol spreadsheet (logging, burning, conversion, ...)
Violation_ID	Each violation is associated with a unique ID consisting of the Patrol_ID and a number Format: Year_Quarter_MonthStartdate_Village_CountViolation So when a logging observation was the first violation observation of a patrol then Year_Quarter_MonthStartdate_Village_1 When the patrol first found a burning (fire) observation and after that a logging observation, accordingly two violation observations on that patrol, so The burning is: Year_Quarter_MonthStartdate_Village_1 The logging is: Year_Quarter_MonthStartdate_Village_2
Distance	Is the recorded distance from start of the patrol tracklog, as indicated by the village forest patrol team in the patrol sheet

2.3 Data sharing

The folder system to store raw and processed patrol data follows this hierarchy (see below) and is stored on the DPMU Desktop computer as well as in the DPMU google drive shared with the PMU.

The google drive folder follows the exact same structure as the DPMU patrol folder system and single patrols are added in regular time intervals (weekly) to the google drive folder and on demand by PMU. See below for folder hierarchy as presented



Typ	Personen	Geändert	Quelle	
Name	Eigentümer	Änderungsdatum	Dateigröße	
Choithar	ukhruldpmu	20. Feb.	—	
Hatha	ukhruldpmu	20. Feb.	—	
Hoomi	ukhruldpmu	20. Feb.	—	
Hungpung Centre	ukhruldpmu	20. Feb.	—	
Hungpung Khapai Rashon	ukhruldpmu	20. Feb.	—	
Hungpung Vashimtang	ukhruldpmu	20. Feb.	—	
Khangkhui Khullen	ukhruldpmu	20. Feb.	—	
Khangkhui Khunou	ukhruldpmu	22. Feb.	—	
Lamlang	ukhruldpmu	20. Feb.	—	

Typ	Personen	Geändert	Quelle	
Name	Eigentümer	Änderungsdatum	Dateigröße	
2025_4_1120_Sirarakhong	chongtham k...	22. Feb.	—	
2025_4_1209_Sirarakhong	chongtham k...	22. Feb.	—	
2025_4_1210_Sirarakhong	chongtham k...	22. Feb.	—	
2025_4_1213_Sirarakhong	chongtham k...	22. Feb.	—	
2025_4_1216_Sirarakhong	chongtham k...	22. Feb.	—	
2025_4_1218_Sirarakhong	chongtham k...	22. Feb.	—	
2026_1_0109_Sirarakhong	chongtham k...	22. Feb.	—	
2026_1_0127_Sirarakhong	chongtham k...	22. Feb.	—	
2026_1_0129_Sirarakhong	chongtham k...	22. Feb.	—	

Typ	Personen	Geändert	Quelle	
Name	Eigentümer	Änderungsdatum	Dateigröße	
2025_4_1209_Sirarakhong.jpeg	chongtham k...	29. Jan.	293 KB	
2025_4_1209_Sirarakhong.kml	chongtham k...	29. Jan.	18 KB	

3 QGIS database and reporting environment

All patrol data are centralized in a comprehensive QGIS patrol database for analysis and reporting. All patrol data are to be processed where necessary and stored in this database at the

PMU level. All basic analytical work to populate the reports are produced in this QGIS⁴ set up. The following sections describe database features, reporting templates and procedures in QGIS.

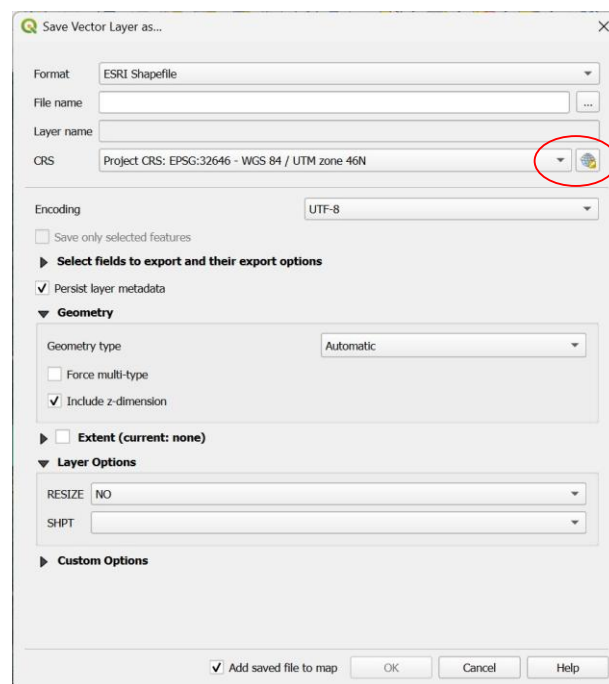
3.1 Database – Basemap

The GIS database (in QGIS termed Map project) base map typically contains:

Item, shapefile, layer	Description
FAC + RAC COSFOM shapefiles	A merged shapefile containing all FAC and RAC area polygon shapefiles Projection of when loading shapes to map project is EPSG:32646 - WGS 84 / UTM zone 46N
COSFOM Villages	A merged shapefile containing all COSFOM village pointfiles
Google satellite	A google satellite raster layer showing land cover
Rivers	Optional – line file
Roads	Optional – line file

The basemap should have a CRS EPSG:32646 - WGS 84 / UTM zone 46N.

In order to do so start QGIS and load your FAC/ RAC shapefile (a single shapefile), and then export the shapefile selecting the CRS EPSG:32646 - WGS 84 / UTM zone 46N. See red circle when you right click the shapefile and export.

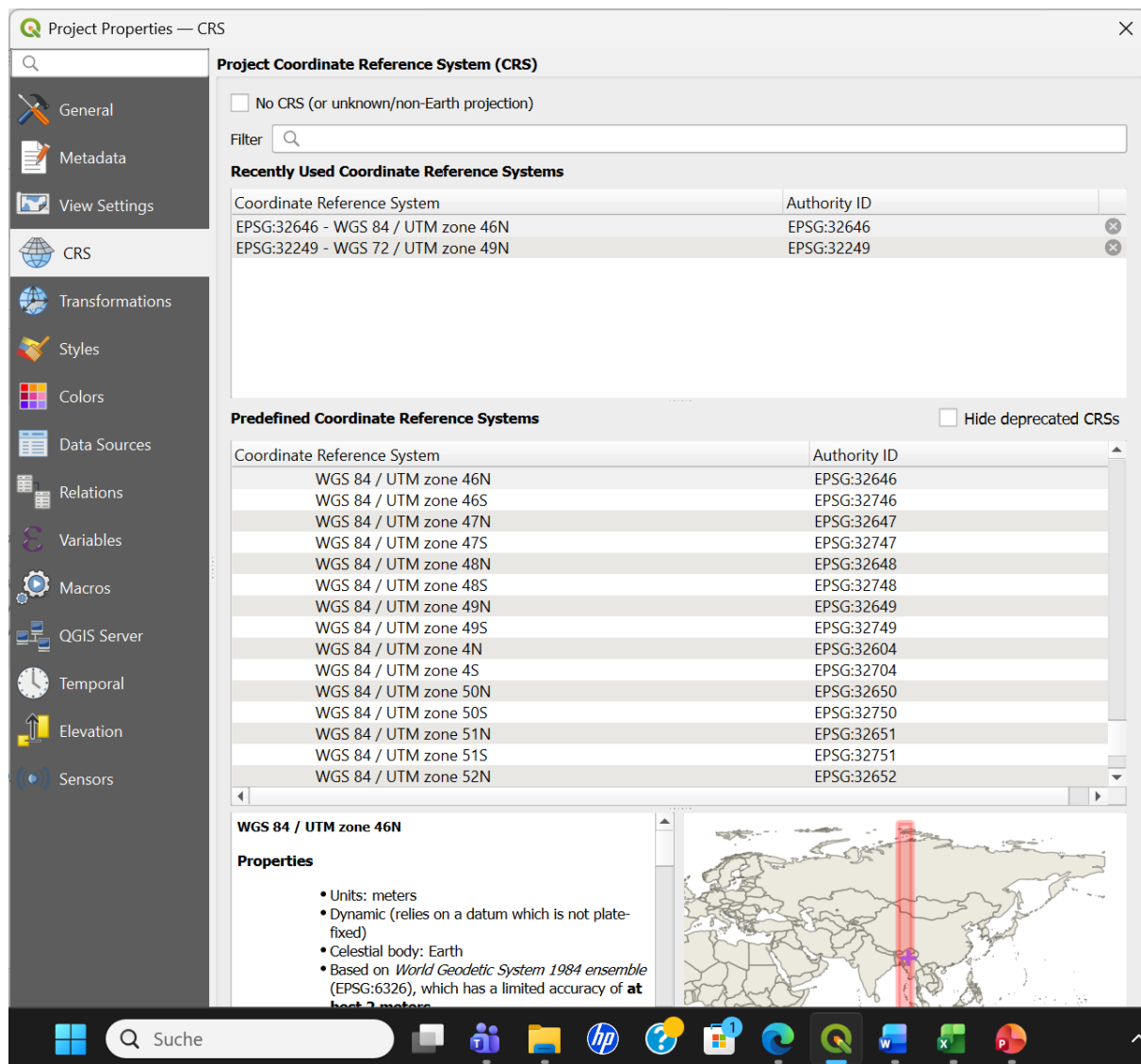


The start a blank QGIS map project – which will then serve as the QGIS patrol database- and load the shapefile you just exported (to a location of your choice in your folder system) and then the project CRS should be EPSG:32646 - WGS 84 / UTM zone 46N automatically.

Double check in your Project (one of the tabs at the top of your open QGIS map project) and

⁴ Open source GIS software installed on PMU GIS specialist laptop

select properties, then ---- > CRS



3.2 Reporting templates

There are two reporting templates. Both templates are populated with QGIS outputs

Quarterly summary report⁵:

⁵ Time frames can be customized. This is a general summary report on developments across all (COSFOM) villages in the Ukhul district



Quarterly Patrol Report

Ukhrul District – COSFOM

>Quarter<	>Date range<	Location
>Prepared by<	>Date of submission<	

FAC/ RAC	Community patrols	Ukhrul
----------	-------------------	--------

Patrol effort	
Number of patrols	>Inset table< (aggregates)
Number of man days	
Patrols by village	>Inset graph< (plotly bar graph)

Patrol effort	
Patrol coverage	>Inset map (map line density)

Violations	
Number of violations	>Inset table< (aggregates)
Number of violators	
Number of logging	
Number of hunting	
Number of fire	
Number of conversion	
Number of other	
Number of violations	>Inset graph< (plotly bar graph)

Violations	
Violation distribution	>Inset map< (density)

Violations	
Violation picture 1	
Violation picture 2	
Violation picture 3	

Violations	
Violation follow up WRCC level	>Descriptive paragraph with 3-4 sentences on violation dealing and follow up<
Violation follow up Forest Department level	>Descriptive paragraph with 3-4 sentences on violation dealing and follow up<
Violation follow up Forest Department level	Reference to any official letter issued concerning follow up on reported violation cases

Summary	
Summary (optional)	>Small text summarizing patrol effort and violations (+follow up)<



Village Patrol Report

Ukhrul District – COSFOM

>Quarter/ Year/ Month<	>Date range<	Location
>Prepared by<	>Date of submission<	

FAC/ RAC	>Village name<	Community patrols
----------	----------------	-------------------

Patrol effort	
Number of patrols	>Inset table< (aggregates)
Number of man days	
Patrols	>pie chart planned/ unplanned< (plotly bar graph)

Patrol effort	
Patrol coverage in village FACs/ RACs	>Inset map (map line density)

Violations	
Number of violations	>Inset table< (aggregates)
Number of violators	
Number of logging	
Number of hunting	
Number of fire	
Number of conversion	
Number of other	

Number of violations	>Inset pie chart<
Number of violations (comparison other villages)	>Inset graph< (bar graph)

Violations	
Violation distribution	>Inset map< (density// points)
Violation distribution	>Inset map< (color tracklogs by violation count)

Violations	
Violation picture 1	
Violation picture 2	
Violation picture 3	

Violations	
Violation follow up WRCC level	>Descriptive paragraph with 3-4 sentences on violation dealing and follow up<
Violation follow up Forest Department level	>Descriptive paragraph with 3-4 sentences on violation dealing and follow up<
Violation follow up Forest Department level	Reference to any official letter issued concerning follow up on reported violation cases

Summary	
Summary	>Small text summarizing patrol effort and violations (+follow up)<

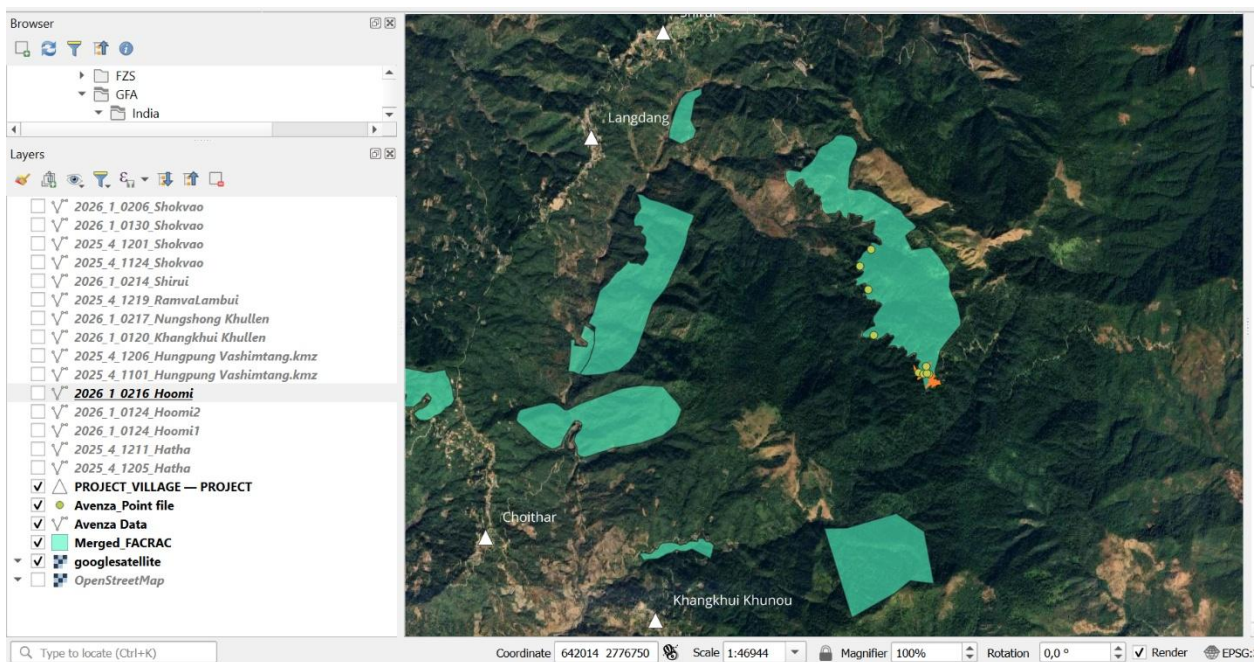
4 Data procedures in QGIS

4.1 Processing Patrol Tracklogs

The patrol tracklogs (.kml raw patrol tracklogs from the patrols) for a specific reporting time frame are extracted from the google drive folder system and loaded into the QGIS patrol database. One can simply drag the patrols from the folders into the QGIS map interface.

This to be done until all patrols in .kml format are loaded to the QGIS map project. See below example with .kml patrols loaded into the QGIS patrol database (map project) with base map containing basic raster and shapefiles, including google satellite, FAC and RAC area polygons

and the COSFOM villages (point file).



Once this is done, all patrol .kml tracklogs can be merged into a single shapefile (which will contain all patrols as features (rows) in the attribute table).

Use the Vector tab⁶ ----> Data Management Tools ----> Merge Vector Layers

Then select all the .kml patrol files you intend to merge, see below red circle

Then define Destination CRS and select the project CRS which should be WGS 84/ UTM Zone 46 N



⁶ In the top menu with all wizards in QGIS

The click run ---- >



Then right click on the merged file, containing all your tracklogs. Open attribute table and check if all patrols are there.

Merged_Patrols — Features Total: 37, Filtered: 37, Selected: 0

id	name	description	timestamp	begin	end	altitudeMo	tessellate	extrude	visibility	drawOrder	icon	layer	path
1	ng Hu...	patrol route II	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1101_H...	C:/Users/graef/...
2	Mali...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1119_Ta...	C:/Users/graef/...
3	Mali...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1122_Ta...	C:/Users/graef/...
4	Mali...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1122_Ta...	C:/Users/graef/...
5	AC	Eco Tourism For...	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1124_S...	C:/Users/graef/...
6	m F A...	Forest petroling...	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1124_S...	C:/Users/graef/...
7	hatha...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1205_H...	C:/Users/graef/...
8	ng Hu...	patrol route I	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1206_H...	C:/Users/graef/...
9	road ...	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1209_Si...	C:/Users/graef/...
10	road...	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1210_Si...	C:/Users/graef/...
11	fac	forest patrolling	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1211_H...	C:/Users/graef/...
12	roa...	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1213_Si...	C:/Users/graef/...
13	d 2,3	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1216_Si...	C:/Users/graef/...
14	rou...	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1218_Si...	C:/Users/graef/...
15	l	RAMVA=FAC (r...	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2025_4_1219_R...	C:/Users/graef/...
16	hout...	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2026_1_0109_Si...	C:/Users/graef/...
17	olling ...	Route 4	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2026_1_0120_K...	C:/Users/graef/...
18	ute 1 ...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2026_1_0124_H...	C:/Users/graef/...
19	ute 2 ...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2026_1_0124_H...	C:/Users/graef/...
20	ig 50 ...	route 2,4	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2026_1_0127_Si...	C:/Users/graef/...
21	ig fac ...	route 1,4	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	2026_1_0129_Si...	C:/Users/graef/...

Show All Features

The column with the header layer contains all Patrol_IDs

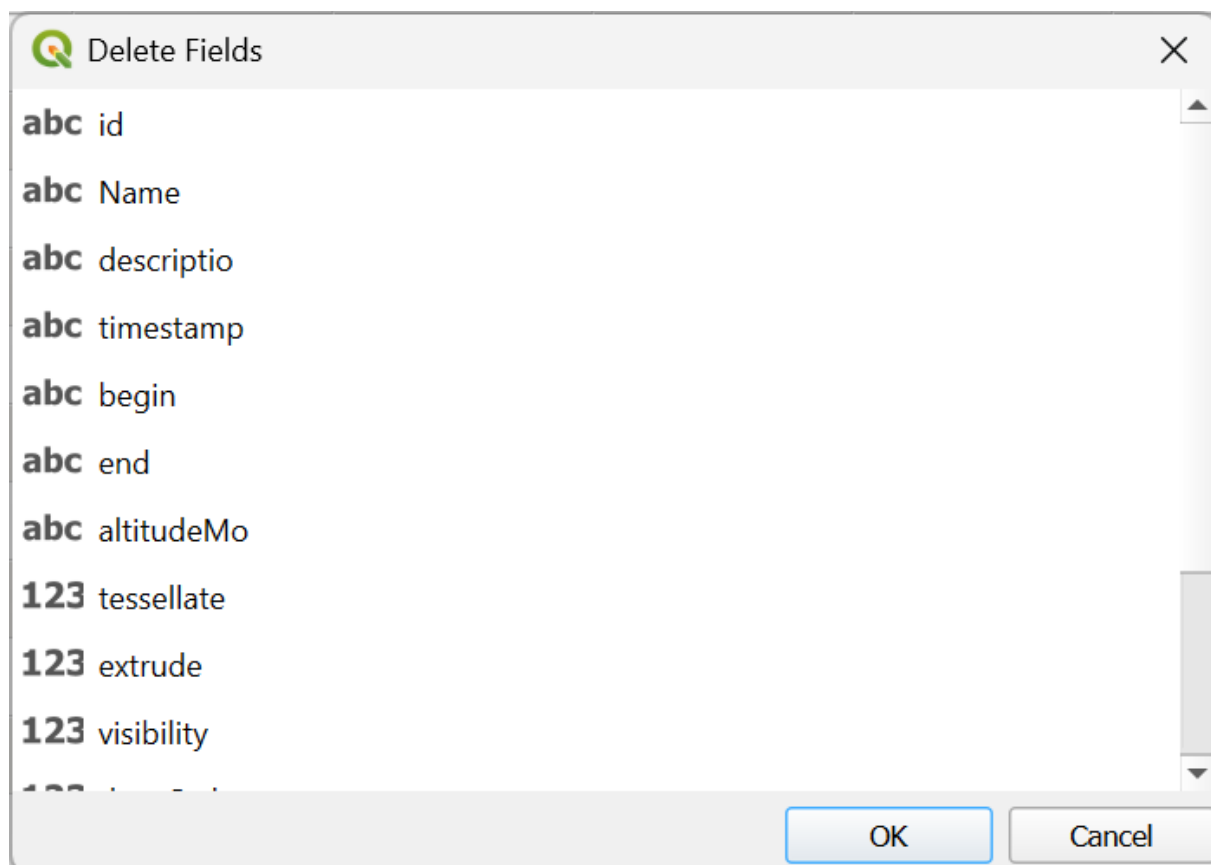
In a next step, toggle the editing mode (the pen top left, red circle) and select “delete field” (orange circle)

Merged_Patrols — Features Total: 37, Filtered: 37, Selected: 0

ne	descriptio	timestamp	begin	end	altitudeMo	tessellate	extrude	visibility	drawOrder	icon	layer	path
1	g Hu...	patrol route II	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
2	Mali...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
3	Mali...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
4	Mali...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
5	-AC	Eco Tourism For...	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
6	m F A...	Forest petroli...	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
7	hatha...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
8	g Hu...	patrol route I	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
9	road ...	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
10	road...	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
11	f ac	forest patrolling	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
12	ic roa...	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
13	d 2,3	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
14	out...	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
15	I	RAMVA=FAC (r...	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
16	hout...	sirarakhong	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
17	olling ...	Route 4	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
18	ute 1 ...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
19	ute 2 ...	NULL	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...
20	g 50 ...	route 2,4	NULL	NULL	NULL	NULL	-1	0	-1	NULL	NULL	C:/Users/graef/...

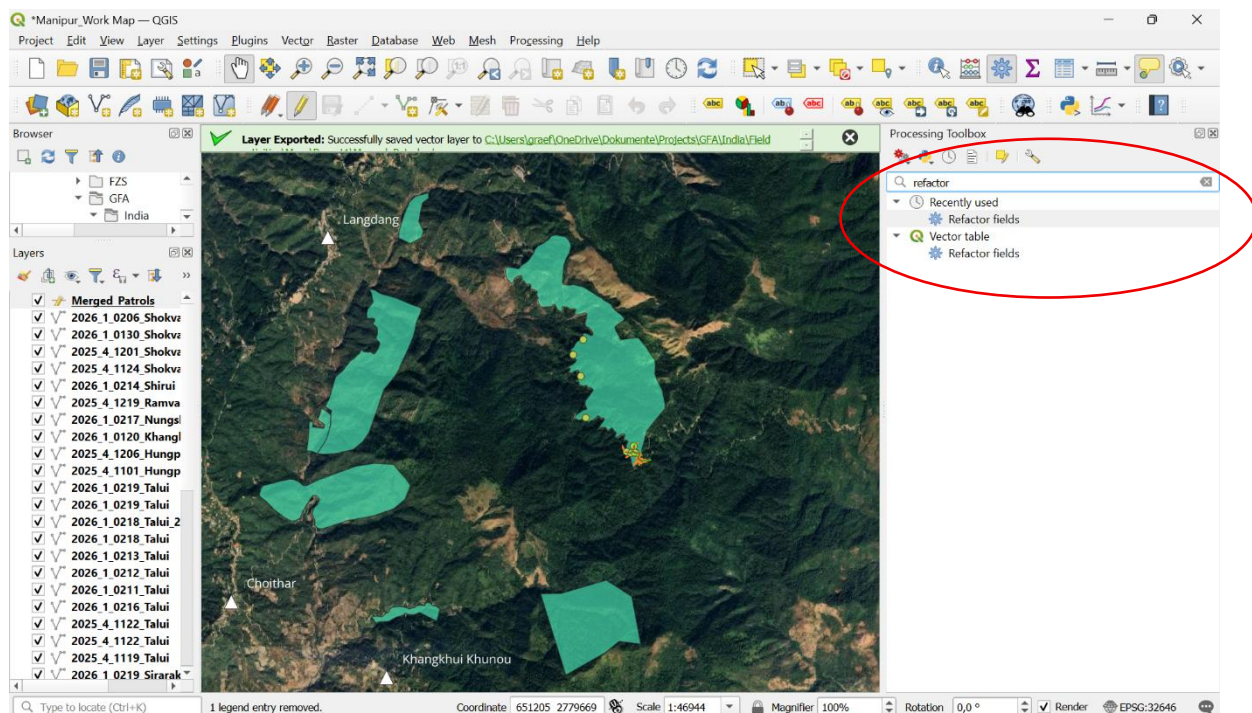
Show All Features

Keep name, description, layer and path but delete ALL other fields, you will not need them



The click save (layer), and untoggle the mode

Once this is done search the “Refactor fields” function/ command in your processing toolbox

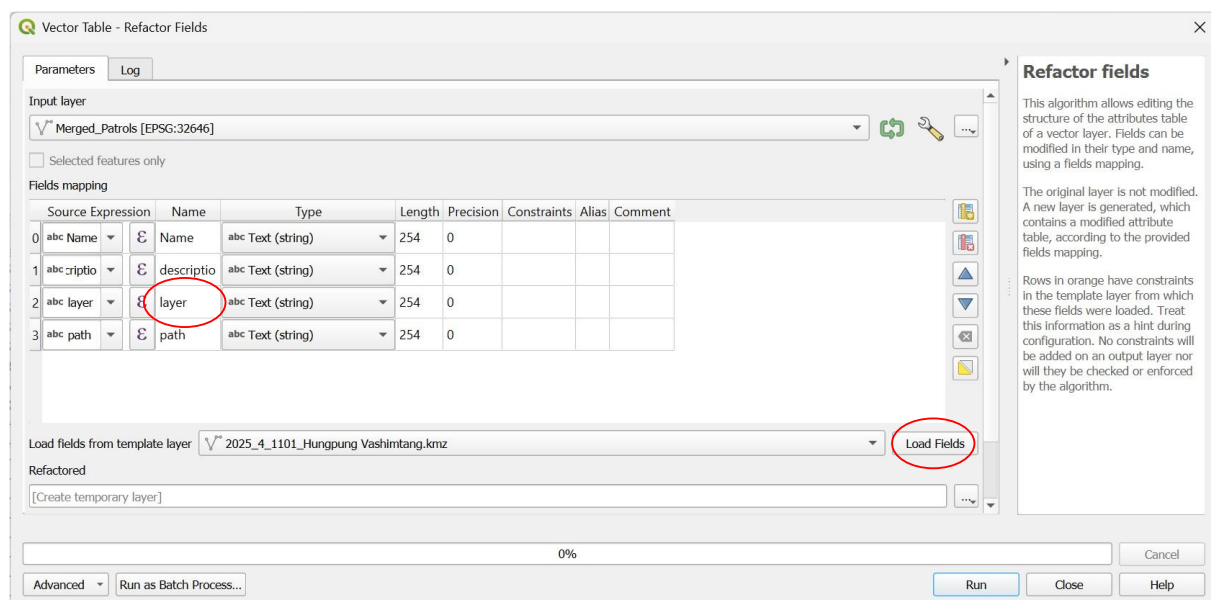


Double click on “Refactor fields”

It will look like this

Rename the layer column (upper red circle) to “Patrol_ID”. Make sure the spelling is like this and identical to the column name in Excel. Spelling is ALWAYS Patrol_ID.

Click load fields (bottom red circle) and select empty (at the top of selection options), then click run at the bottom.



Now open the refactored output file and check the headings of the four columns, Patrol_ID should have replaced “header”.

Refactored — Features Total: 37, Filtered: 37, Selected: 0

	Name	descriptio	Patrol_ID	path
1	Vashimtang Hu...	patrol route II	2025_4_1101_H...	C:/Users/graef/...
2	Talui F-AC Mali...	NULL	2025_4_1119_Ta...	C:/Users/graef/...
3	Talui F-AC Mali...	NULL	2025_4_1122_Ta...	C:/Users/graef/...
4	Talui F-AC Mali...	NULL	2025_4_1122_Ta...	C:/Users/graef/...
5	Shokvao F-AC	Eco Tourism For...	2025_4_1124_S...	C:/Users/graef/...
6	ecotourism F A...	Forest petroling...	2025_4_1201_S...	C:/Users/graef/...
7	patrolling hatha...	NULL	2025_4_1205_H...	C:/Users/graef/...
8	Vashimtang Hu...	patrol route I	2025_4_1206_H...	C:/Users/graef/...
9	Patrolling road ...	sirarakhong	2025_4_1209_Si...	C:/Users/graef/...
10	fac 50 hac road...	sirarakhong	2025_4_1210_Si...	C:/Users/graef/...
11	khaikong f ac	forest patrolling	2025_4_1211_H...	C:/Users/graef/...
12	fac 50_ hac roa...	sirarakhong	2025_4_1213_Si...	C:/Users/graef/...
13	fac 50 road 2,3	sirarakhong	2025_4_1216_Si...	C:/Users/graef/...
14	fac 50 hac rout...	sirarakhong	2025_4_1218_Si...	C:/Users/graef/...
15	ROUTE=III	RAMVA=FAC (r...	2025_4_1219_R...	C:/Users/graef/...
16	fac 50 hac hout...	sirarakhong	2026_1_0109_Si...	C:/Users/graef/...
17	F-AC patrolling ...	Route 4	2026_1_0120_K...	C:/Users/graef/...
18	Hoomi Route 1 ...	NULL	2026_1_0124_H...	C:/Users/graef/...
19	Hoomi Route 2 ...	NULL	2026_1_0124_H...	C:/Users/graef/...
20	sirarakhong 50 ...	route 2,4	2026_1_0127_Si...	C:/Users/graef/...
21	sirarakhong fac ...	route 1,4	2026_1_0129_Si...	C:/Users/graef/...
22	Eco-tourism sh	Forest patrol du	2026_1_0130 S...	C:/Users/graef/...

Show All Features

Once this I done, please **export** and **save** the refactored shapefile in the location of your choice. The shapefile is now ready for a join with the patrol sheet data saved in the Excel file.

4.2 Processing patrol Excel Data

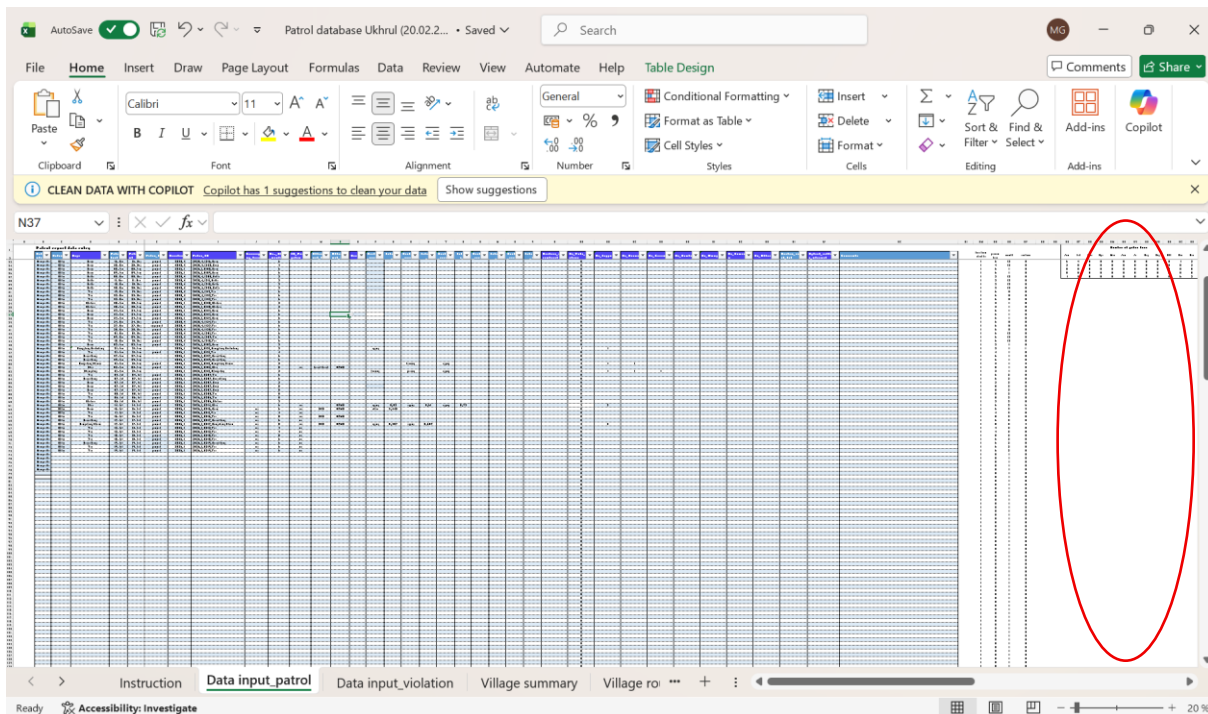
Download the Excel file containing all the patrol sheet data that you need for your analysis

You copy all the data and columns from the sheet that you need for your analysis, from the Data input_patrol sheet

Note that this includes the standardized data columns only and not the tables further on the right of the Patrol data_input sheet

Make sure that the first row are the headers of the columns (Patrol_ID, Village, and so on) and that there is no blank columns.

See below red circle marking columns that you do not copy into the empty Excel file.



Then paste your data columns into a new

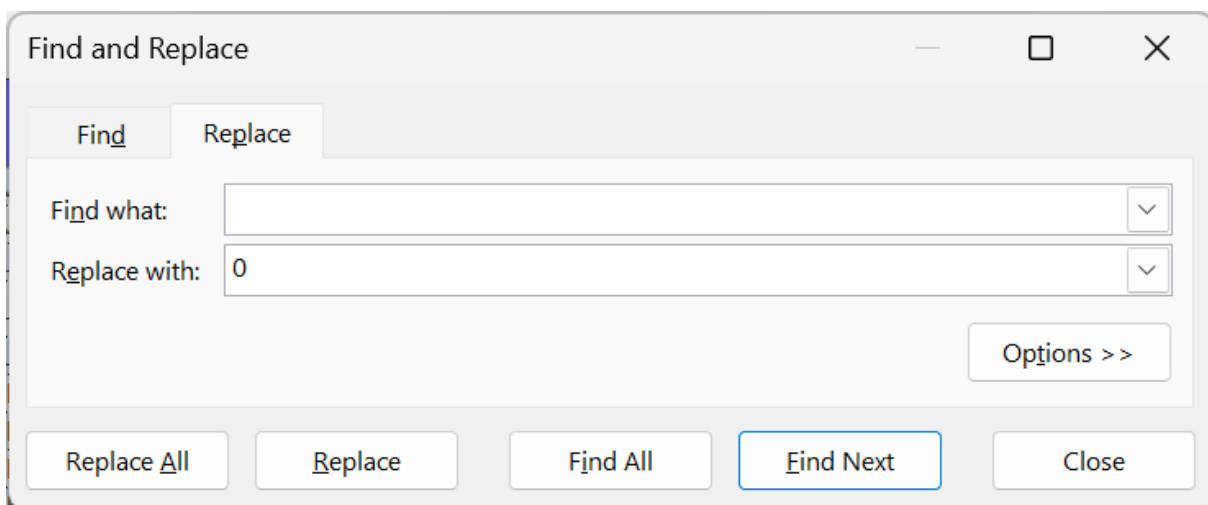
Do the same for the **Data input_violation spreadsheet** --- > paste it into a new Excel document containing only these data

Save both documents as a **CSV** file. Double check that all the patrol IDs are assigned properly and match with your attribute table (the refactored patrol tracklog shapefile) --- > see previous section.

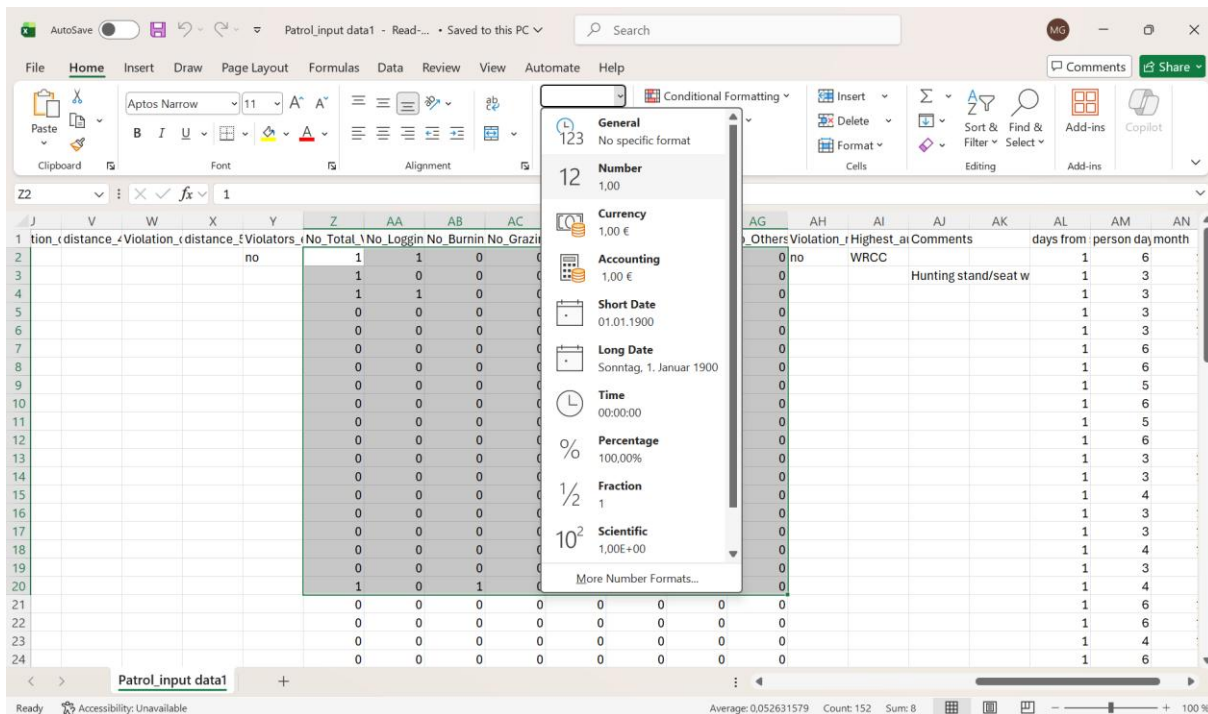
THEN: In order to ensure smooth refactor commands in QGIS

In your CSV file select all numeric fields (not the corresponding headers) and run click Control + F

And replace blanks with Zeros (Replace all) --- > check your excel file this worked



Then select all your fields with numbers and format them as number --- > like this



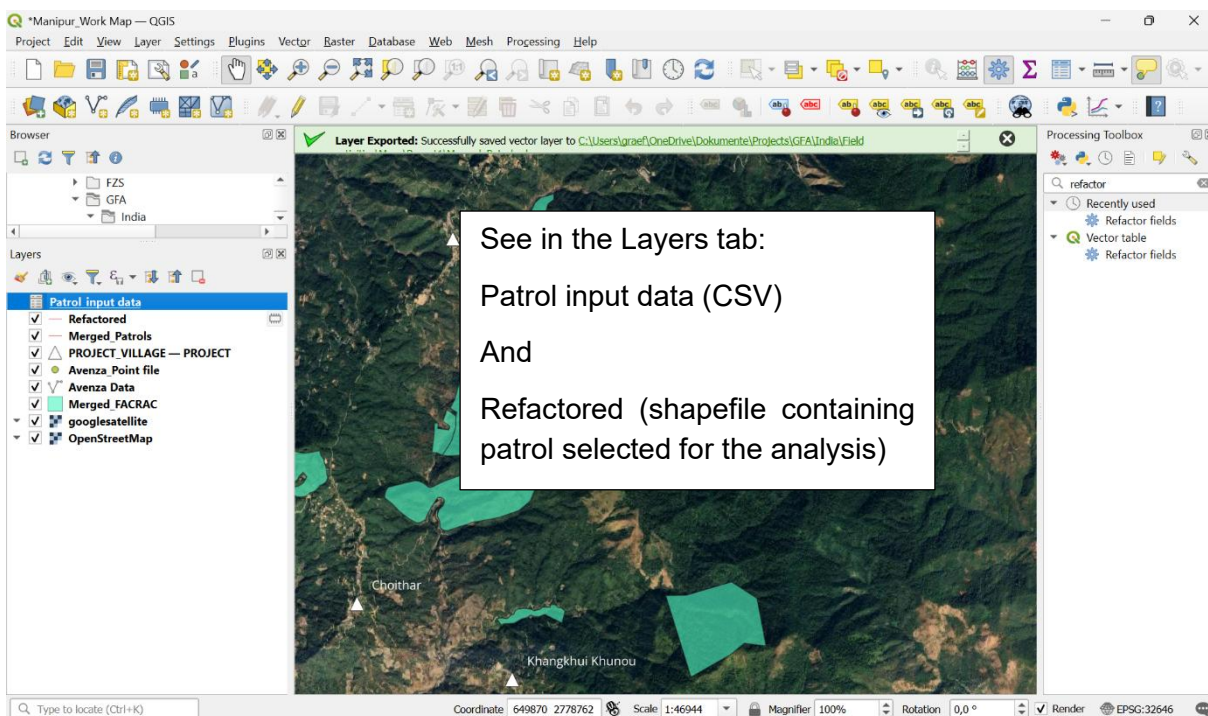
Once you are sure that the formatting is correct, you can move ahead and save your CSV. It is now ready for join with the patrol tracklog shapefile in QGIS.

4.3 Join: Excel data to Patrol tracklogs

This is a central task in order to prepare for any analysis and reporting in QGIS

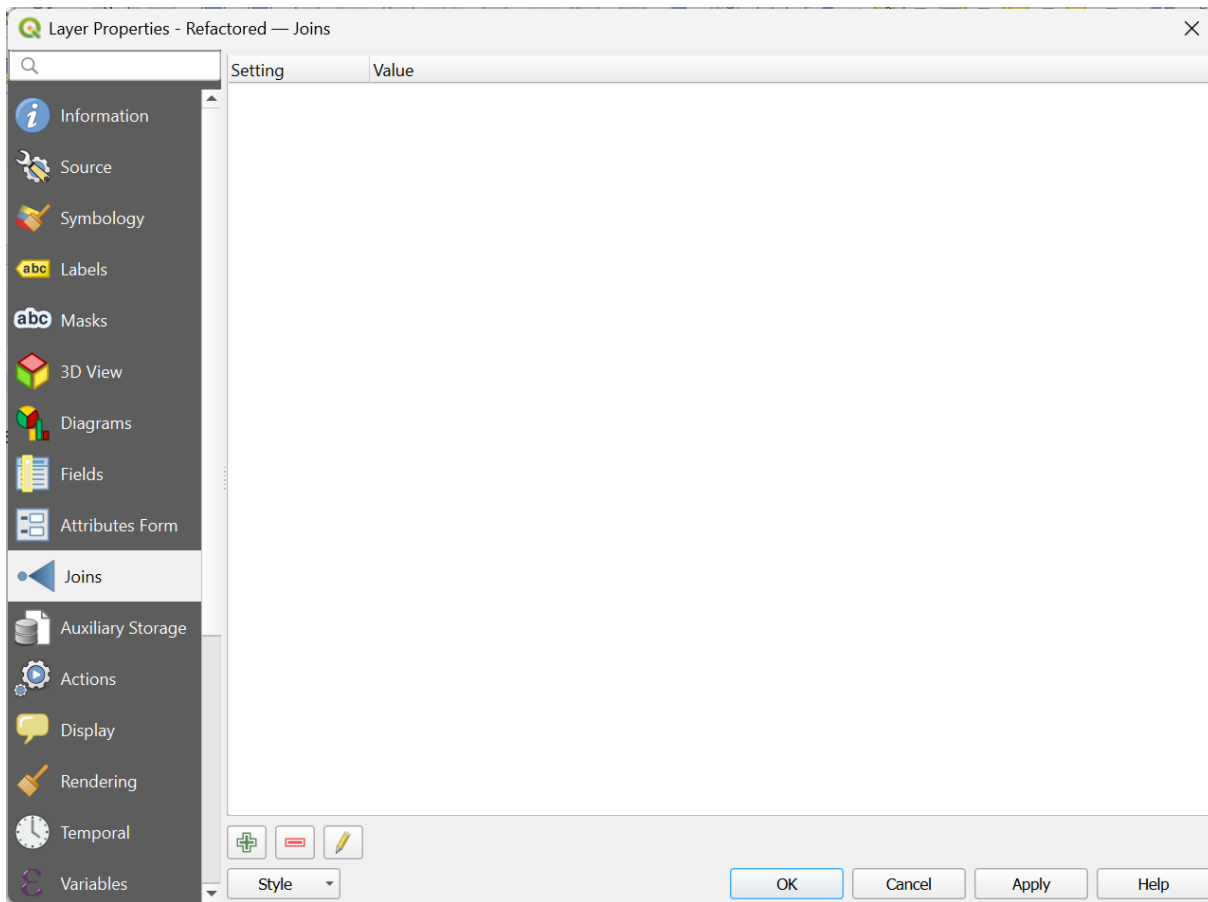
Have your QGIS patrol database open. Make sure your merged and refactored tracklog shapefile is in place

Then drag your CSV file containing the Data input_patrol into the QGIS map project, subsequently it should look like this:



Once this is done you right click the Refactored shapefile ---- > select properties ----- > and click on “Joins” in the tab menu on the left once the shapefile is open.

This is what you see:



The click on the green “plus” symbol at the bottom

See below is what you’ll select:

Select Join layer: your CSV file

Select Join field: Patrol_ID

Select: Target field Patrol_ID

----- > this is to ensure that for all data assigned to Patrol_ID (rows) in the Excel file are joined with all the tracklogs according to Patrol_ID in the tracklog shapefile attribute table

Add Vector Join

Join layer: **Patrol_input data**

Join field: **abc Patrol_ID**

Target field: **abc Patrol_ID**

☒ Cache join layer in memory

☐ Create attribute index on join field

☐ Dynamic form

☐ Editable join layer

☒ **Joined fields**

☐ Data_entry

☐ District

☐ Village

☐ Patrol_start

☐ Patrol_end

☐ Patrol_type

☐ Quarter

☐ Patrol_ID

☐ Corresponding_tracklog

☐ No_VFPG_members

☐ FD_Participation

☐ Others joined 1

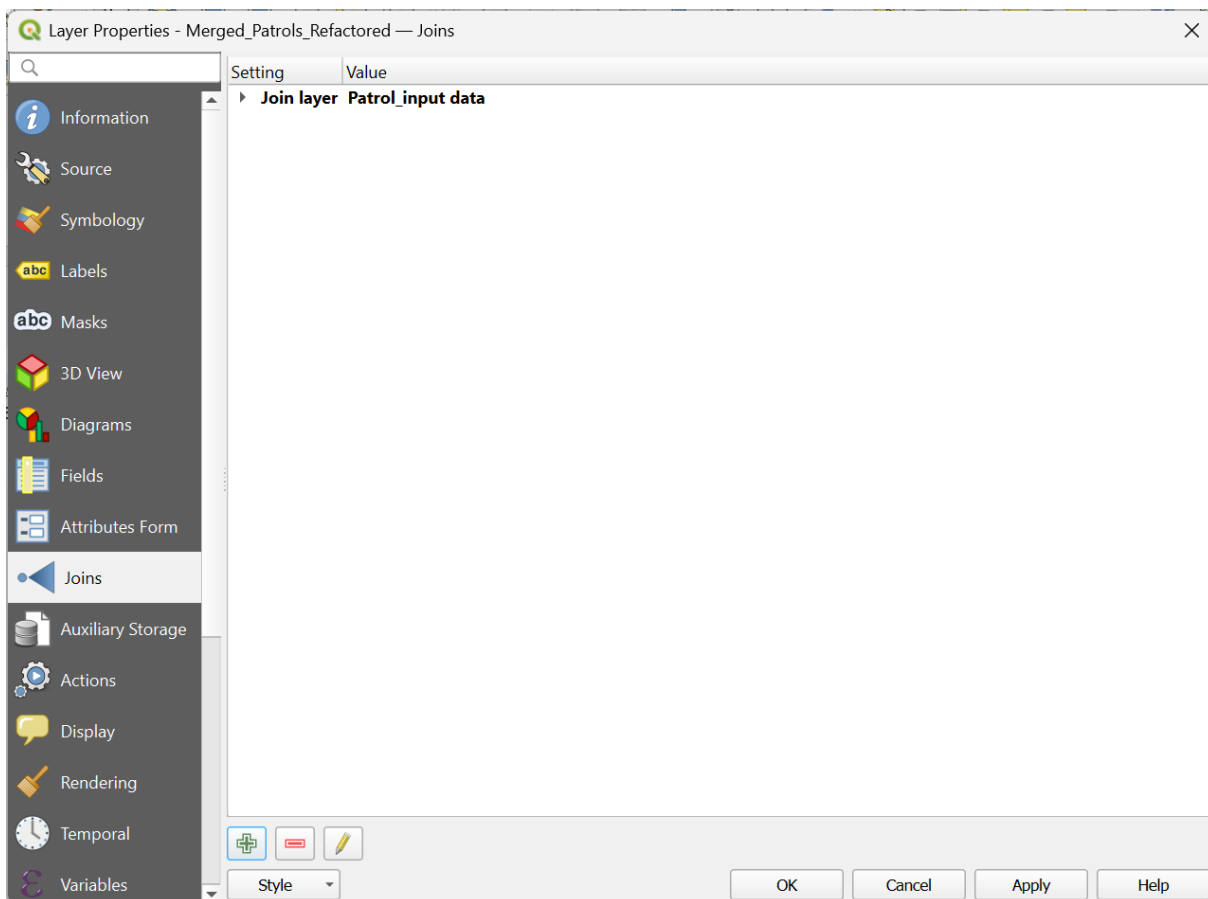
☐ Custom field name prefix

In Joined fields you select all the data fields that you wish to join and have in your attribute table for analysis

OK **Cancel** **Help**

Once you did that, click OK

The in the following set up click Apply and then OK



Open your attribute table of your patrol tracklog shapefile and assess whether all data have been merged, the table will look like this

Merged_Patrols_Refactored — Features Total: 37, Filtered: 37, Selected: 0

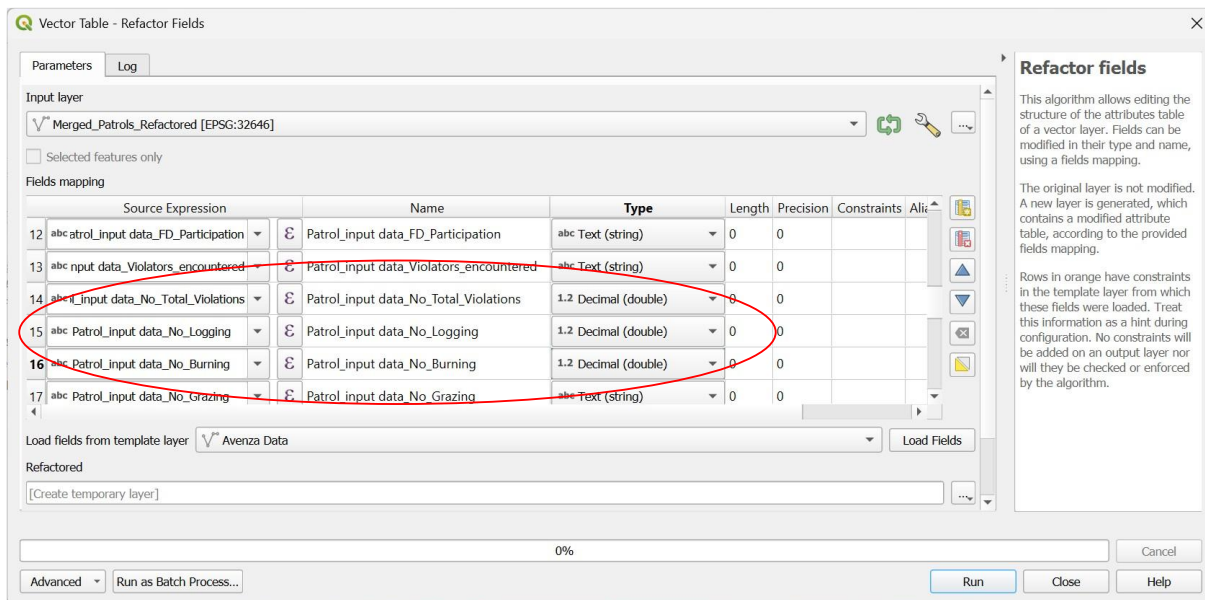
	descriptio	Patrol_ID	path	I_input_data_Data	I_input_data_Dis	I_input_data_Vill	I_input_data_Patrol	I_input_data_Que	I_input_data_Patrol	data_Correspondi	ut data_No_VFPG	input data_FD_Part	t dat
1	patrol route II	2025_4_1101_H...	C:/Users/graef/...	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NUL
2	NULL	2025_4_1119_Ta...	C:/Users/graef/...	Wungrietha	Ukhrul	Talui	planned	2025_4	2025_4_1119_Ta...	6			
3	NULL	2025_4_1122_Ta...	C:/Users/graef/...	Wungrietha	Ukhrul	Talui	planned	2025_4	2025_4_1122_Ta...	6			
4	NULL	2025_4_1122_Ta...	C:/Users/graef/...	Wungrietha	Ukhrul	Talui	planned	2025_4	2025_4_1122_Ta...	6			
5	Eco Tourism For...	2025_4_1124_S...	C:/Users/graef/...	Wungrietha	Ukhrul	Shokvao	planned	2025_4	2025_4_1124_S...	6	no	no	
6	A... Forest petroli...	2025_4_1201_S...	C:/Users/graef/...	Wungrietha	Ukhrul	Shokvao		2025_4	2025_4_1201_S...	3	no		
7	ia... NULL	2025_4_1205_H...	C:/Users/graef/...	Wungrietha	Ukhrul	Hatha	planned	2025_4	2025_4_1205_H...	3			
8	patrol route I	2025_4_1206_H...	C:/Users/graef/...	Wungrietha	Ukhrul	Hungpung Vas...	unplanned	2025_4	2025_4_1206_H...	3	no		
9	sirarakhong	2025_4_1209_Si...	C:/Users/graef/...	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NUL
10	d... sirarakhong	2025_4_1210_Si...	C:/Users/graef/...	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NUL
11	forest patrolling	2025_4_1211_H...	C:/Users/graef/...	Wungrietha	Ukhrul	Hatha	planned	2025_4	2025_4_1211_H...	3			
12	sirarakhong	2025_4_1213_Si...	C:/Users/graef/...	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NUL
13	sirarakhong	2025_4_1216_Si...	C:/Users/graef/...	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NUL
14	sirarakhong	2025_4_1218_Si...	C:/Users/graef/...	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NUL
15	RAMVA=FAC (r...	2025_4_1219_R...	C:/Users/graef/...	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NUL
16	sirarakhong	2026_1_0109_Si...	C:/Users/graef/...	Wungrietha	Ukhrul	Sirarakhong	planned	2026_1	2026_1_0109_Si...	6			
17	Route 4	2026_1_0120_K...	C:/Users/graef/...	Wungrietha	Ukhrul	Khangkhui Khul...	planned	2026_1	2026_1_0120_K...	4			
18	NULL	2026_1_0124_H...	C:/Users/graef/...	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NUL
19	NULL	2026_1_0124_H...	C:/Users/graef/...	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NUL
20	route 2,4	2026_1_0127_Si...	C:/Users/graef/...	Wungrietha	Ukhrul	Sirarakhong		2026_1	2026_1_0127_Si...	6			
21	route 1,4	2026_1_0129_Si...	C:/Users/graef/...	Wungrietha	Ukhrul	Sirarakhong		2026_1	2026_1_0129_Si...	6			

Show All Features

----- > note that empty rows mean that you do have a tracklog with a patrol ID for that but no associated patrol ID with corresponding data in the Excel database

Then open the refactor command in the toolbox again

Set all numeric fields (counts etc) in your attribute table to decimal double (see red circle) or any other number format. Study your Excel file in case of doubt what the numeric/ count fields are



After investigation of the merge and joins has been performed move on.

4.4 Generating violation point data

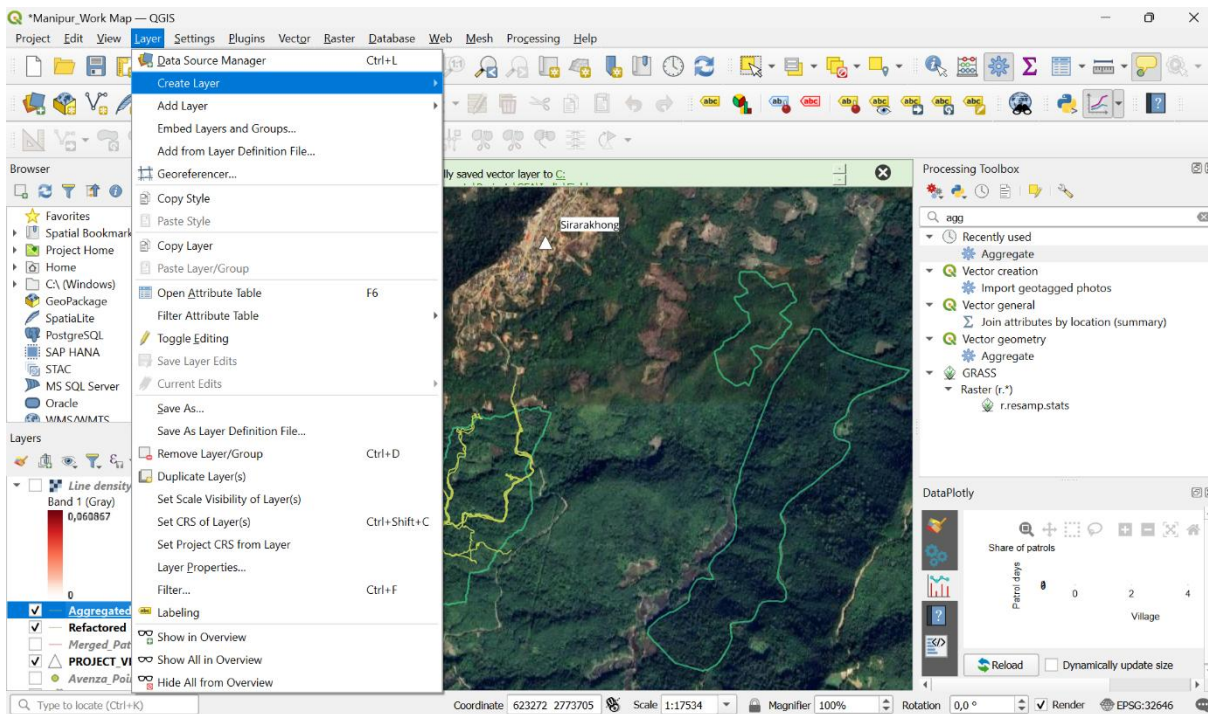
The raw data from patrols do not feature geo-referenced waypoints for violation observations (unlike the patrol tracklog).

The patrol sheet provides written information and a reference of distance of violation observation location to patrol start.

Generate waypoints of the reported violations as approximations directly in QGIS

For this, open the Excel sheet “Data input_violation” and investigate the data. Each violation from each of the patrols has a single ID. Investigate the distances are available.

In a next step open your QGIS map project/ patrol database and then click on your Layer tab and ----- > Create layer ----- >



Choose the selection where you intend to save the point file in the folder where you store all data/ outputs relevant for this report. (See below)

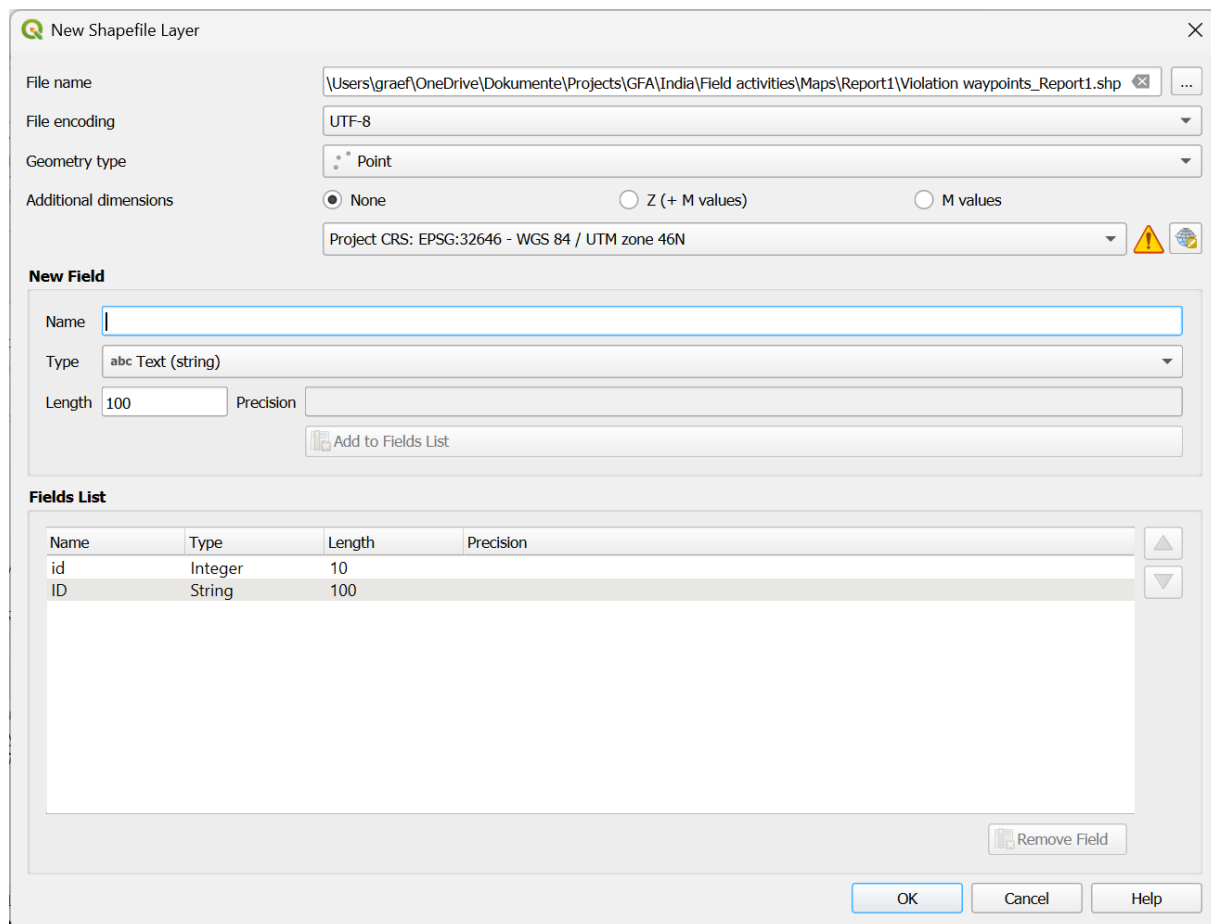
Select Geometry type: Point

Set the CRS: EPSG:32646 WGS 84/ UTM zone 46 N – The project CRS

Add a field (Text) labelling it ID. (Later you will have to refactor the field to Violation_ID to match the Violation_ID field in the “Data input_violation” sheet.

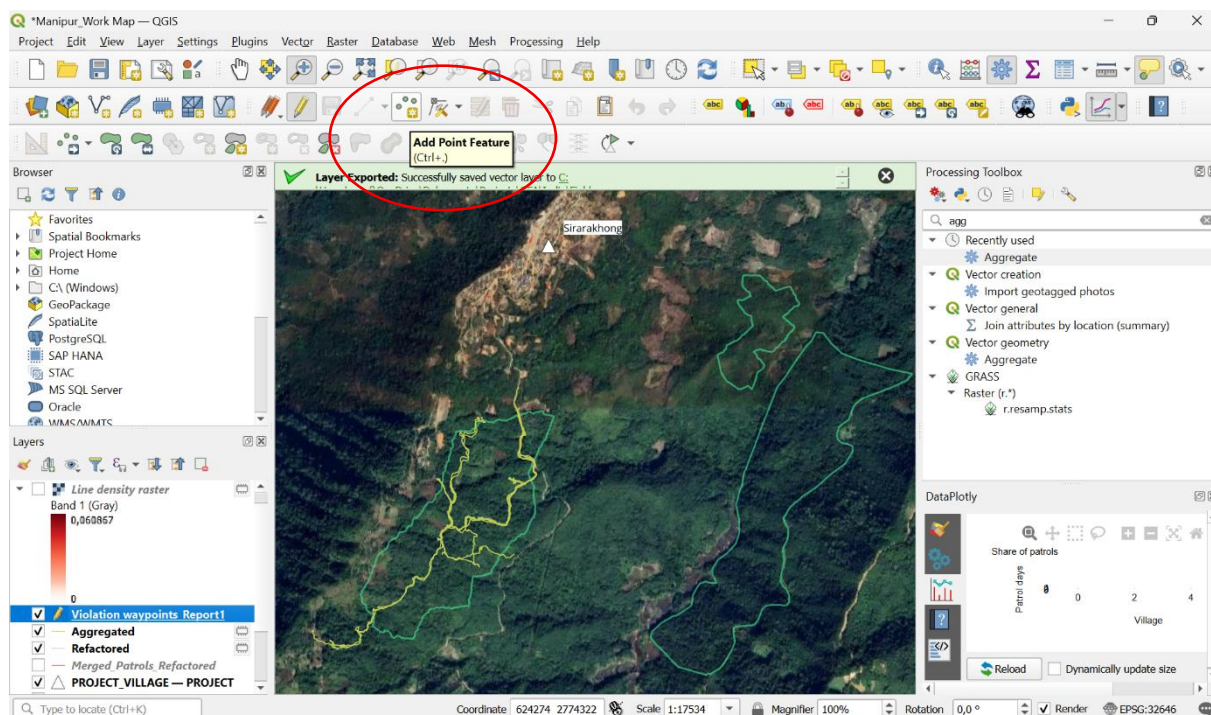
Then click OK

Now you generated the shapefile



Now right click on the point file in your layer panel on the left and toggle editing.

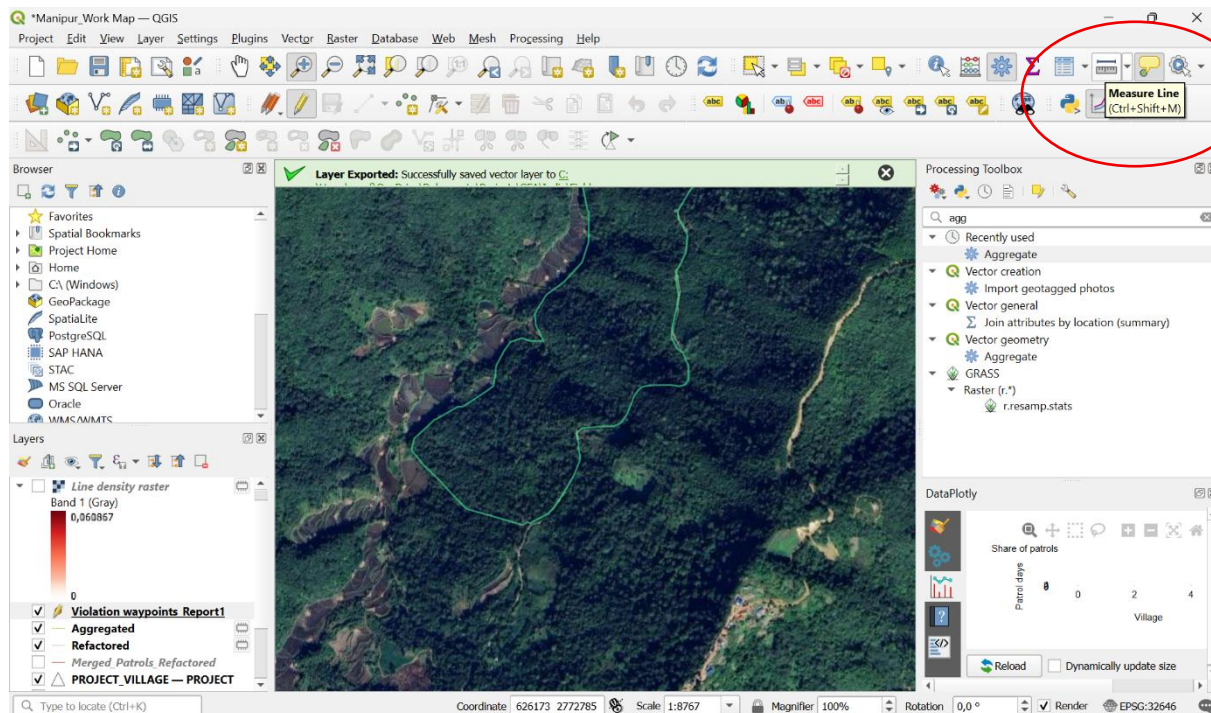
Then click on the point icon (see below) to add waypoints to the layer



Then add all points and assign the Violation_ID by copying – pasting from the Data input_violation

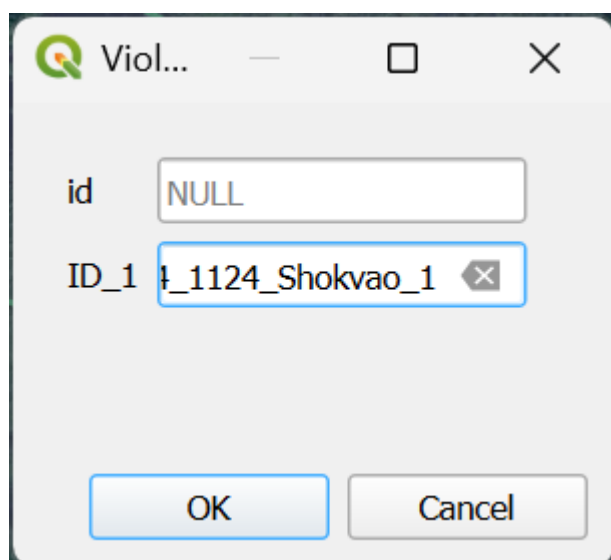
sheet.

You select the locations for the points by using a distance approximation (top right in the map project set up you have a Measure line



Or an educated guess. Identify the patrol tracklogs in your open map project – all violations are coded according to tracklogs. Then generate the points for all the waypoints in your Data input_violations list, and the points that are relevant for the period of analysis.

Create the points



Save your file

Then extract the violation data from your spreadsheet and copy to a new Excel file that will contain only this spreadsheet, then save as CSV.

It will look somewhat like this

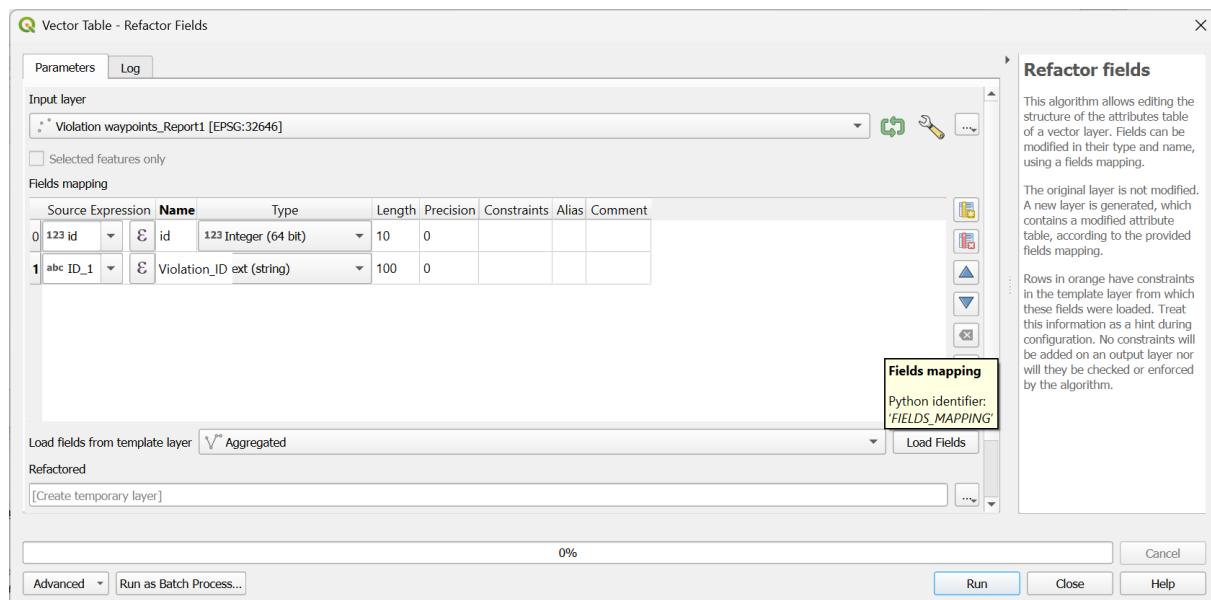
	A	B	C	D	E	F
	Village	Quarter	Patrol_ID	Type_Violation	Violation_ID	Distance
2	Shokvao	2025_4	2025_4_11	logging	2025_4_11	0,64
3	Shokvao	2025_4	2025_4_12	hunting	2025_4_1201_Shokvao_1	
4	Ramva/Lai	2025_4	2025_4_12	logging	2025_4_1203_Ramva/Lambui_1	
5	Hungphun	2025_4	2025_4_12	burning	2025_4_1206_Hungphun Vashimtang_1	
6	Hungphun	2025_4	2025_4_12	burning	2025_4_1213_Hungphun Vashimtang_1	
7	Hungphun	2025_4	2025_4_12	burning	2025_4_1217_Hungphun Vashimtang_1	
8	Hungphun	2025_4	2025_4_01	burning	2025_4_0106_Hungphun Vashimtang_1	
9	Hungphun	2026_1	2026_1_01	burning	2026_1_0109_Hungphun Vashimtang_1	
10	Hungphun	2026_1	2026_1_01	logging	2026_1_0131_Hungphun Vashimtang_1	
11	Nungshon	2026_1	2026_1_01	burning	2026_1_0131_Nungshong khunou_1	
12	Nungshon	2026_1	2026_1_01	logging	2026_1_0131_Nungshong khunou_2	
13	Shangchin	2026_1	2026_1_01	burning	2026_1_0131_Shangching_1	
14	Shangchin	2026_1	2026_1_01	grazing	2026_1_0131_Shangching_2	
15	Shangchin	2026_1	2026_1_01	logging	2026_1_0131_Shangching_3	
16	Shirui	2026_1	2026_1_02	logging	2026_1_0214_Shirui_1	
17	Shirui	2026_1	2026_1_02	logging	2026_1_0214_Shirui_2	
18	Shirui	2026_1	2026_1_02	logging	2026_1_0214_Shirui_3	
19	Nungshon	2026_1	2026_1_02	logging	2026_1_0217_Nungshong Khullen_1	
20	Nungshon	2026_1	2026_1_02	logging	2026_1_0217_Nungshong Khullen_2	

Then you can move ahead with the join

4.5 Join: Excel data to Patrol observation points

First open the refactor tool in your toolbox and open your violations pointfile. Rename the ID_1 to Violation_ID so that the column label matches the Violation_ID column header in the Excel sheet.

---- > then click run



Then export the refactored shapefile (right click on the layer and export) to the location where you save your data/ materials for this report using the project projection.

Then drag your CSV file containing the violations into your map project/ QGIS patrol database

Next is you right click on your exported violation pointfile and click ---- > properties --- > Joins

The select the Join layer: your CSV file containing the violations

Join field: Violation_ID

Target field: Violation_ID

And select the fields you intend to join, most importantly the violation type

The click OK

Add Vector Join

Join layer: Violation_input data

Join field: abc Violation_ID

Target field: abc Violation_ID

☒ Cache join layer in memory

☐ Create attribute index on join field

☐ Dynamic form

☐ Editable join layer

☒ Joined fields

- ☐ Village
- ☐ Quarter
- ☐ Patrol_ID
- ☒ Type_Violation
- ☐ Violation_ID
- ☒ Distance

☐ Custom field name prefix

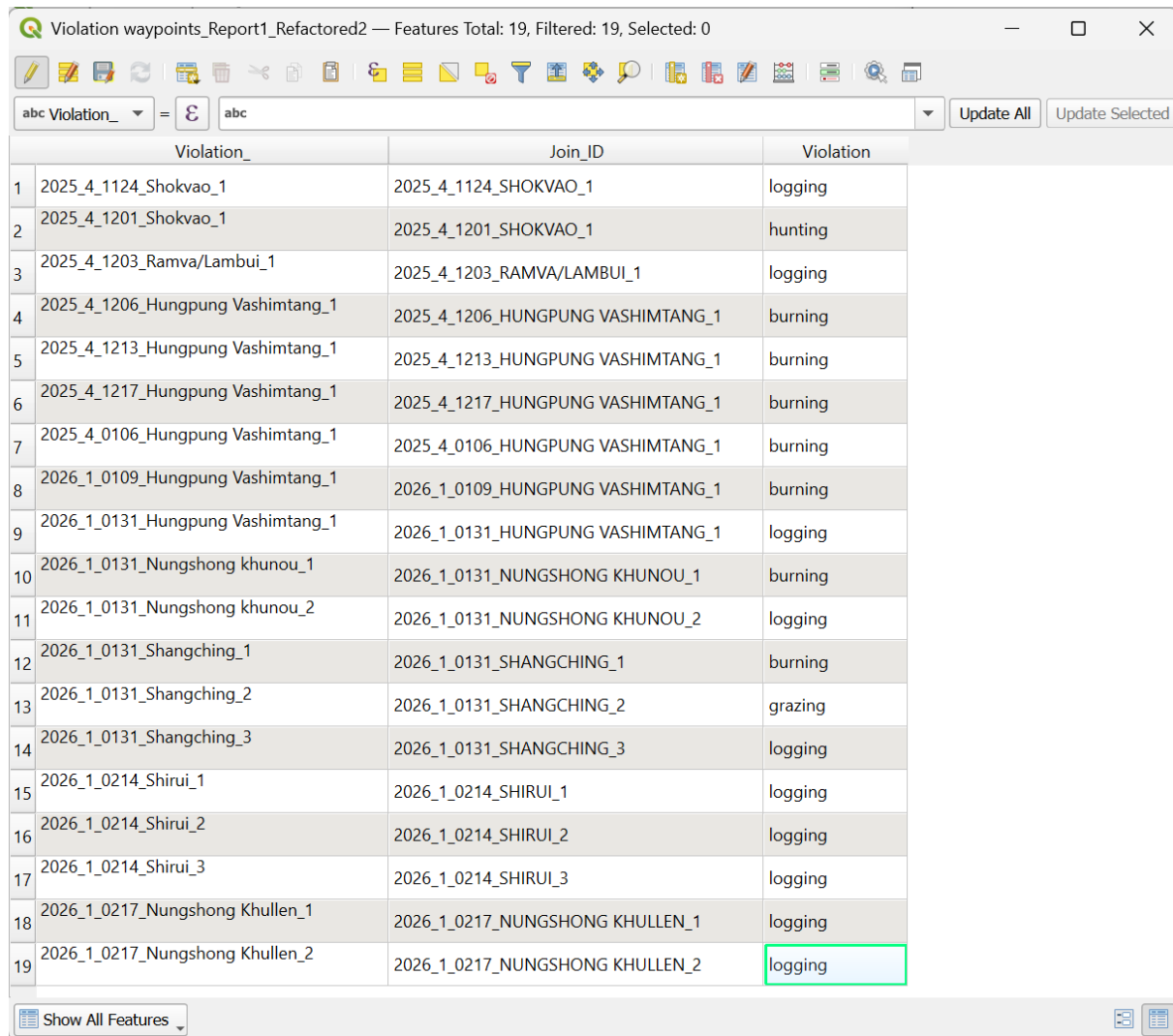
OK Cancel Help

Once finished your attribute table of your pointfile will look like this

This is Option 1

Option 2 is to generate a Violation field directly in QGIS and attribute the violation category to the field, which might as well be quicker if not dealing with a large dataset

This exercise = 30 seconds, see below attribute table output



	Violation_	Join_ID	Violation
1	2025_4_1124_Shokvao_1	2025_4_1124_SHOKVAO_1	logging
2	2025_4_1201_Shokvao_1	2025_4_1201_SHOKVAO_1	hunting
3	2025_4_1203_Ramva/Lambui_1	2025_4_1203_RAMVA/LAMBUI_1	logging
4	2025_4_1206_Hungpung Vashimtang_1	2025_4_1206_HUNGPUK VASHIMTANG_1	burning
5	2025_4_1213_Hungpung Vashimtang_1	2025_4_1213_HUNGPUK VASHIMTANG_1	burning
6	2025_4_1217_Hungpung Vashimtang_1	2025_4_1217_HUNGPUK VASHIMTANG_1	burning
7	2025_4_0106_Hungpung Vashimtang_1	2025_4_0106_HUNGPUK VASHIMTANG_1	burning
8	2026_1_0109_Hungpung Vashimtang_1	2026_1_0109_HUNGPUK VASHIMTANG_1	burning
9	2026_1_0131_Hungpung Vashimtang_1	2026_1_0131_HUNGPUK VASHIMTANG_1	logging
10	2026_1_0131_Nungshong khunou_1	2026_1_0131_NUNGSHONG KHUNOU_1	burning
11	2026_1_0131_Nungshong khunou_2	2026_1_0131_NUNGSHONG KHUNOU_2	logging
12	2026_1_0131_Shangching_1	2026_1_0131_SHANGCHING_1	burning
13	2026_1_0131_Shangching_2	2026_1_0131_SHANGCHING_2	grazing
14	2026_1_0131_Shangching_3	2026_1_0131_SHANGCHING_3	logging
15	2026_1_0214_Shirui_1	2026_1_0214_SHIRUI_1	logging
16	2026_1_0214_Shirui_2	2026_1_0214_SHIRUI_2	logging
17	2026_1_0214_Shirui_3	2026_1_0214_SHIRUI_3	logging
18	2026_1_0217_Nungshong Khullen_1	2026_1_0217_NUNGSHONG KHULLEN_1	logging
19	2026_1_0217_Nungshong Khullen_2	2026_1_0217_NUNGSHONG KHULLEN_2	logging

DONE

5 Analysis in QGIS

The following sections describe steps in basic analysis of patrol effort and violation cases. Follow the reporting templates.

5.1 Patrol effort

Have a look at the reporting template first and specifically at the sections that treat patrol effort, this is the summary report

Patrol effort	
Number of patrols	>Inset table< (aggregates)

Number of man days	
Patrols by village	>Inset graph< (plotly bar graph)

Patrol effort	
Patrol coverage	>Inset map (map line density)

And this is the village report

Patrol effort	
Number of patrols	>Inset table< (aggregates)
Number of man days	
Patrols	>pie chart planned/ unplanned< (plotly bar graph)

Patrol effort	
Patrol coverage in village FACs/ RACs	>Inset map (map line density)

---- > See marked in Green what you wish to produce with QGIS

Summary report aggregate table showing number of patrols and number of man days per village. This can be shown in a single bar graph with two data categories, or alternatively, depending on ease of visual interpretation separated into two different graphs

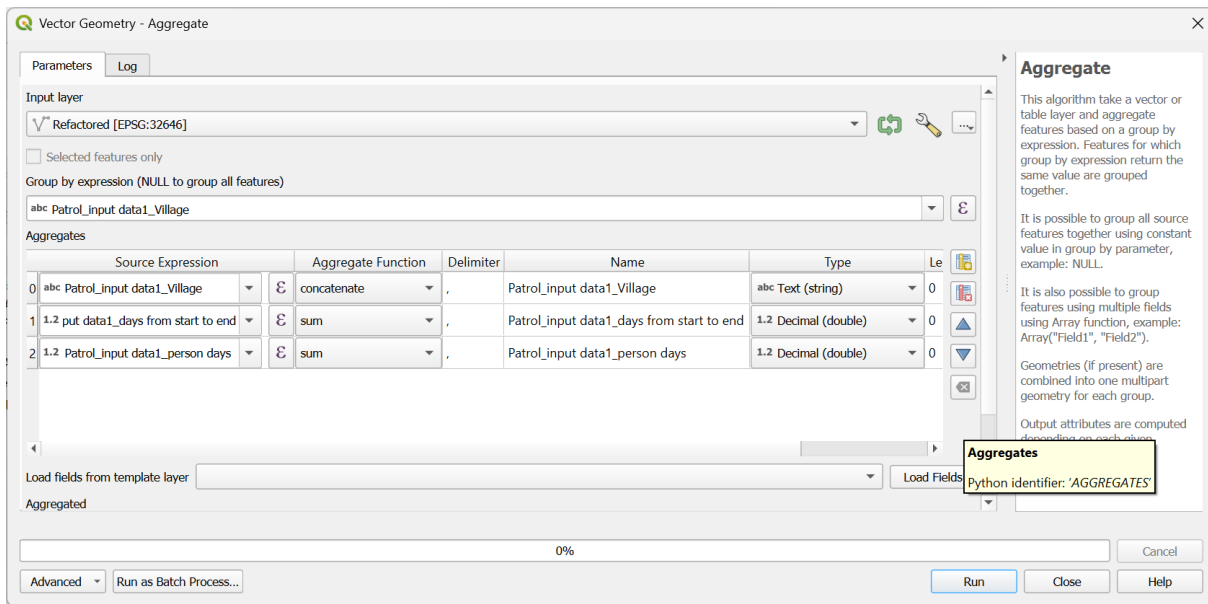
First produce a table using aggregates. Open our toolbox on the right hand panel in our QGIS map project / patrol database

Click aggregate and select your patrol shapefile

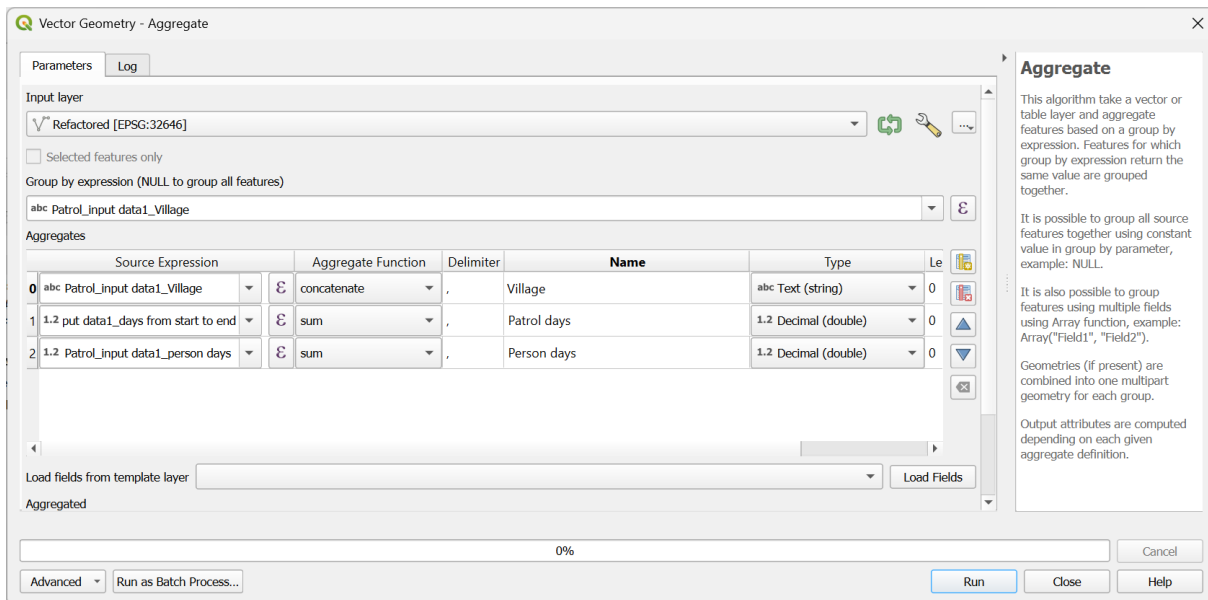
Then Group by village (as you wish to see number of patrol (days) and person days as a sum per village (see below aggregate interface)

Select and delete fields that you do not need for this bar graph exercise, only keep village and make sure its set on “concatenate” to ensure this is your organizing data category.

Then make sure that the patrol days and person days fields are set on sum, as you want to see totals. You can either rename the fields here now under “Name” or later in our graph. Most convenient is here

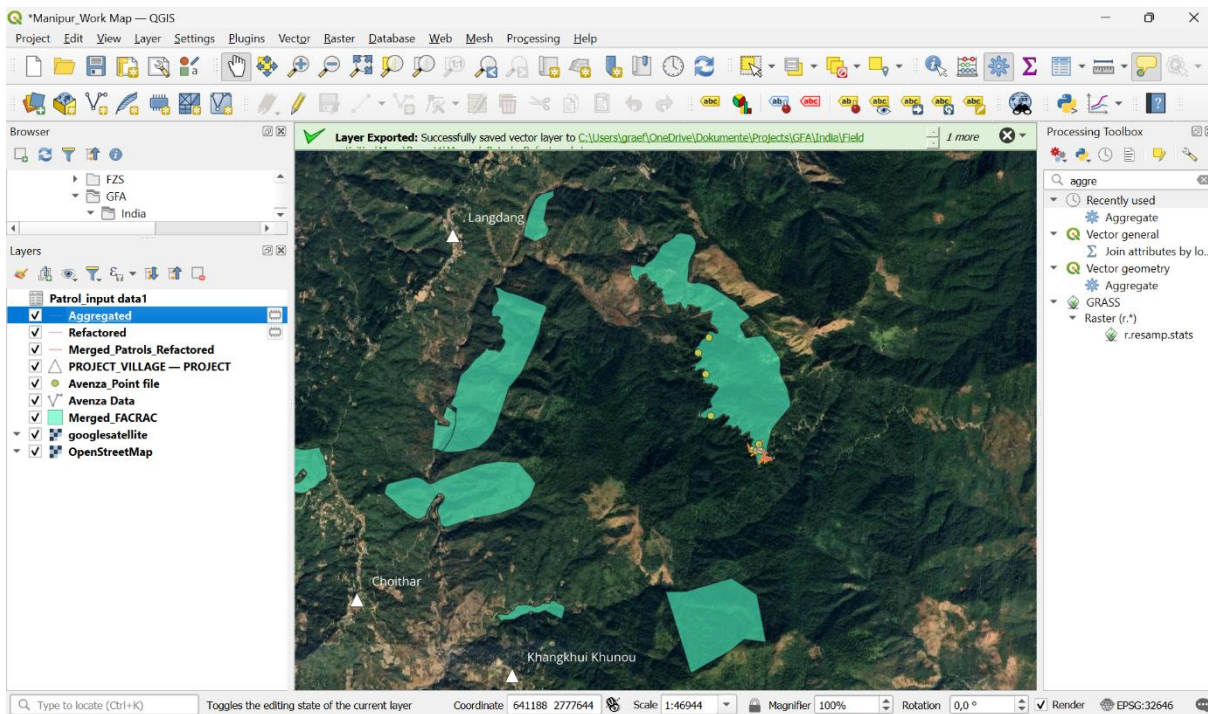


So it will look like this



The run

You now have an aggregated output in your layers tab in QGIS (marked blue)



Open it and inspect the attribute table

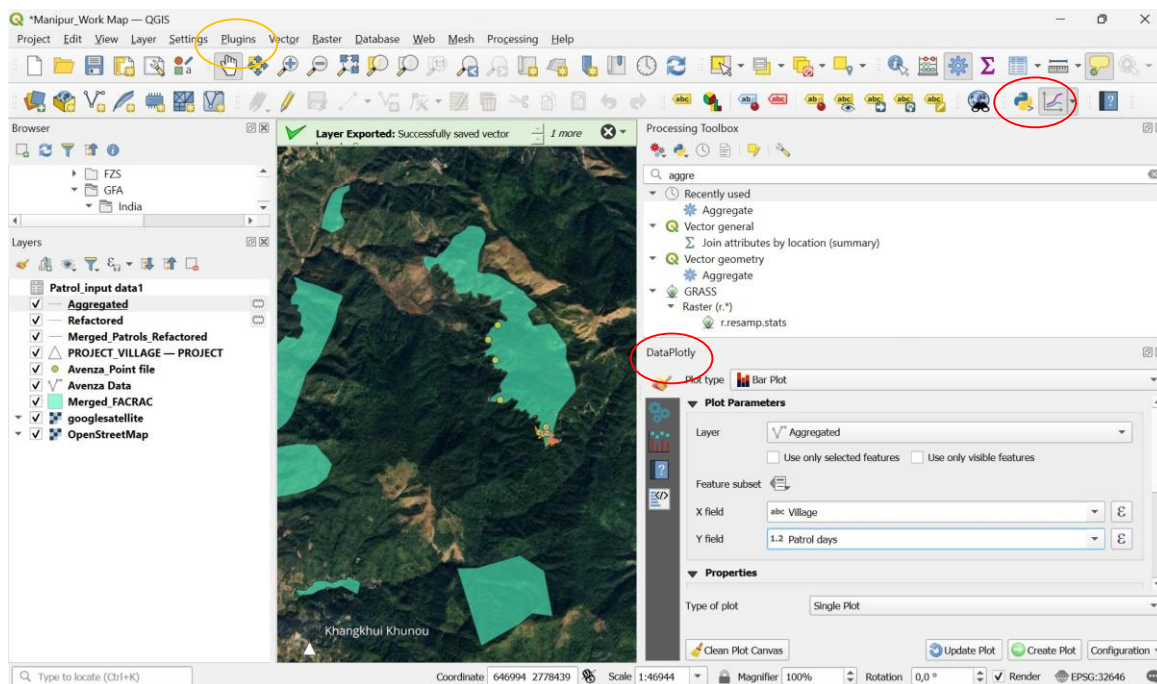
Aggregated — Features Total: 9, Filtered: 9, Selected: 0

	Village	Patrol days	Person days
1	Talui,Talui,Talui,T...	10	56
2	Shokvao,Shokv...	4	15
3	Hatha,Hatha	2	6
4	Hungpung Vas...	1	3
5	Sirarakhong,Sir...	6	36
6	Khangkhui Khul...	1	4
7	Shirui	1	6
8	Hoomi	1	6
9	Nungshong Kh...	1	5

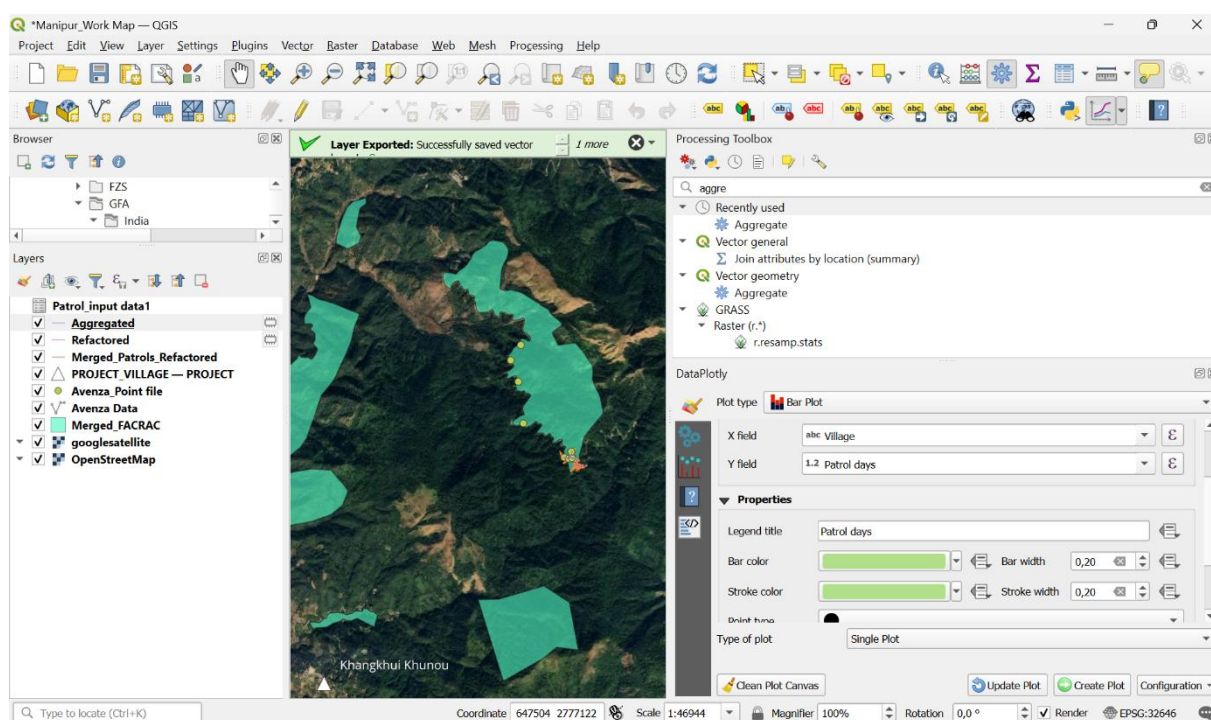
If necessary, toggle editing and make sure that in the Village column, each village name appears only once ---- > do that edit ---- > then save.

Great. Now open your data plotly⁷ to perform simple graphs ---- > open, see red circles

⁷ This has already been installed on the PMU GIS specialists QGIS. If you wish to add this (distinct laptop and QGIS set up) go to plugins (orange circle) and search dataplotly, and then install the plugin



Choose bar plot from the drop down menu, then put Village as your X and then Patrol days as your Y, then select bar width --- > keep it narrow

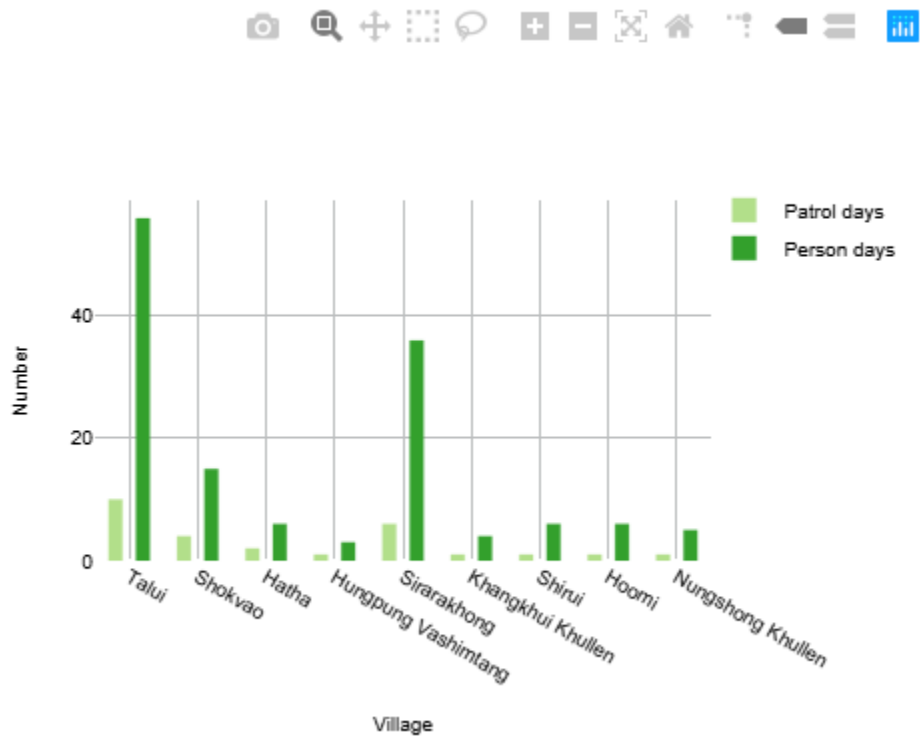


The click create plot at the bottom

Then run the same for Person days, altering the colour of the bar

You can now edit the axis titles, for example y = number (as you are looking at two different parameters)

Your output should look like this ---- > save as a .png



Crop and then add to the field in the Patrol summary report template

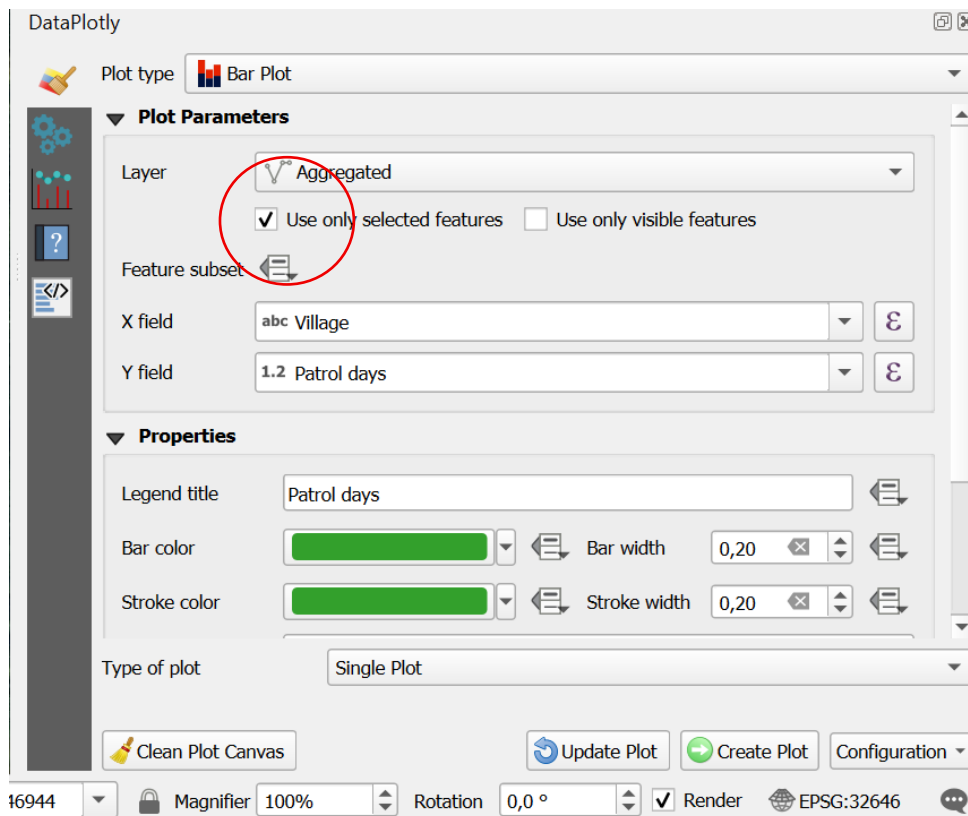
For the village patrol template, filter the village of your choice by selecting it in the attribute table of your aggregated layer in your layers tab

Aggregated — Features Total: 9, Filtered: 9, Selected: 1

	Village	Patrol days	Person days
1	Talui	10	56
2	Shokvao	4	15
3	Hatha	2	6
4	Hungpung Vas...	1	3
5	Sirarakhong	6	36
6	Khangkhui Khul...	1	4
7	Shirui	1	6
8	Hoomi	1	6
9	Nungshong Kh...	1	5

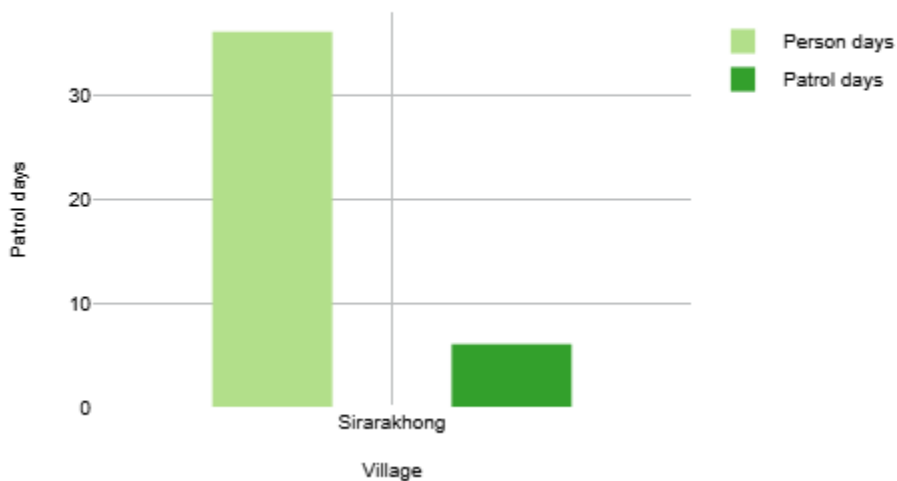
Show All Features

Then select in plotly “Use only selected features”



The run the graph similar to the previous plot and you should receive the following output, when exporting as a .png ---- > note you can edit the graph axis etc right in the plotly output

Share of patrols



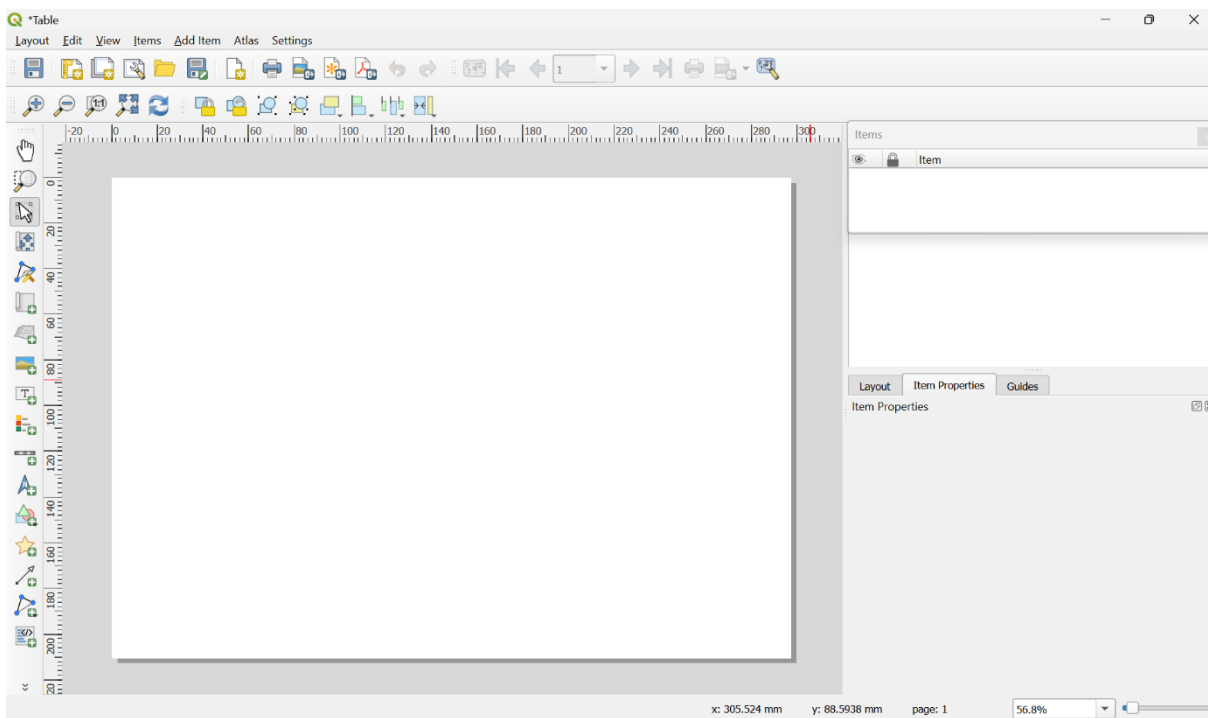
For the patrol summary report also export the table produced through aggregates:

This one

Aggregated — Features Total: 9, Filtered: 9, Selected: 1

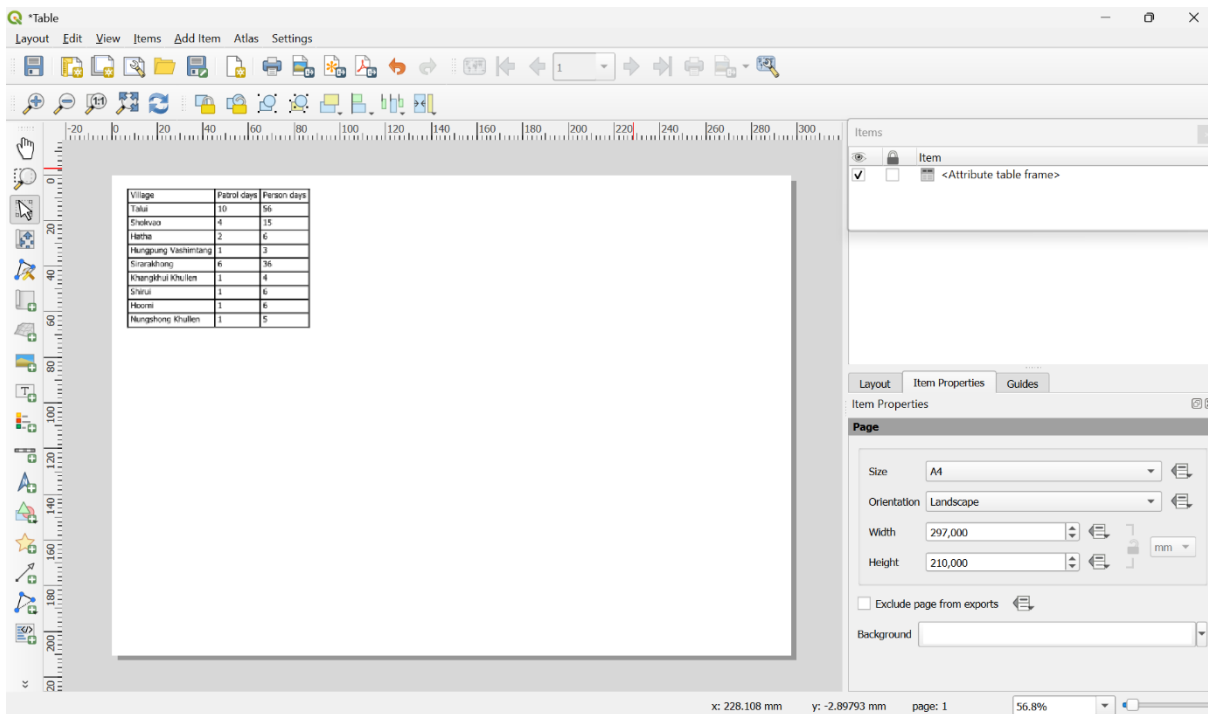
	Village	Patrol days	Person days
1	Talui	10	56
2	Shokvao	4	15
3	Hatha	2	6
4	Hungpung Vas...	1	3
5	Sirarakhong	6	36
6	Khangkhui Khul...	1	4
7	Shirui	1	6
8	Hoomi	1	6
9	Nungshong Kh...	1	5

To achieve that go (in the main map project, QGIS database) and click on the project tab and then ---- > click on print layout ---- > name it Tables and then start editing the layout: this is what it looks like when it opens



Click on the add items tab and then add attribute table, the table then appears and can be edited it the way we want, change size, change font, change colour etc⁸

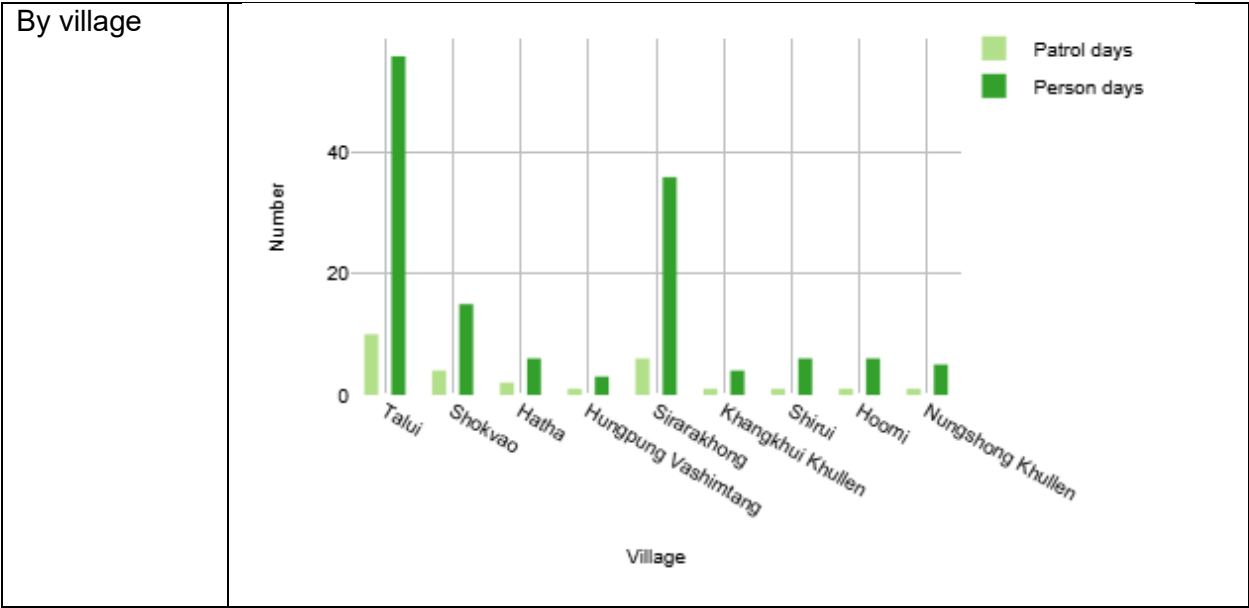
⁸ Please explore yourself



Click the Layout tab (top left in the above set up) and export as ---- > image to the location where you save your QGIS outputs for your table

Then populate the report. Your first section of the report should look like this then

Patrol effort				
Number of patrols		Village	Patrol days	Person days
		Talui	10	56
Shokvao		4	15	
Hatha		2	6	
Hungpung Vashimtang		1	3	
Sirarakhong		6	36	
Khangkhui Khullen		1	4	
Shirui		1	6	
Hoomi		1	6	
Nungshong Khullen		1	5	

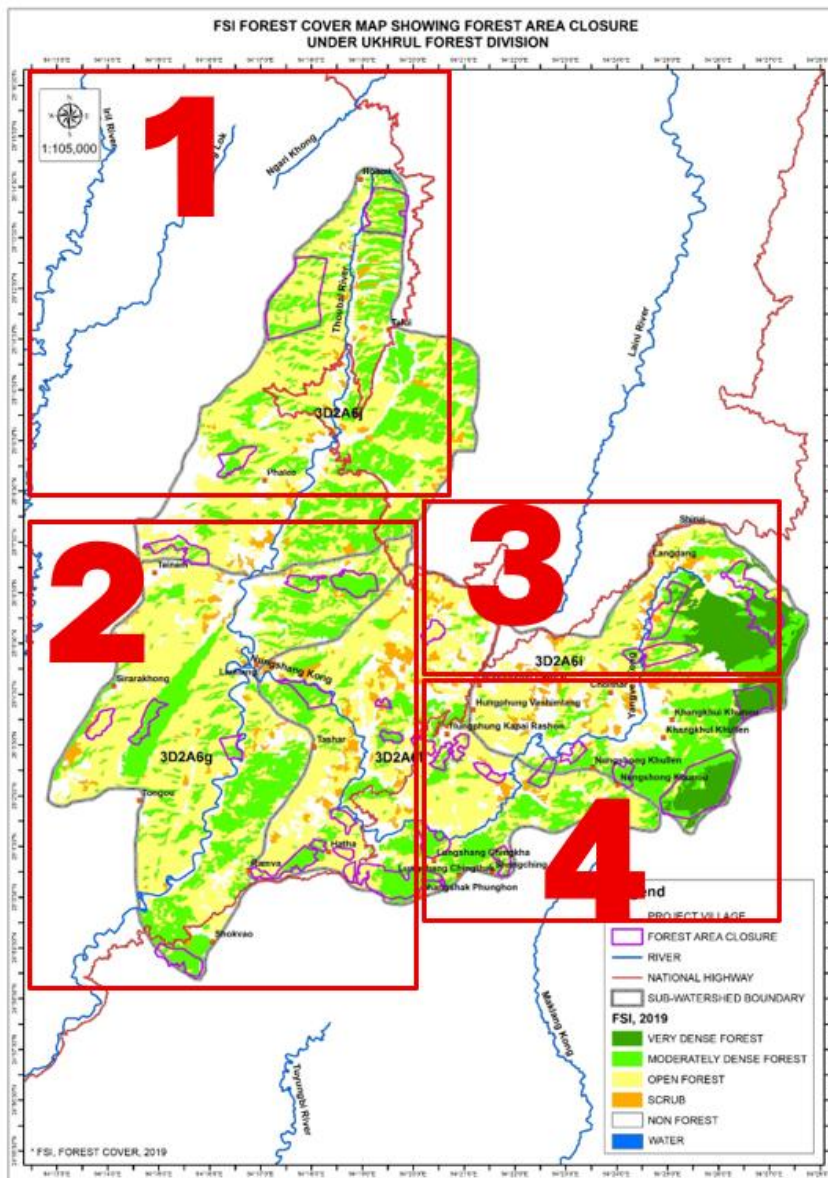


Then look at the next section of the summary report

Patrol effort mapping: Following the summary reporting template the next step is to populate the map inset fields in the summary patrol report.

Make a total of 4 maps, see below figure depicting the more or less extent of the insets

Do a density representation of effort per cell to represent patrol coverage over the reporting period for the areas of interest



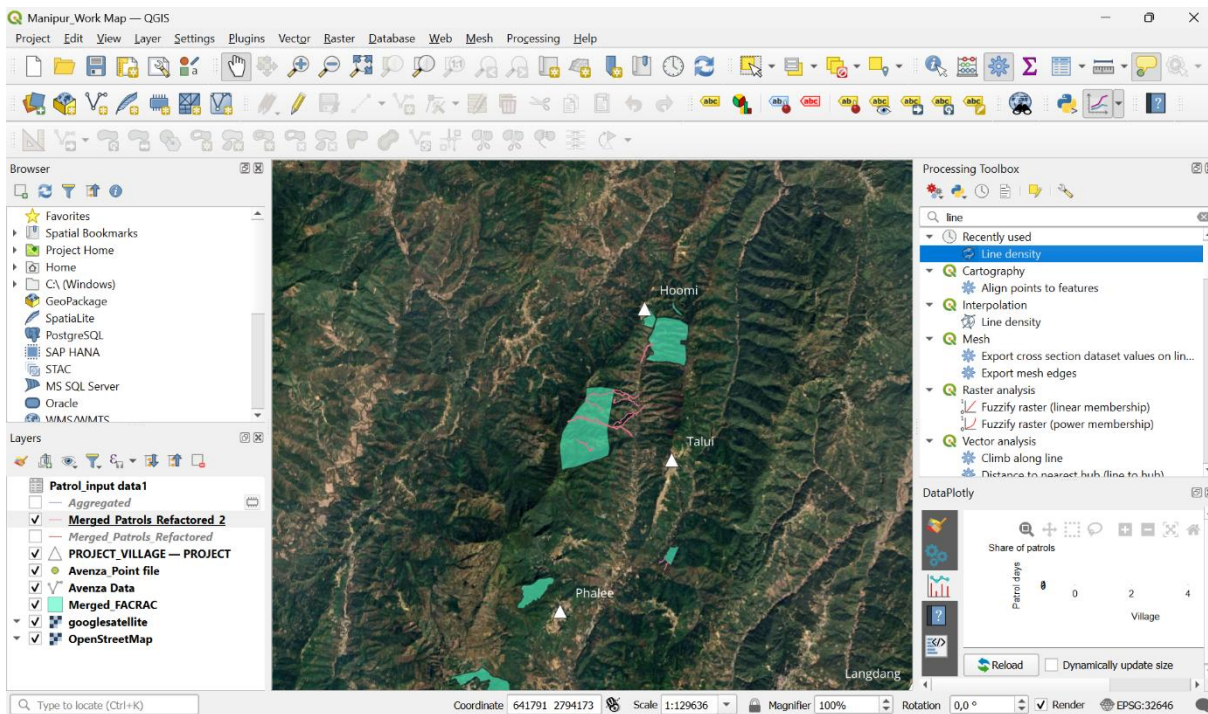
Each of the numbered zones representing roughly extent of the 4 inset maps

Do zone 1 as an example

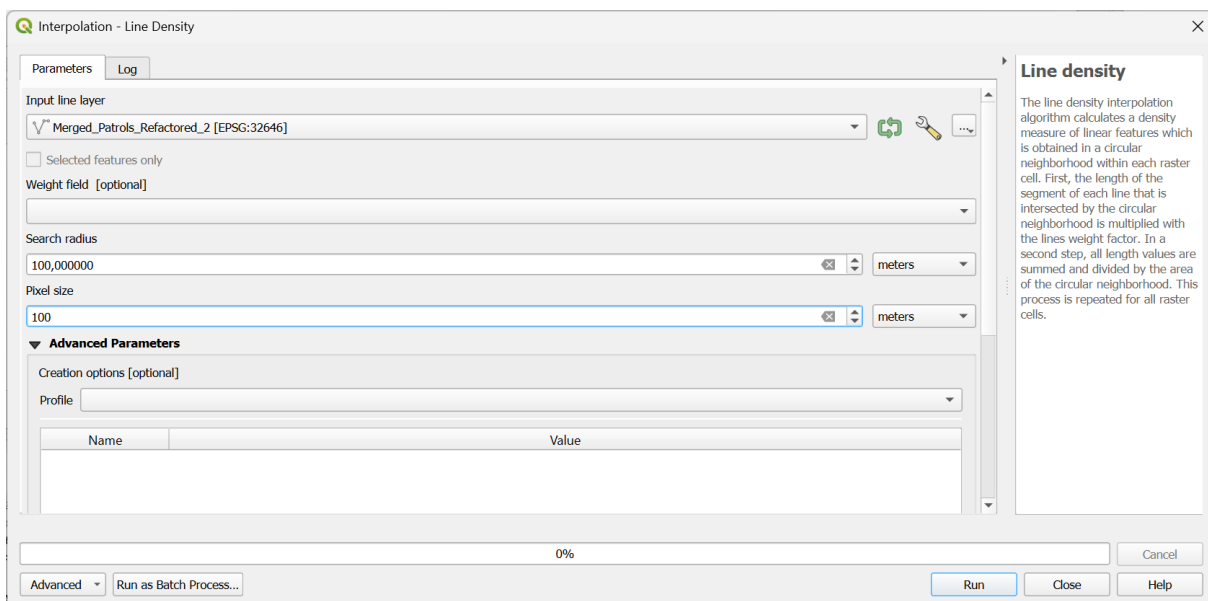
Select your patrol layer and then search for the line density tool in your processing toolbox⁹

Search for line density and click

⁹ Always check whether your plugins are available, otherwise open the plugin tab and search for Processing and install

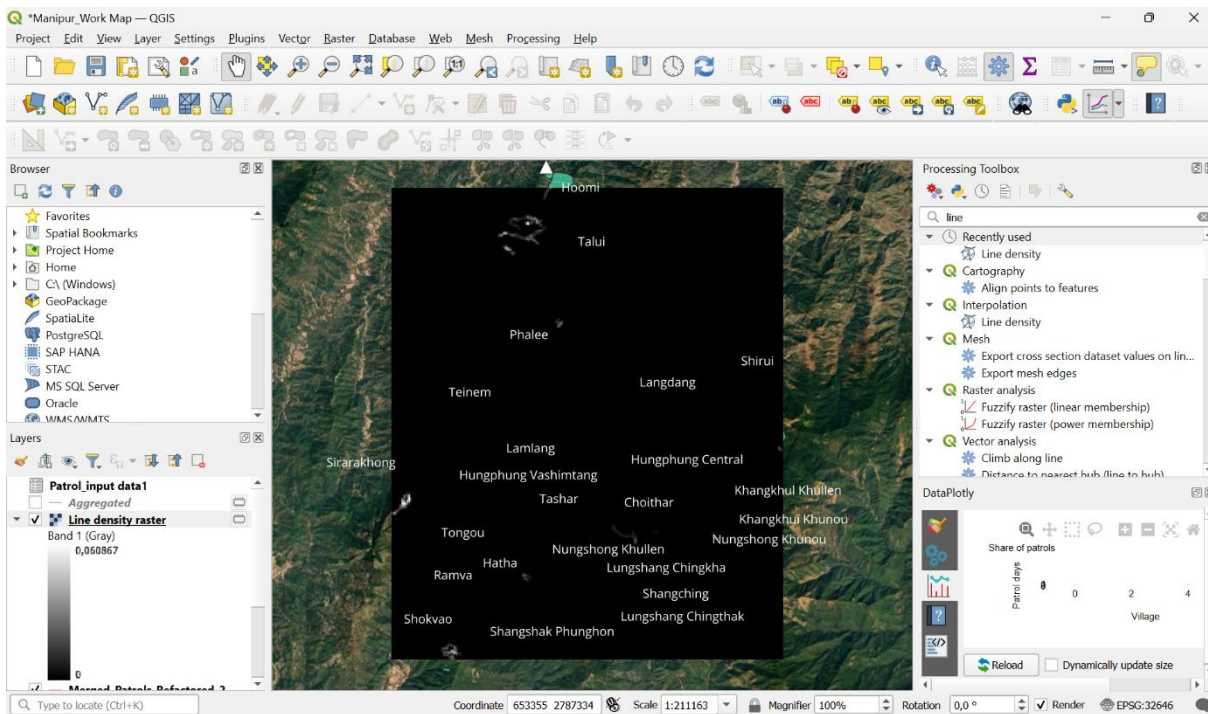


Open that line density window and then set search radius and pixel size to 100 (meters). This defines the cell size for which we will calculate relative patrol effort to visualize patrol effort and coverage of the FAC/ RAC areas.



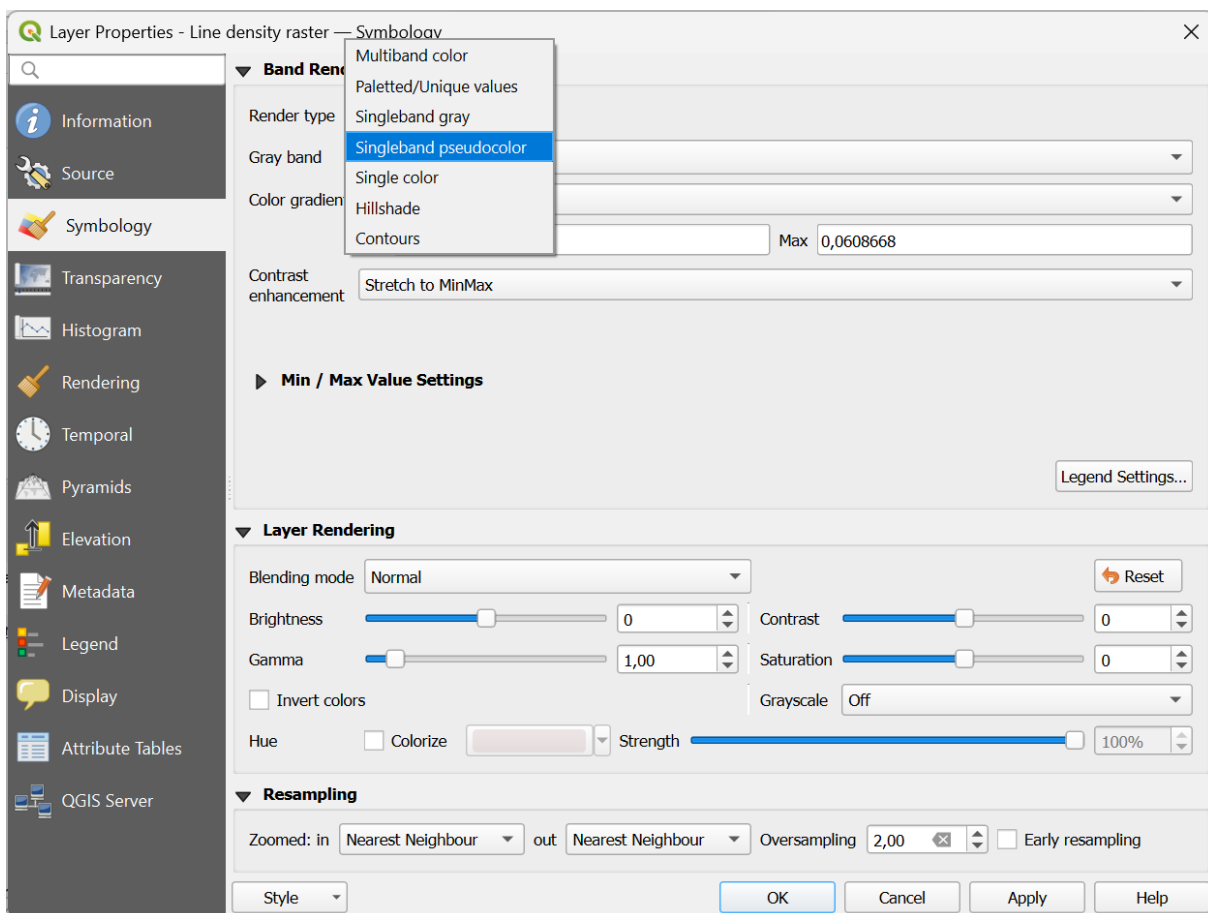
---- > then click run

This is your unedited default output



Now open the raster layer (Line density raster) by right click on go on properties ----- > in properties select ---- > symbology

This opens --- > select singleband pseudocolor as render type

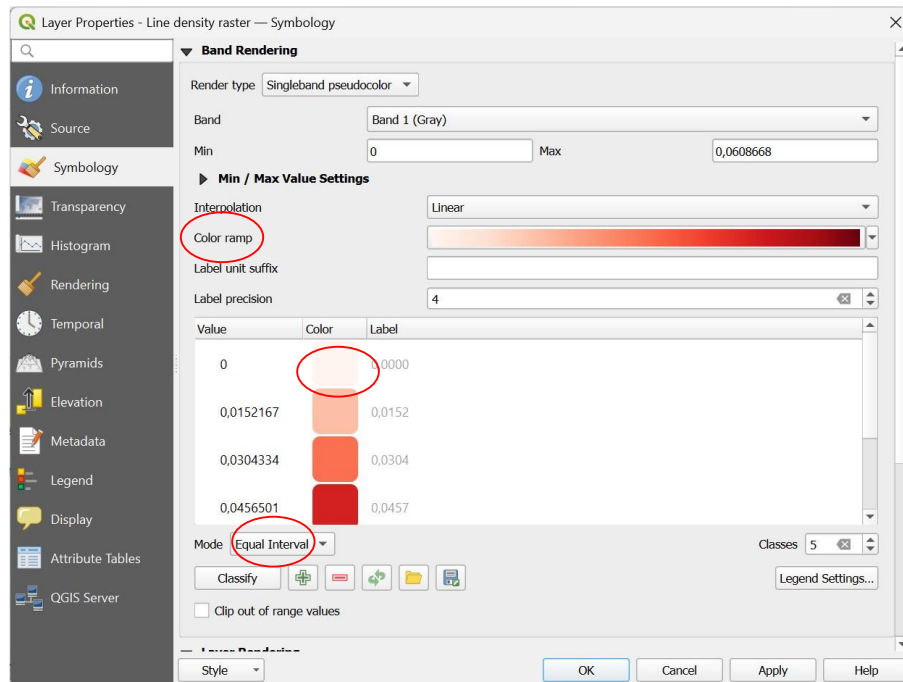


Then you can keep the colour ramp to reds, upper red circle. Alternatively you can also select greens if you prefer a separation between visualization of patrol effort (in greens) and violations later (in red).

Bottom red circle: Change mode to equal interval

Middle red circle: Change the opacity of your zero value to 0 (so that it is fully transparent, cells with a zero won't be represented in the maps; so they do not have any colouring; by right clicking on the zero colour field and setting opacity then to zero

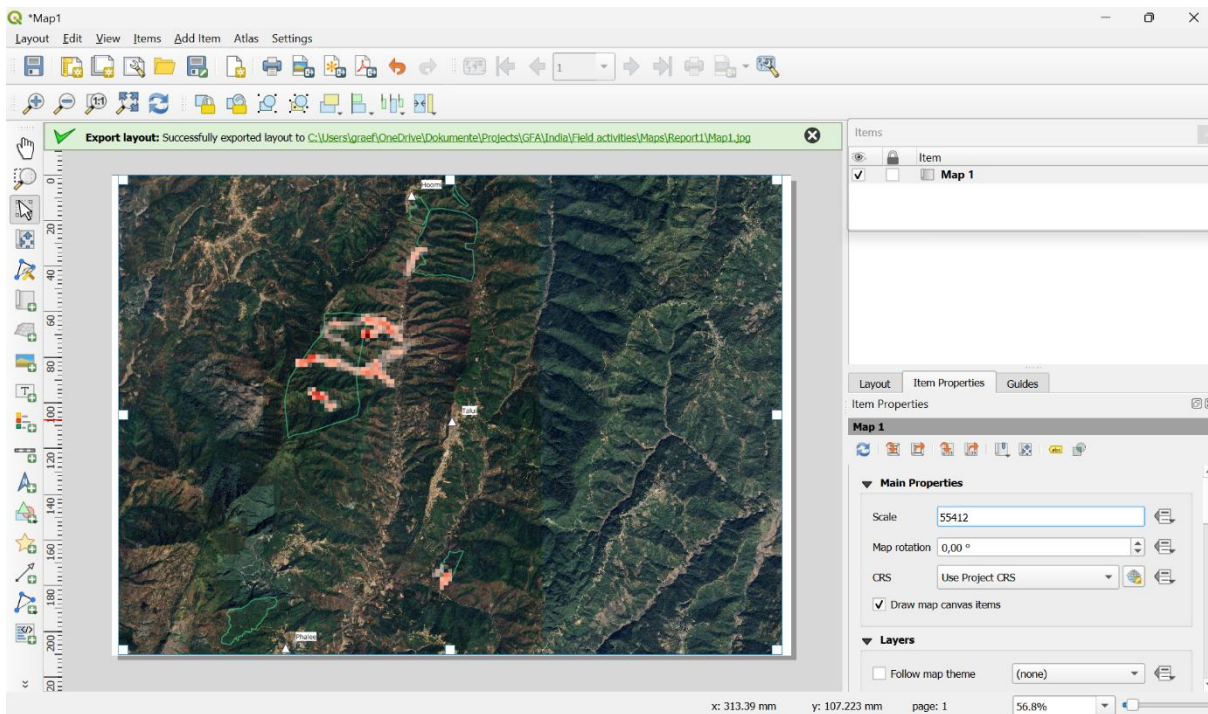
Then click apply and ok and investigate your output



Then open the Project tab and open a new print layout, call it maps

Then click on add item --- > click map --- > pan to the extent you anticipate. A simple map showing gradients, presence vs absence of patrols serves the purpose. Otherwise there is a whole lot of options to modify and produce maps in the print layout that you can discover, by adding items (graphs, maps, tables, text, legends, etc).

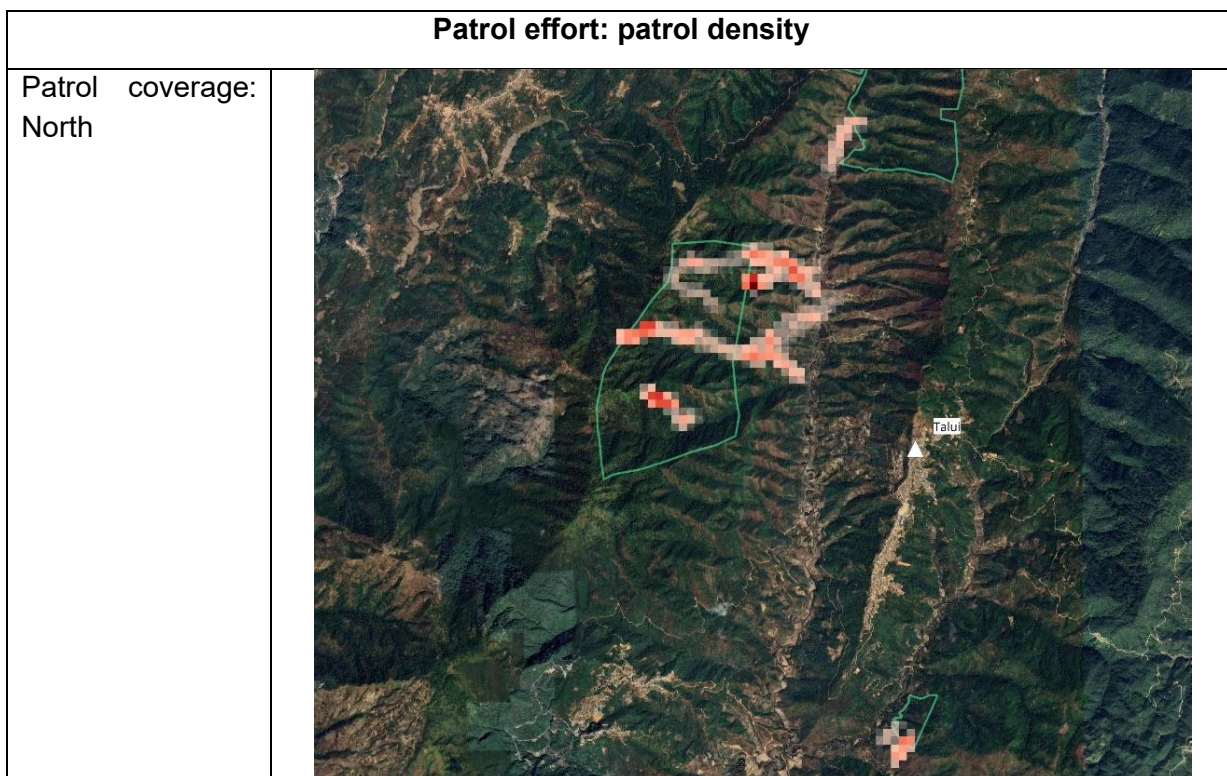
Your output for now should look like this



Proceed and go to export (in the layout tab) and save as a .jpg to the location where you save the materials for this report

Subsequently insert into your reporting template

It should look like this then

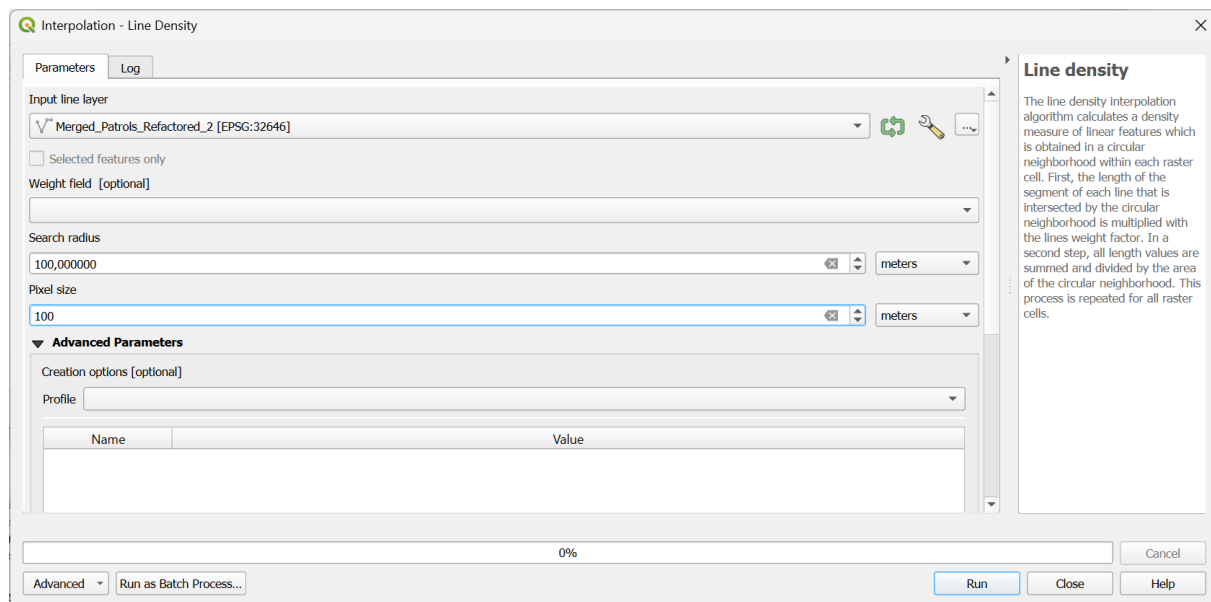


Then save your report and proceed with all the rest of the three maps

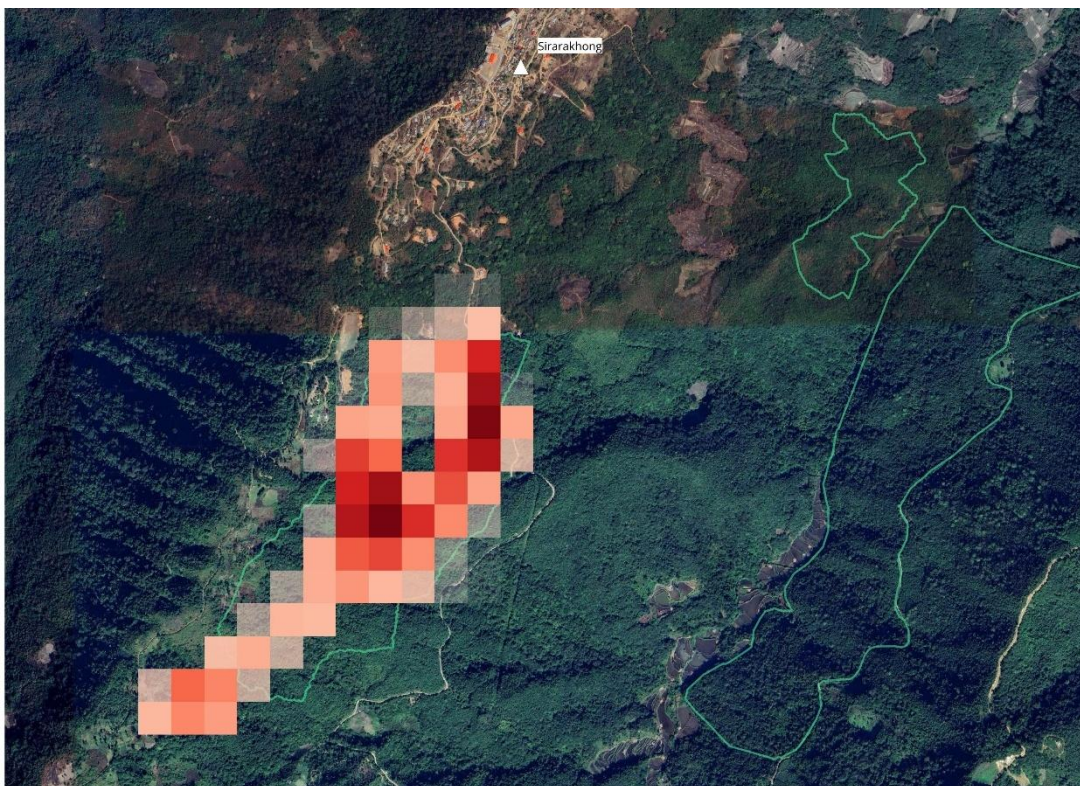
And populate the report accordingly

In your **village report** a single inset map showing the density of patrol effort over the particular FAC area

If you intend to have a narrower resolution on patrol effort / coverage (smaller grid size for effort calculations just go ahead and change pixel size and search radius to 50 meters in the following line density command interface



Your output will look like this (with 100 meter pixel size and search radius)



That's it for effort

5.2 Violations

Open the violations sections of the two reports and inspect what we will do

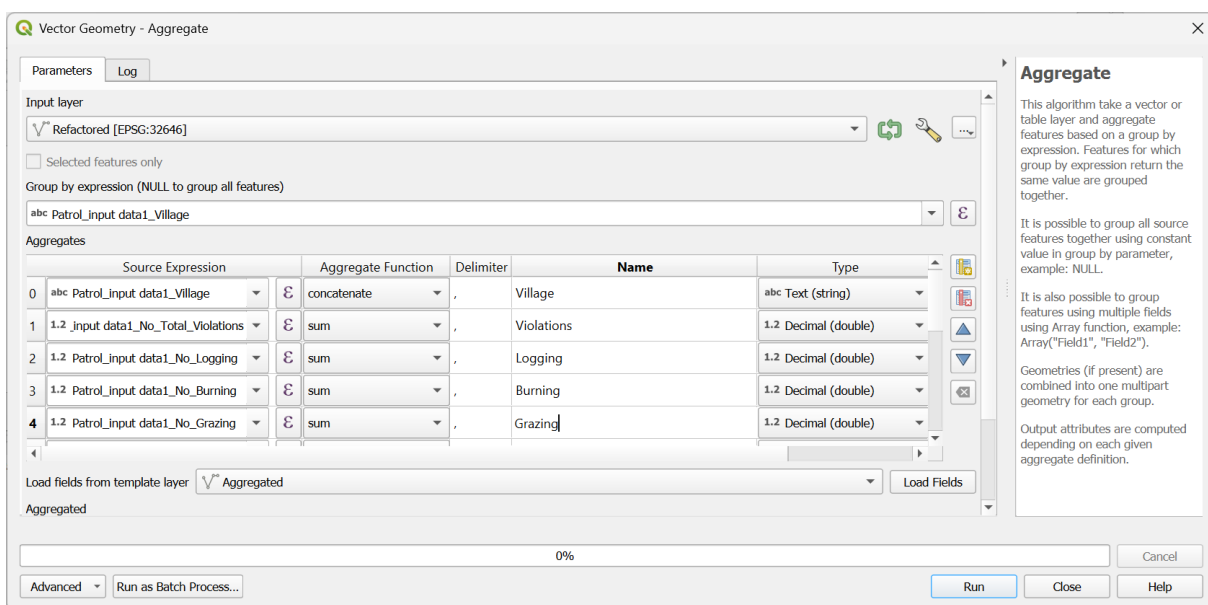
First focus on the patrol summary report

Get a table (aggregates) on violations (overall) and then by category by village

Open the aggregate function for our patrol tracklog file; and then group by villages, and then delete all categories that are not representing violations (total) nor any of the violations categories. Keep those. Then change the Type for each of the numeric/ count categories to decimal double. Set the village = concentrate and then all the numeric (violations and violation categories) = sum

Make sure in aggregate that you already rename your variables

It should look like this



Then run the aggregate

Inspect it and edit the village names where necessary in the attribute table

Then open in your layer tab ----> table layout or a new print layout ----> then add item and add the attribute table

Then export your table and save as .png to the location where you save all your materials for this report

It should look like this

Village	Violations	Logging	Burning	Grazing	Hunting	Mining	Conversion	Others
Talui	0	0	0	0	0	0	0	0
Shokvao	2	1	0	0	1	0	0	0
Hatha	0	0	0	0	0	0	0	0
Hungpung Vashimtang	0	0	0	0	0	0	0	0
Sirarakhong	0	0	0	0	0	0	0	0
Khangkhui Khullen	0	0	0	0	0	0	0	0
Shirui	3	3	0	0	0	0	0	0
Hoomi	0	0	0	0	0	0	0	0
Nungshong Khullen	2	2	0	0	0	0	0	0

Put it into your report

Now generate a graph showing the number of violations per village.

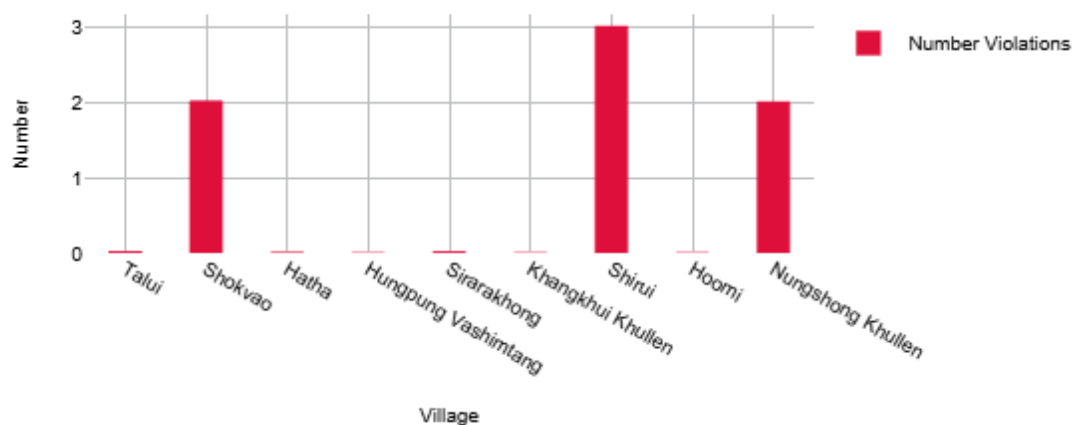
If you want to customize the graph and show bar graphs according to distinct violation categories you can also do that, so when the emphasize is somewhat on showing

Logging, hunting, conversion, etc...

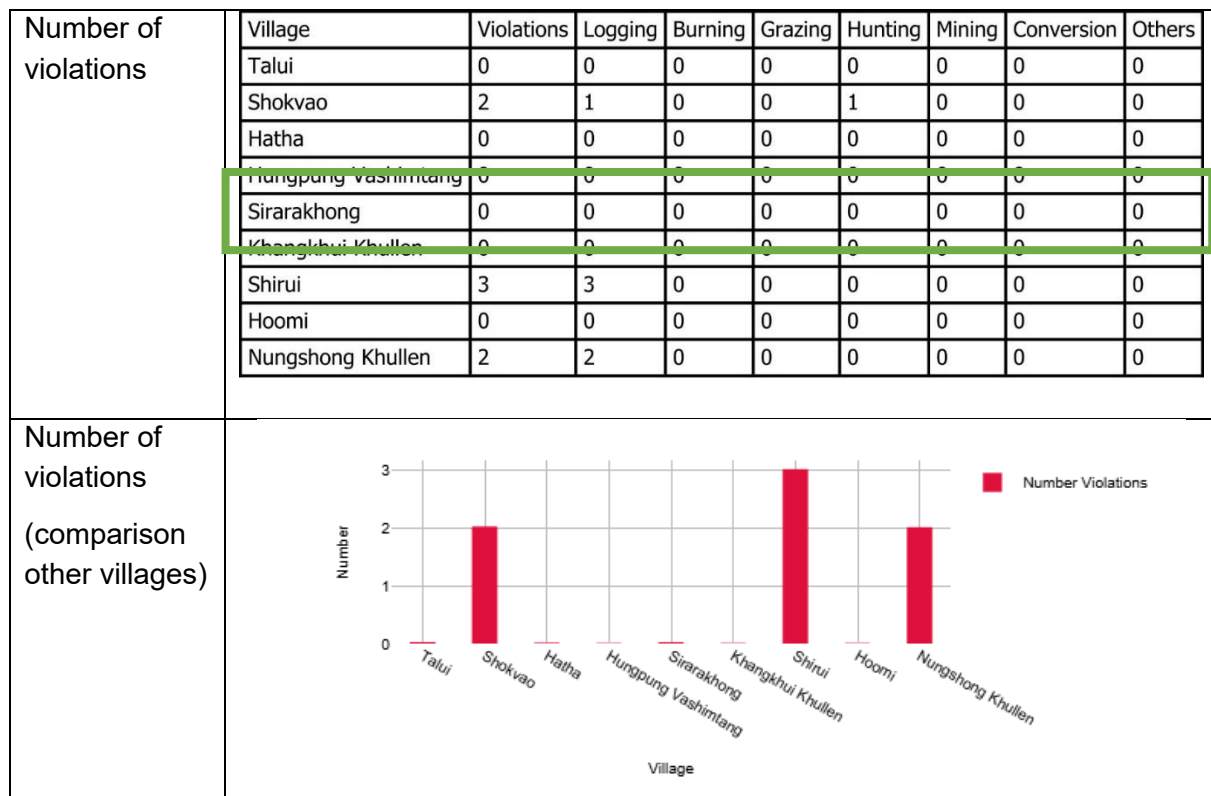
Here do a simple example just showing the number of violations per village

Open our data plotly and arrange our graph, it will look like this when we plot violations against villages, set the bar red (for violations)

Share of patrols



The same outputs will go into the village report, in the appropriate fields, so the output will look like this



----- > then copy and paste it to the report

Look at the next section of the report and create a heatmap showing violation densities roughly

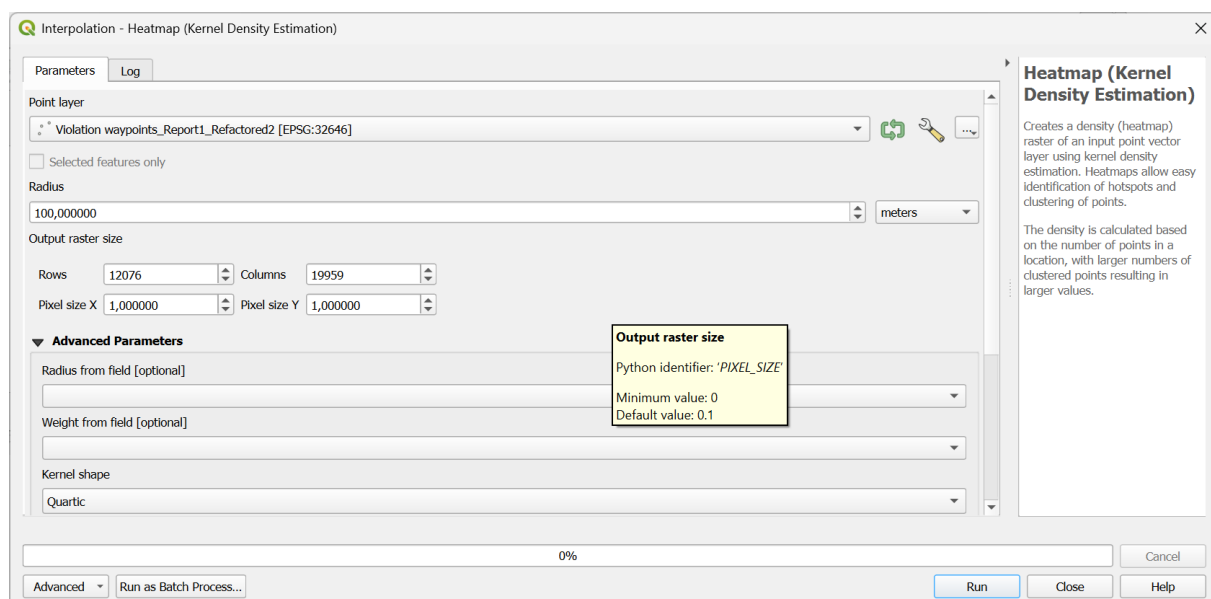
So search for heatmap (kernel densities) in the toolbox on the right

Then select your point layer

Set radius to 100 m or more (sphere of influence of the point)

Set Pixel size to 1 or a little bit more

----- > then run



Then investigate your map project/ QGIS database

The right click on your heatmap

Click properties

Click on the symbology tab and then set your heatmap up this way for good visualization

Select render type = singleband pseudocolour

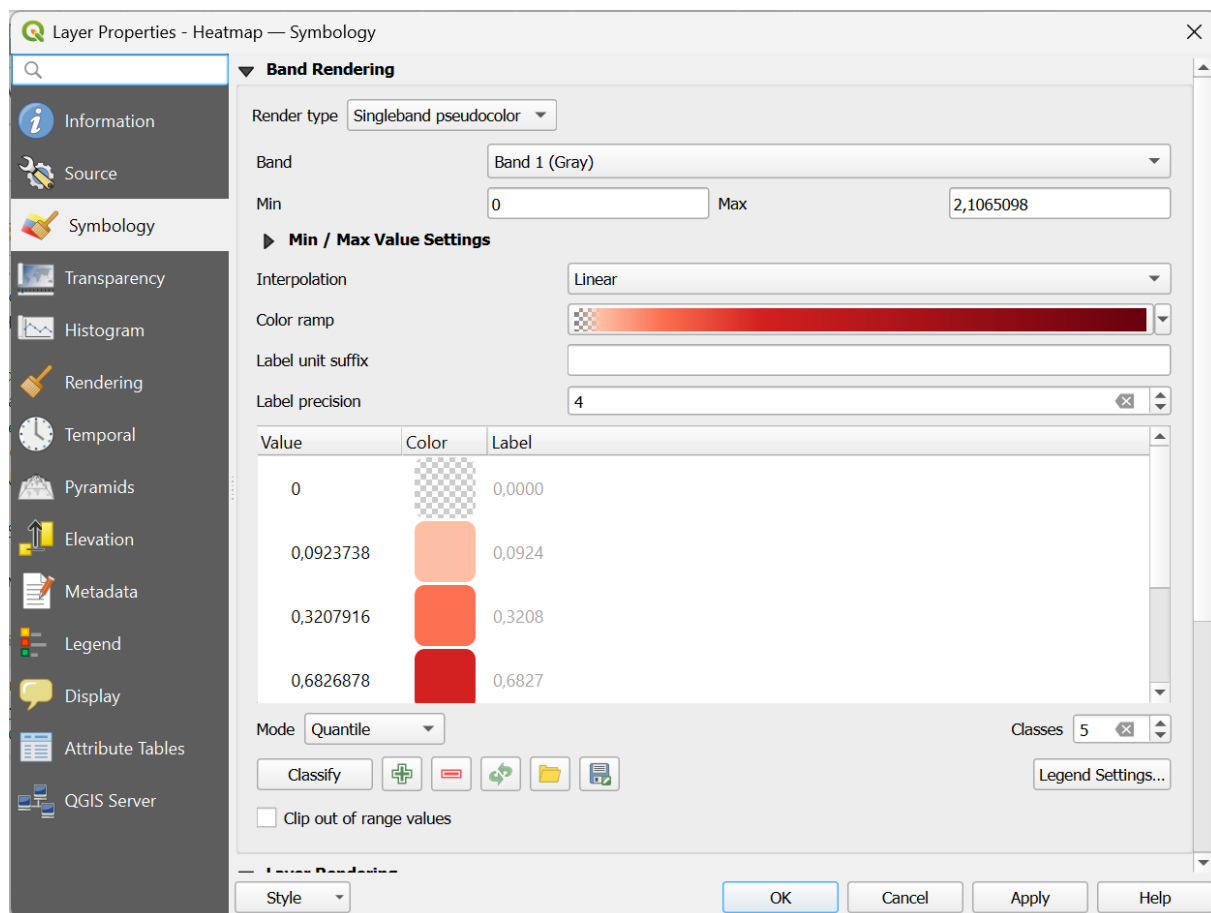
Colour ramp = red

Mode = Quantile

For 0 values right click and do 0 Opacity, so that it is fully transparent

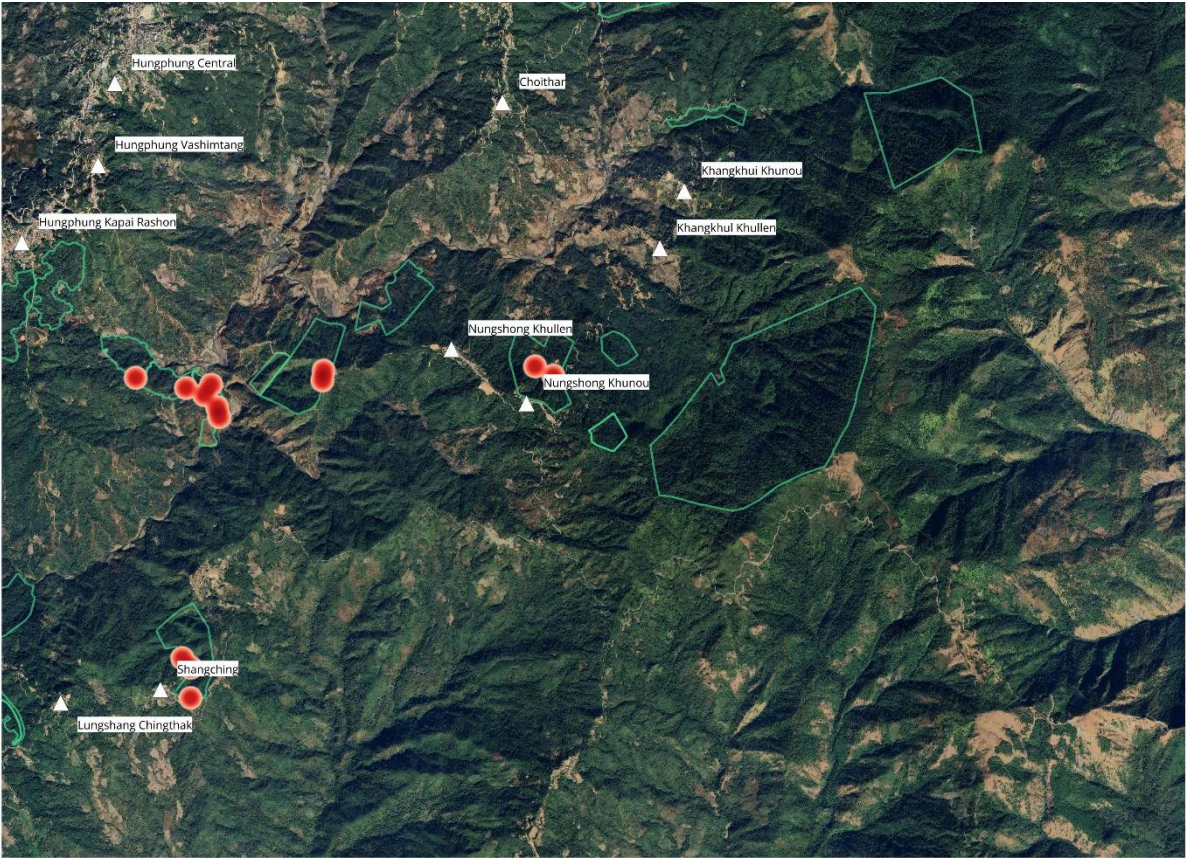
The click apply and OK

You can now make maps



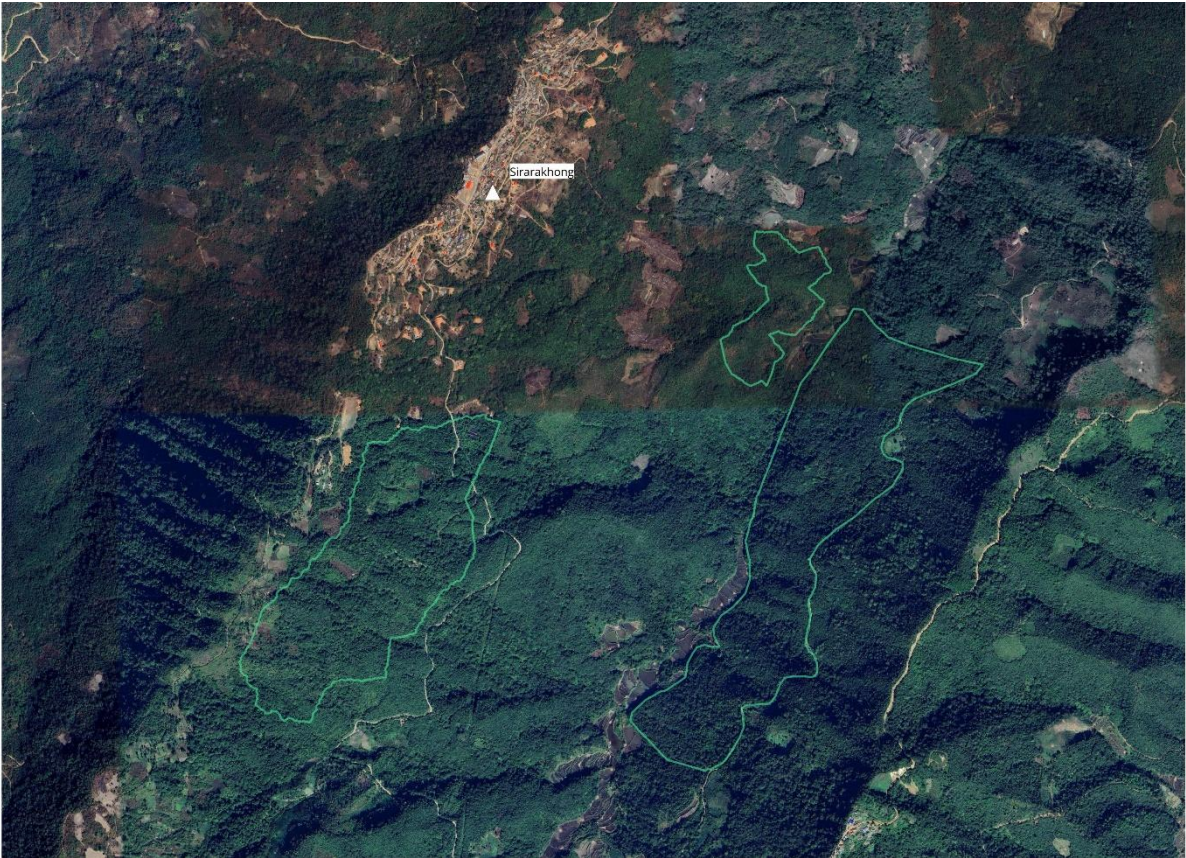
Do up to 4 inset maps for the summary report and insert into the reporting template, follow the same format as for mapping and inset maps of patrol effort see further above

See below example for the SE of the Area of Interest



DO the same for the village report

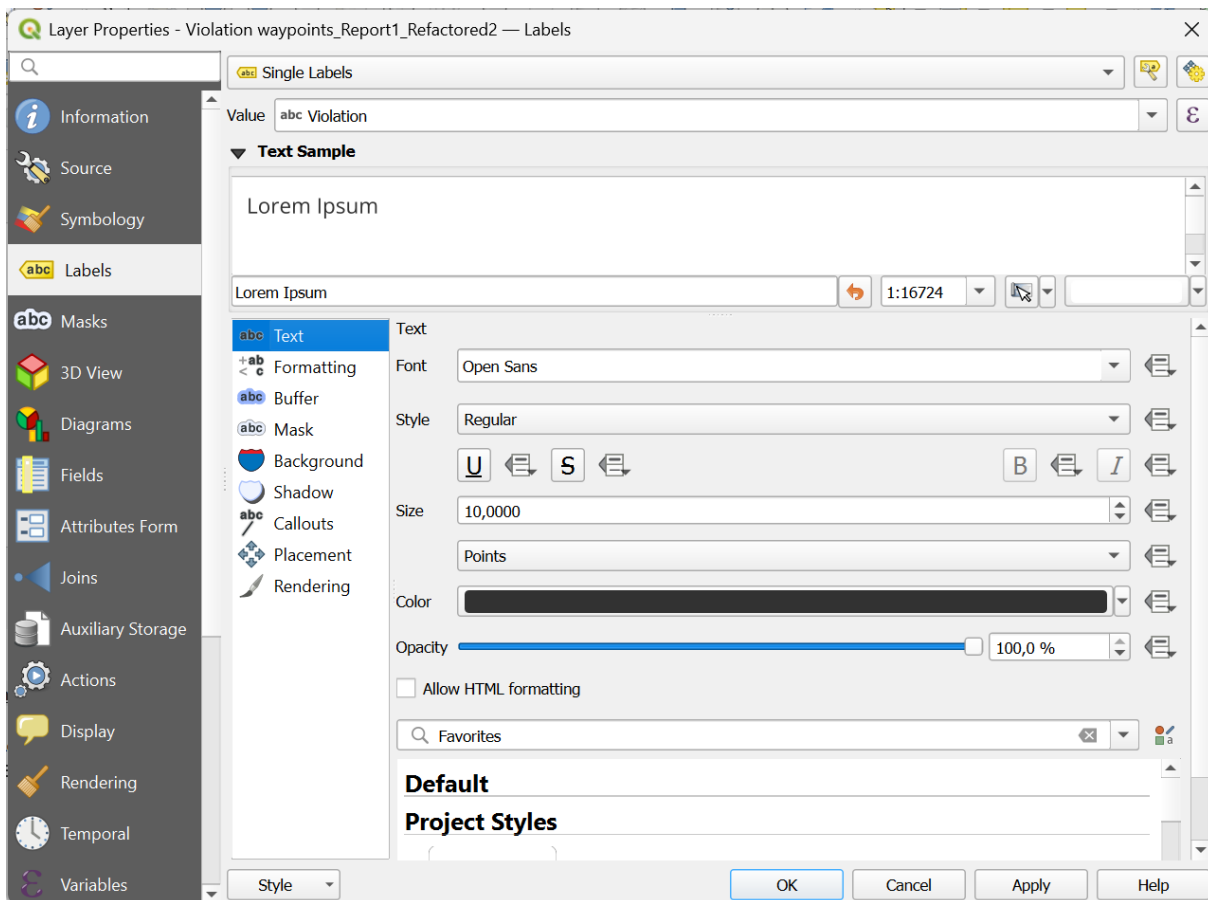
This will look like this for the Sirarakhong on the basis of the data analysed



For the village report you can also just use the waypoints

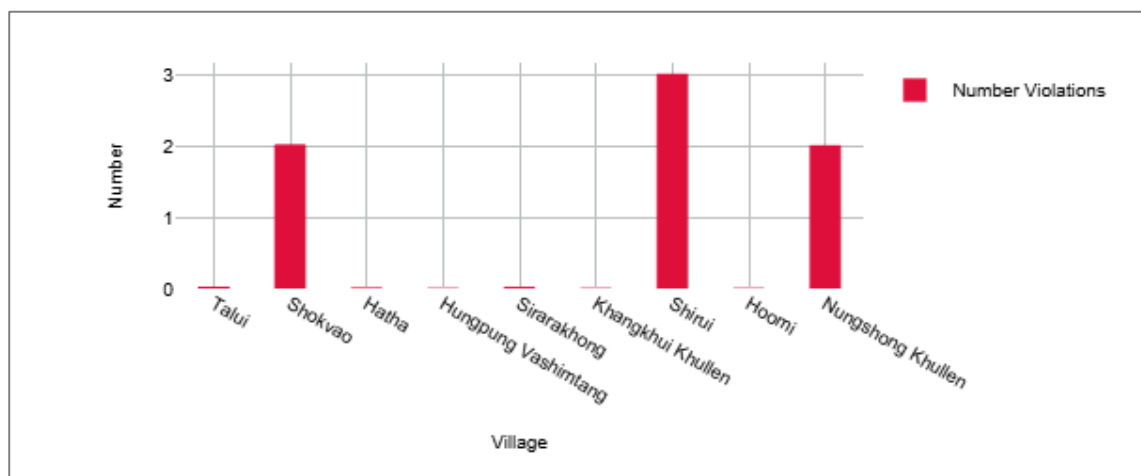
Right click ----- > properties ----- > label ----- > select single label according to violations

You can modify visibility by adding a background

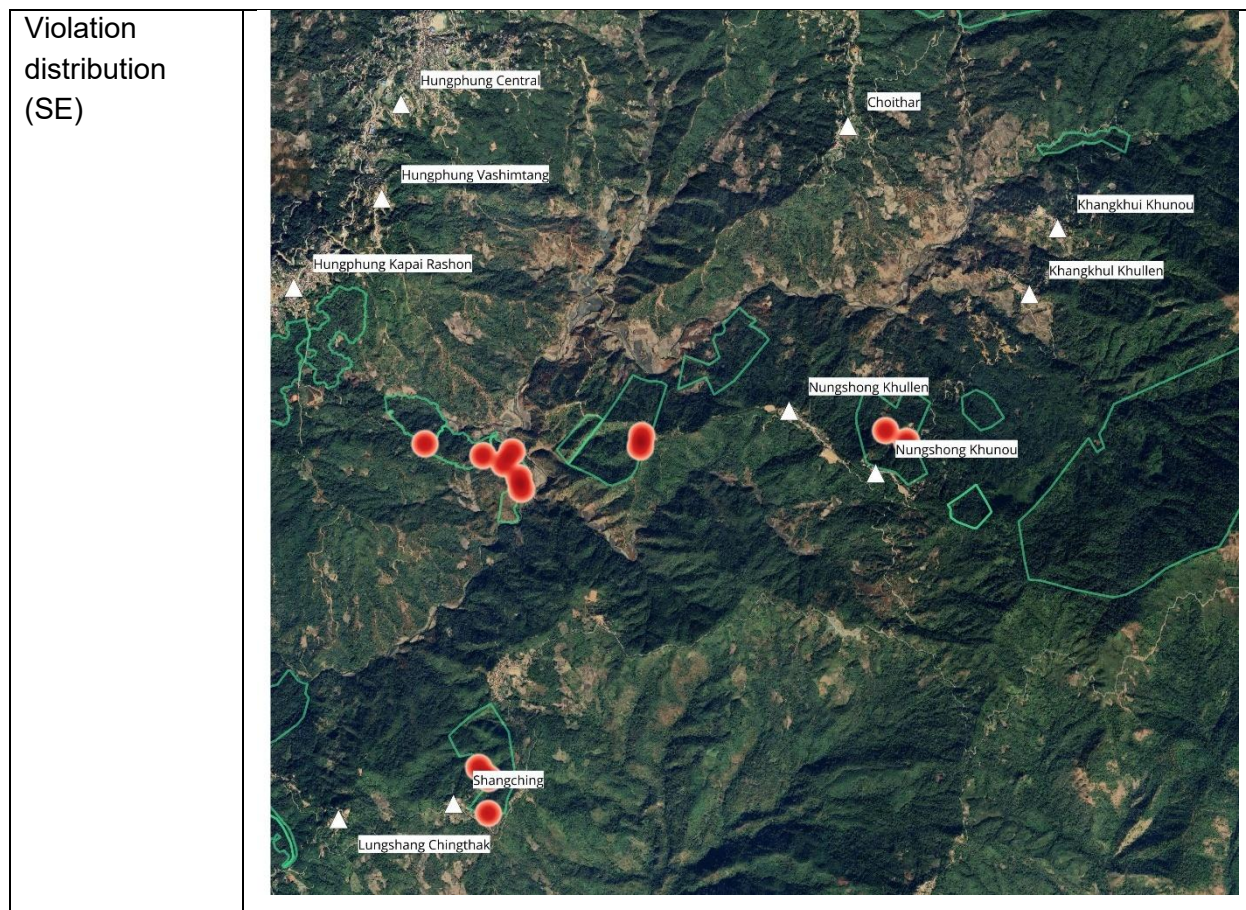


Click apply and Ok

The violation section of the summary report would look like this

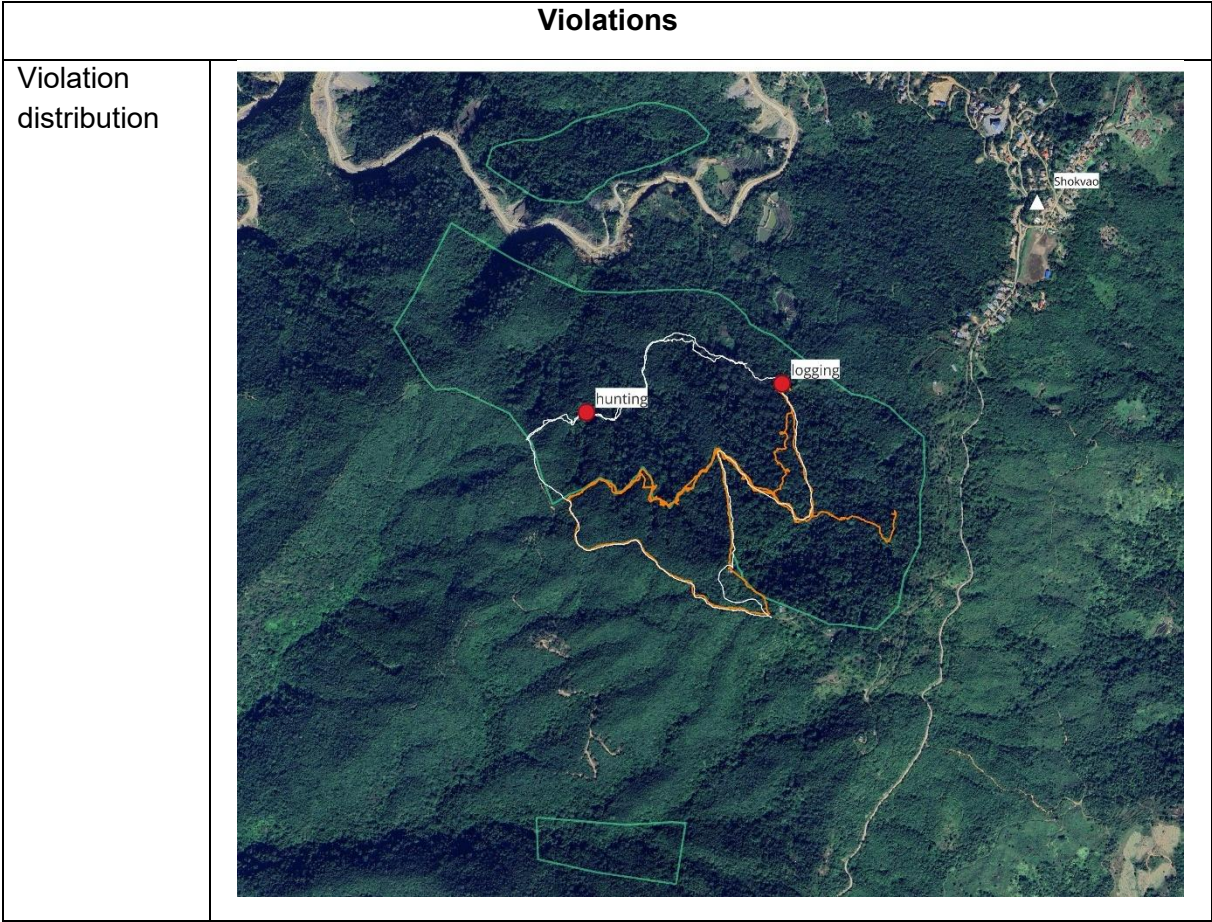
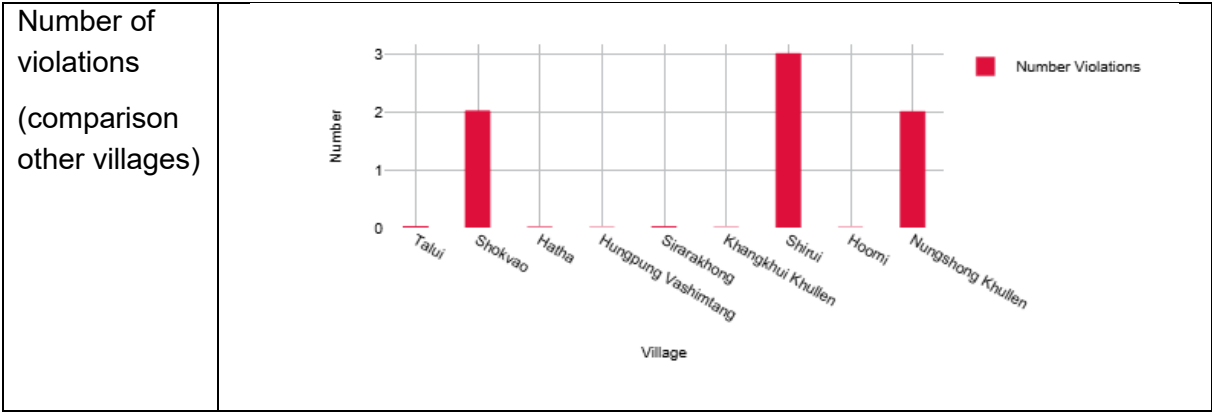


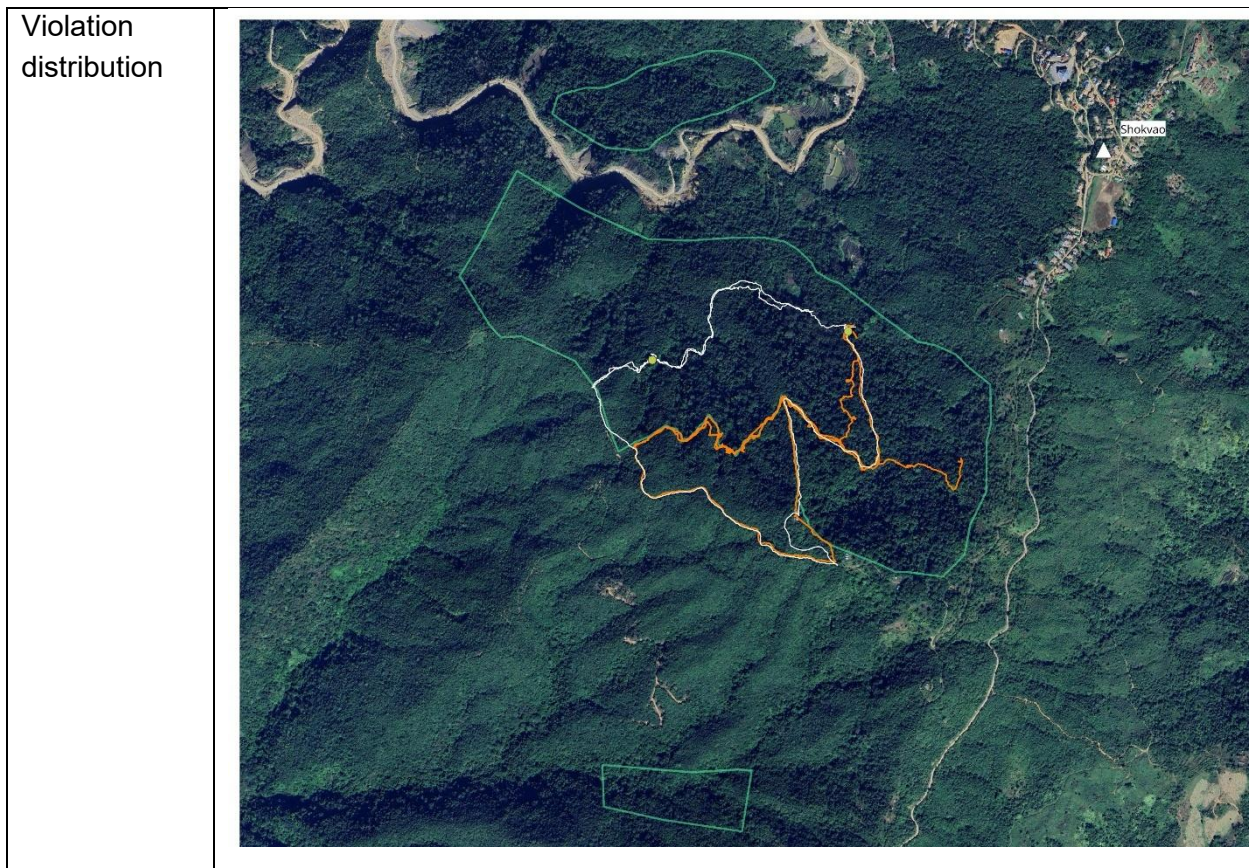
Violations



The violation section of the village report would look like this

Violations									
Number of violations	Village	Violations	Logging	Burning	Grazing	Hunting	Mining	Conversion	Others
	Talui	0	0	0	0	0	0	0	0
	Shokvao	2	1	0	0	1	0	0	0
	Hatha	0	0	0	0	0	0	0	0
	Hungphung Vashintang	0	0	0	0	0	0	0	0
	Sirarakhong	0	0	0	0	0	0	0	0
	Khangkhui Khullen	0	0	0	0	0	0	0	0
	Shirui	3	3	0	0	0	0	0	0
	Hoomi	0	0	0	0	0	0	0	0
	Nungshong Khullen	2	2	0	0	0	0	0	0





Populate your reporting templates

Another way showing violations for the particular villages is to highlight the number of violations reported for a particular patrol and adjust the size of the line files accordingly

So for that you go right click your patrol tracklog file and you go into symbology

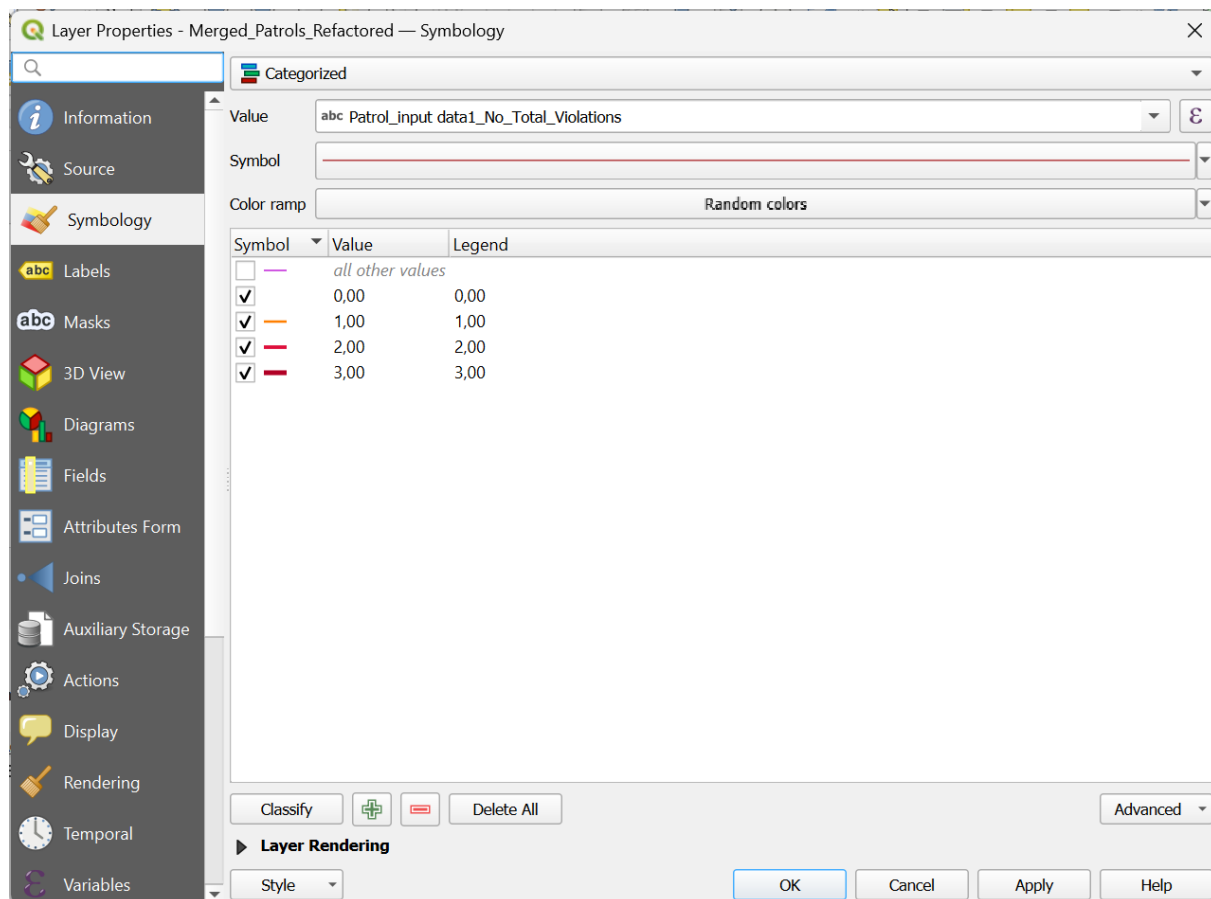
You can click categorized

Select the value you would like to categorize, in this case violations

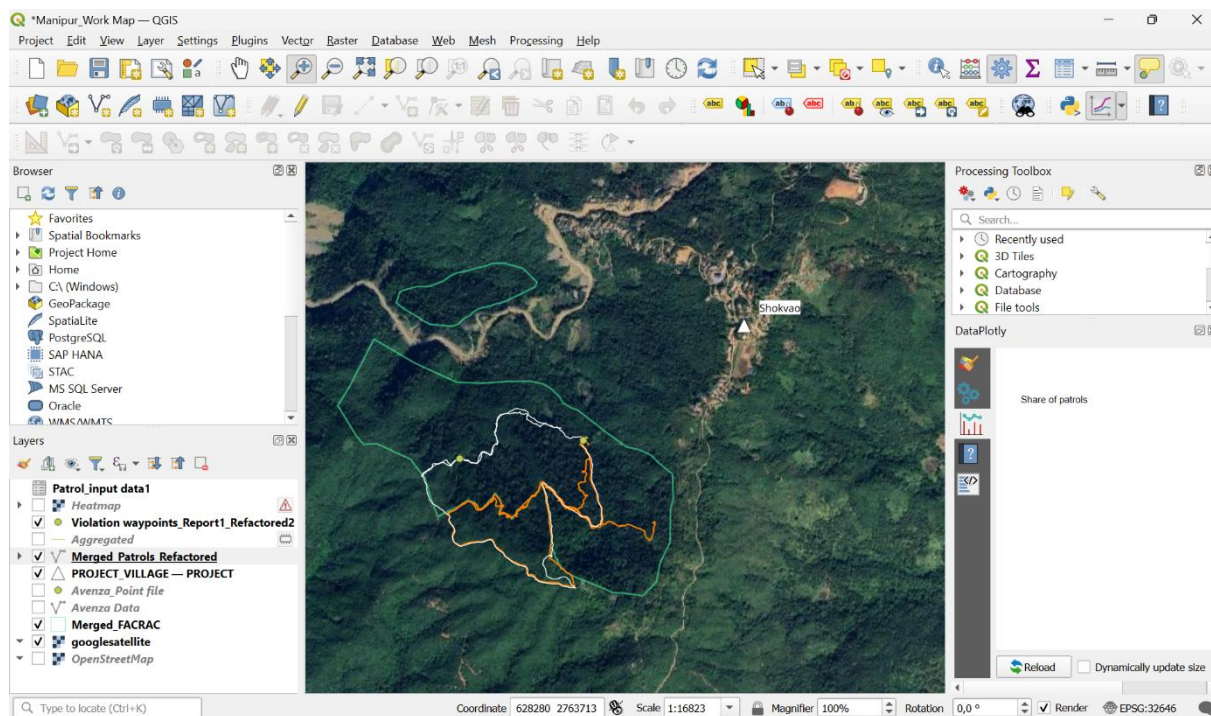
Then click classify (bottom left) and it will classify automatically according to the number of violations detected on a patrol. In this example the maximum is 3

The click on symbol and modify, make it gradually larger (stroke width) the higher the value (number of violation observations)

Make the zero = white



Then your output should look like this



You can produce some maps and add them to the village reporting template

Then it would look like this

This is it: these are some of the basic commands suitable to generate a QGIS driven report for

COSFOM patrolling.

6 Further resources and materials

For further materials and/ or information pertaining to QGIS you can go on this

[QGIS Training Manual — QGIS Documentation documentation](#)

[Spatial Thoughts OpenCourseWare](#)

[Tutorials - UMass GIS Hub](#)

COMMUNITY BASED SUSTAINABLE FOREST MANAGEMENT FOR WATER RESOURCE CONSERVATION (COSFOM)

List of related Technical guidelines

- Patrol Database Management and Reporting in QGIS
- ...
- ...

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