



PROJECT STILL WATER



A FREE WORKSHOP AIMED AT COMBATING
DENGUE USING SATELLITE DATA

DIY workshop Rev 4.8

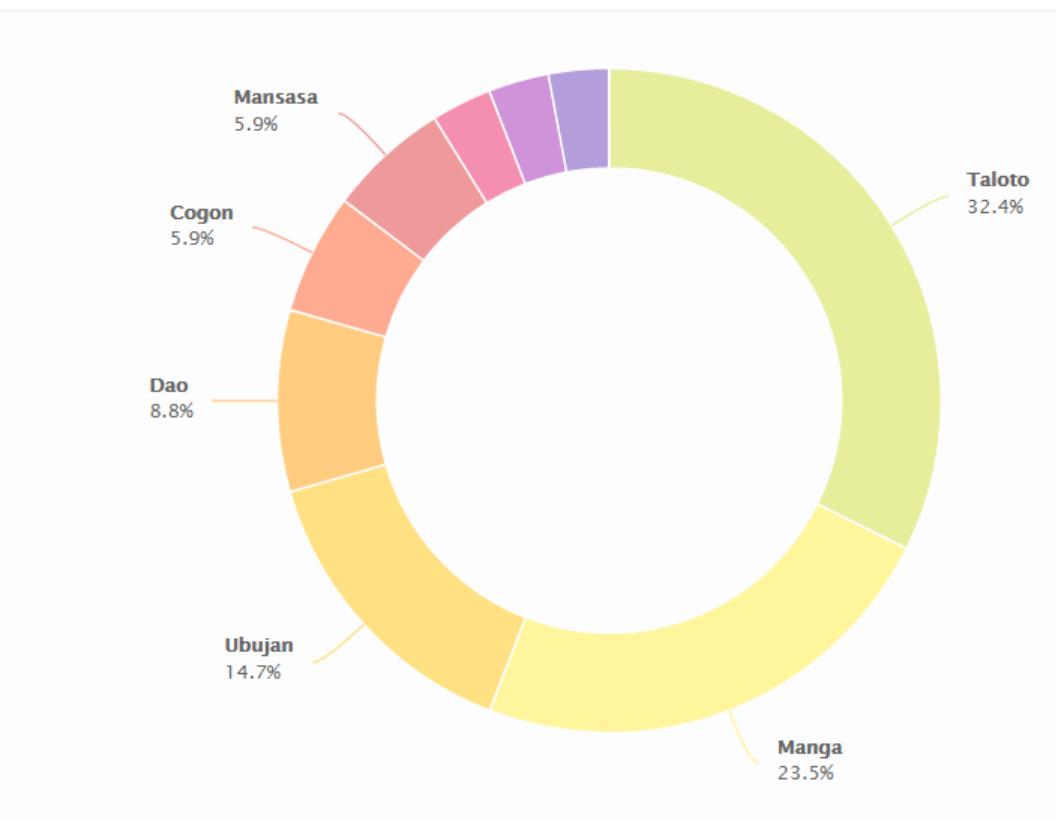
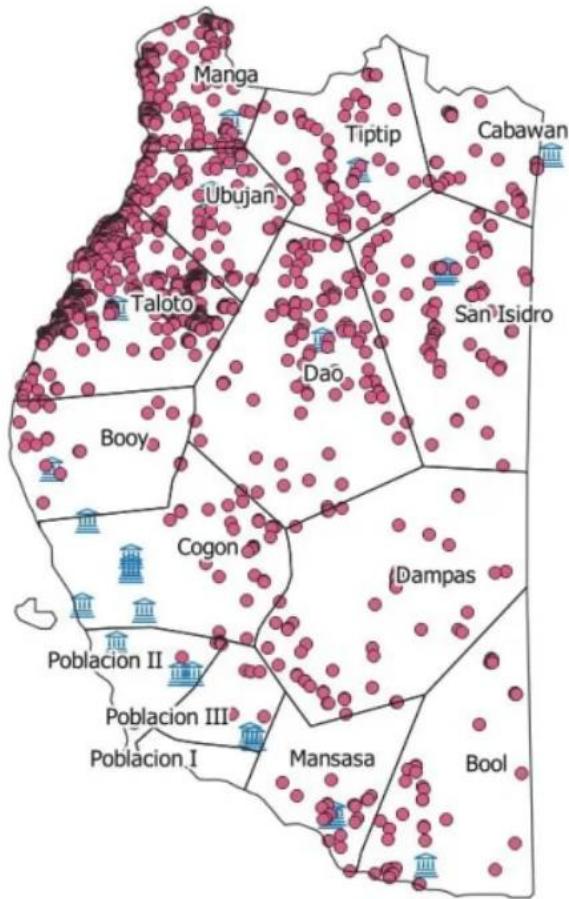
Why Do This?



“If you know the enemy and know yourself, you need not fear the result of a hundred battles. If you know yourself but not the enemy, for every victory gained you will also suffer a defeat. If you know neither the enemy nor yourself, you will succumb in every battle.”

— Sun Tzu, *The Art of War*

tags: strategy



* Given that the Satellite data on August 13, 2019 shows potential stagnant waters in red dots and DEPED public schools in Blue building icons. Kindly guess the top 3 areas that you think will have the highest dengue infections.

🔍 TOWN

dateofadmission.a...



dateofadmission.a...



dateofadmission.a...



My new sheet

TAGBILARAN

ALBUR

ALBURQUERQUE

ALICIA

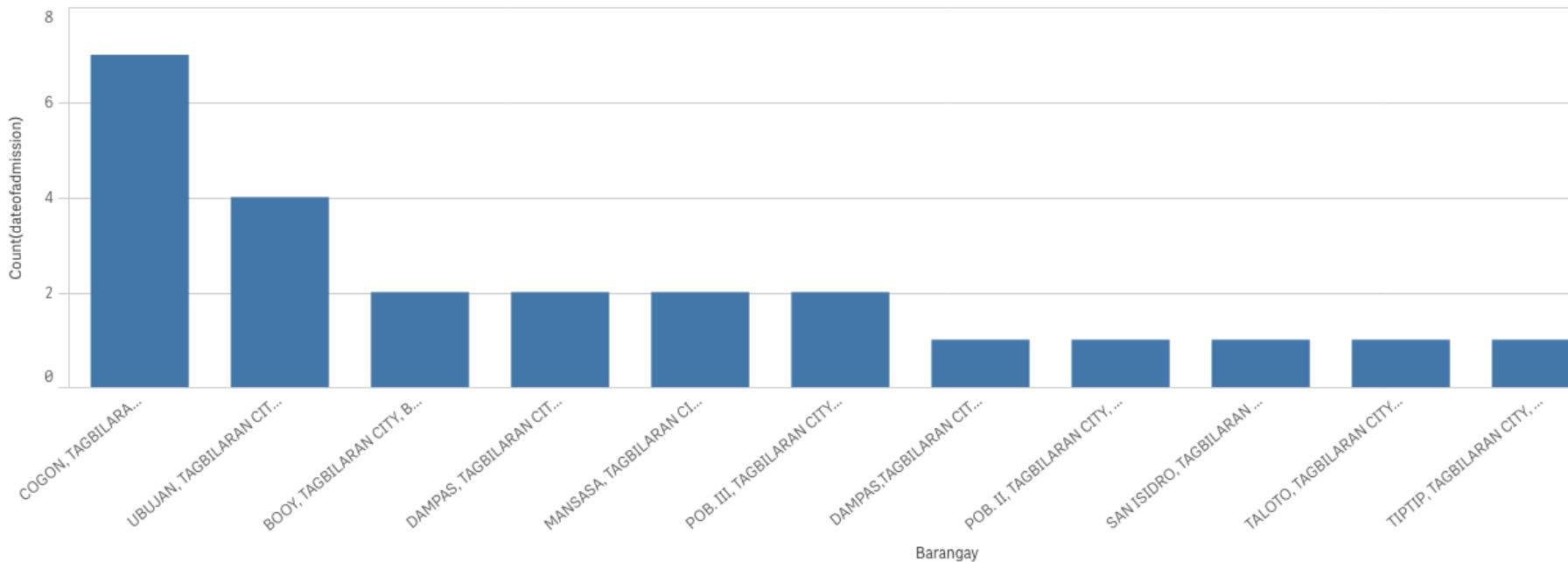
ANDA

ANTE

2019

Aug

Q3



Phases

Setting UP your 'rig'

Operating

Generating

Reporting

Did you know about BTI?

MOSQUITO CONTROL WHAT YOU NEED TO KNOW ABOUT BTI



Killing larvae that hatch from eggs reduces mosquito populations and may reduce the risk of getting infected with Zika, dengue, chikungunya, or West Nile spread by mosquitoes. *Bacillus thuringiensis* subspecies *israelensis* (Bti) bacteria is found in soil. Bti is used as a larvicide to kill larvae before they can grow into adults that can bite people. Bti has been used for mosquito control for more than 30 years.

During an outbreak, local government departments and mosquito control districts take the lead for large-scale mosquito control activities to quickly kill larvae that hatch from eggs. Depending on the size of the outbreak, larvicides may be applied using handheld sprayers, trucks, or airplanes.



Mosquito control truck used for spraying larvicides

1. Setting UP

Install [QGIS 3.6 or later](#)

Install SCP Plugins

Apply for Satellite Accounts

You do need GOOD internet to be able to access the massive satellite data sets.

Use [Projectbass.org](#) speedtest to check your bandwidth



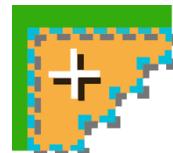
PROJECT
AMIHAN



Disaster Risk and Exposure Assessment for Mitigation

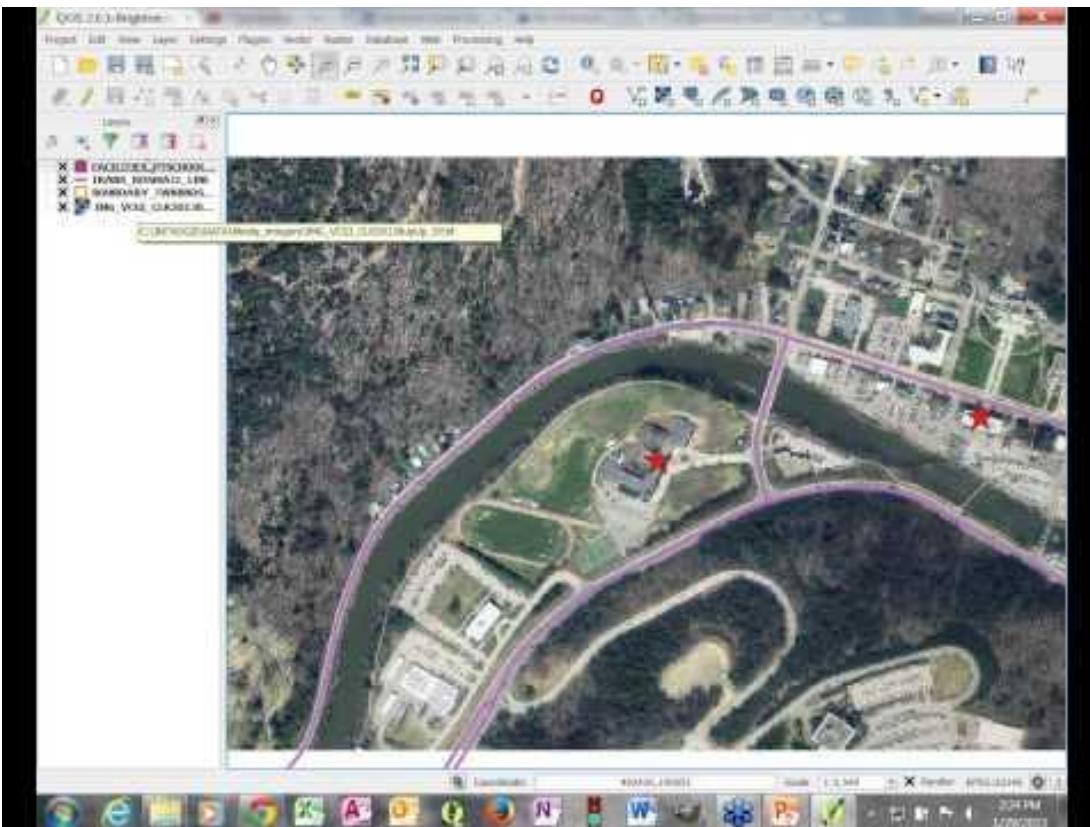


University of
New Hampshire



1 Setting UP QGIS Primer Video

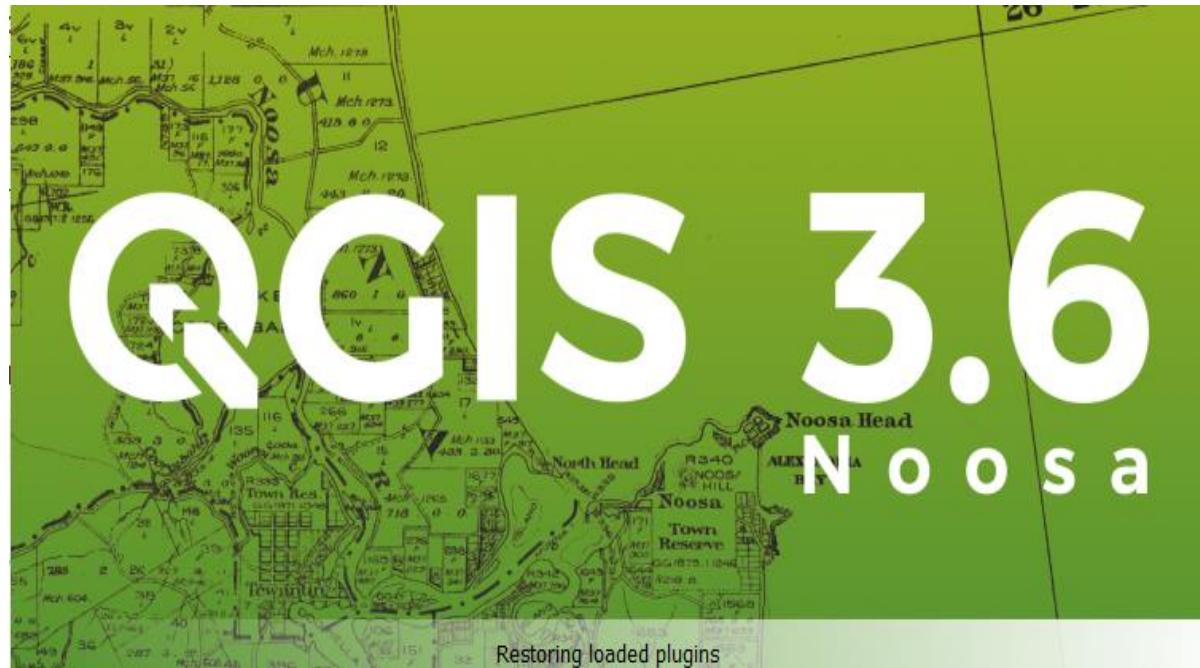
[QGIS Intro
Video](#)



1. Setting UP - Installing QGIS 3.6 or later

Installing QGIS

<https://qgis.org/en/site/forusers/download.html>



1. Setting UP- Applying for Satellite Accounts

Click [here to register](#) your account at **scihub.copernicus.eu**

Select “**Land**” for **Domain**, “**Research**” for **Usage** and “**Philippines**” for the **Country**

The screenshot shows the self-registration form for the Copernicus Open Access Hub. The URL in the browser is <https://scihub.copernicus.eu/dhus/#/self-registration>. The page features the ESA and Copernicus logos at the top left. The title "Copernicus Open Access Hub" is centered at the top right. The registration form consists of several input fields:

- Firstname and Lastname (text input fields)
- Username (text input field)
- Password and Confirm Password (text input fields)
- E-mail and Confirm E-mail (text input fields)
- Select Domain: A dropdown menu currently showing "Land".
- Select Usage: A dropdown menu currently showing "Research".
- Select your country: A dropdown menu currently showing "Philippines".

At the bottom of the form, a small note states: "By registering in this website you are deemed to have accepted the T&C for Sentinel data use." A large blue "REGISTER" button is located at the bottom right.

1. Setting UP- Applying for Satellite Accounts

We will input the account details later in the process to be used to automatically download satellite data.

For now, we only need the Sentinel-2

Note:

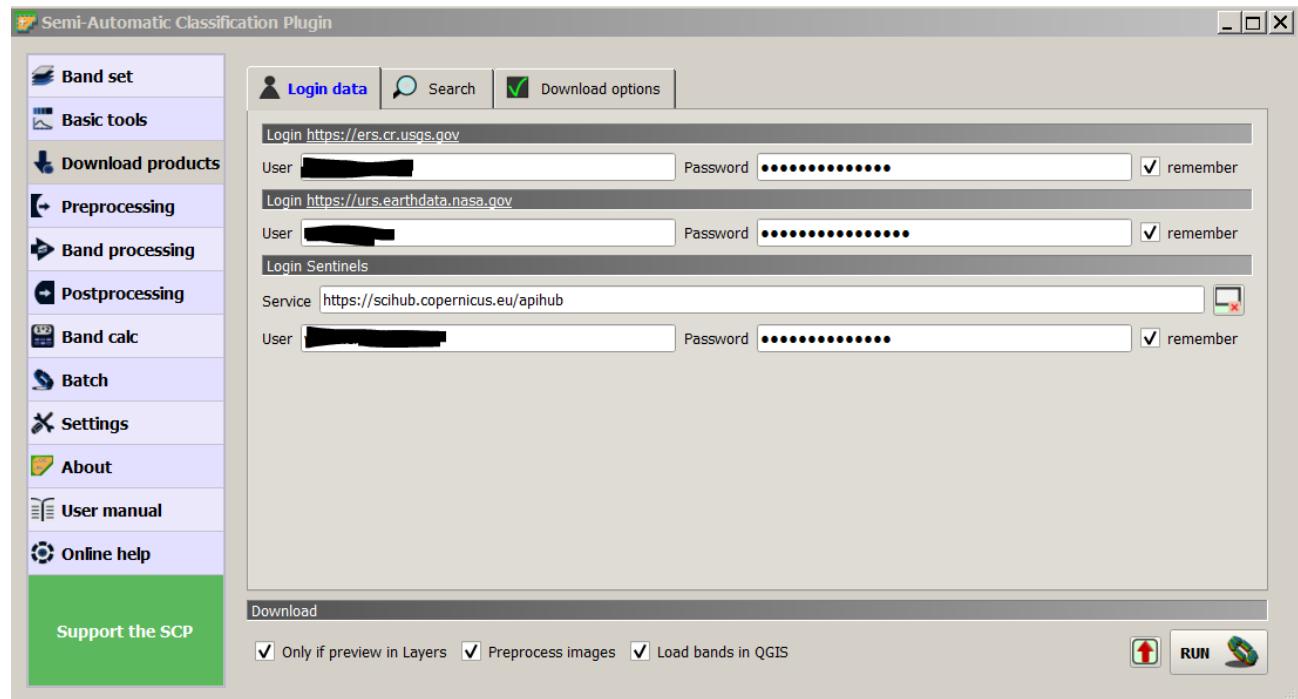
If you get error, try this:

<https://scihub.copernicus.eu/dhus/>

or

<https://finhub.nsdc.fmi.fi/> or

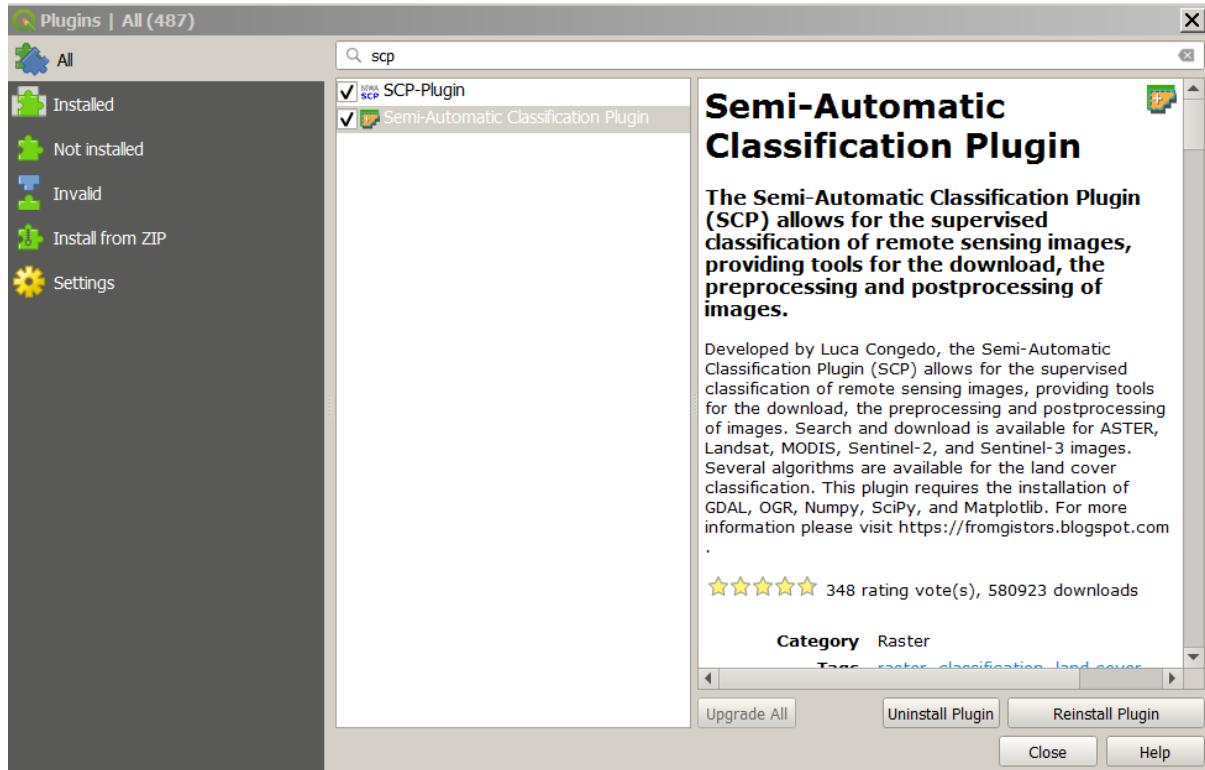
<https://data.sentinel.zamg.ac.at/>



1. Setting UP

Start the Plugin

Installation from the
“Plugins” -> Manage
and Install Plugin on
the top menu bar and
search for “SCP”



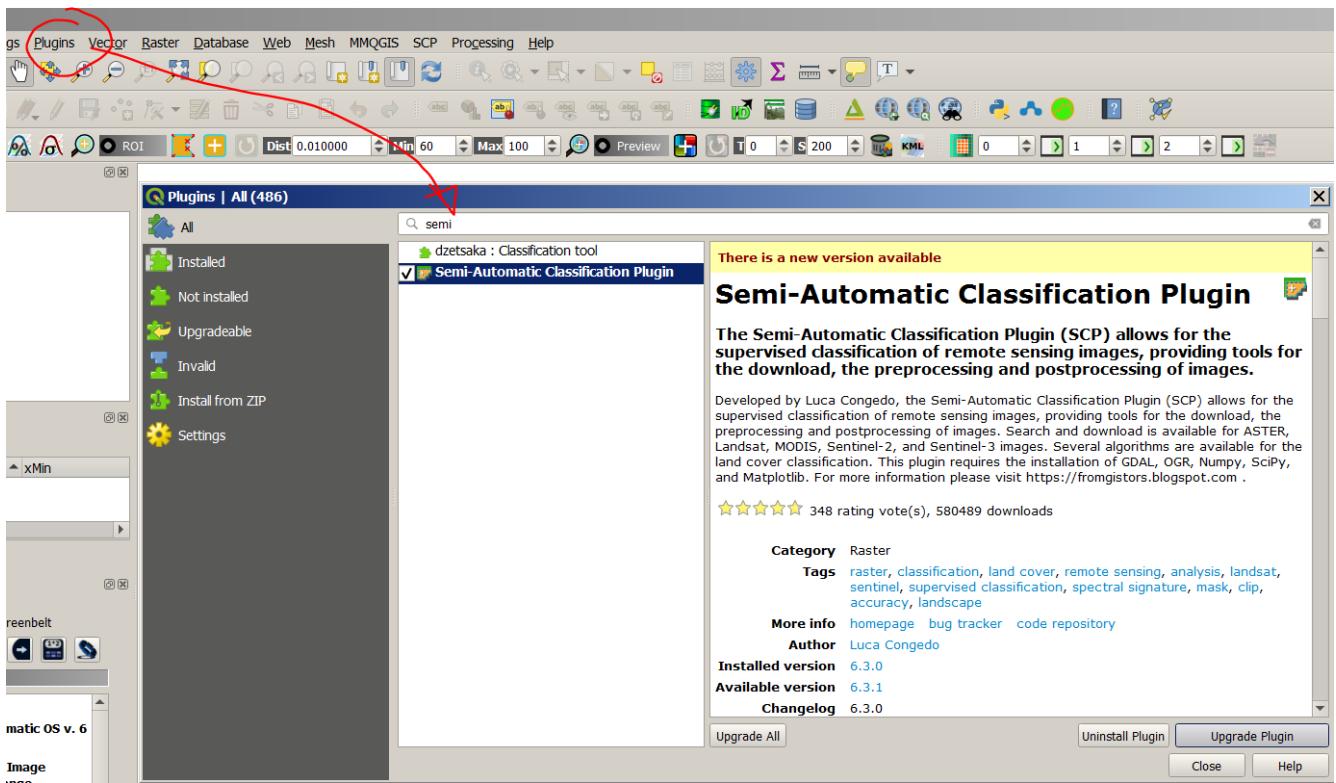
1. Setting UP - Installing SCP Plugin

Install Semi-Automatic Classification Plugin

Note extra steps ONLY for MAC users:

```
ruby -e "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/master/install)" </dev/null 2> /dev/null
```

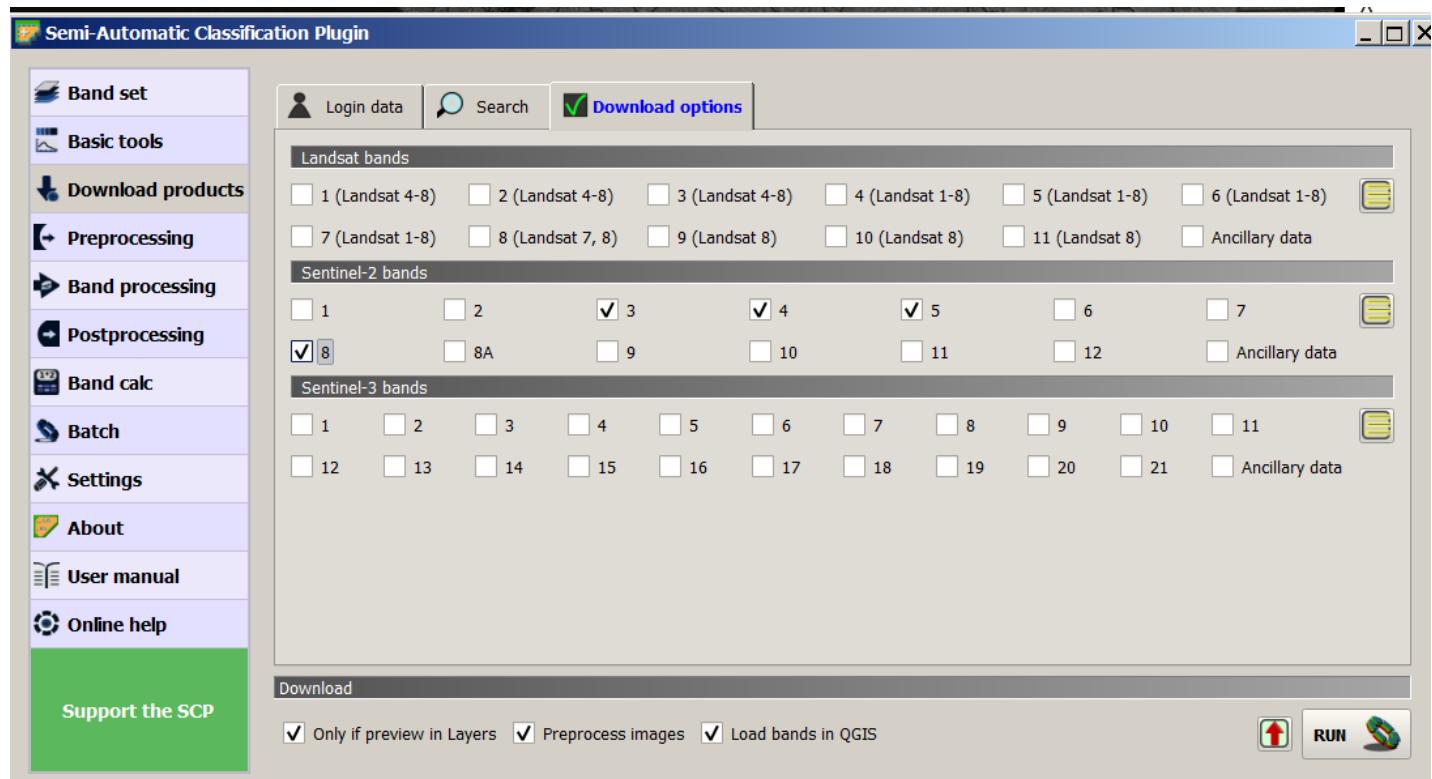
```
brew install lftp
```



1. Setting UP - SCP Configuration

We will use only 4 bands from Sentinel-2 Satellite:
3, 4, 5 and 8

You are all set for this phase.

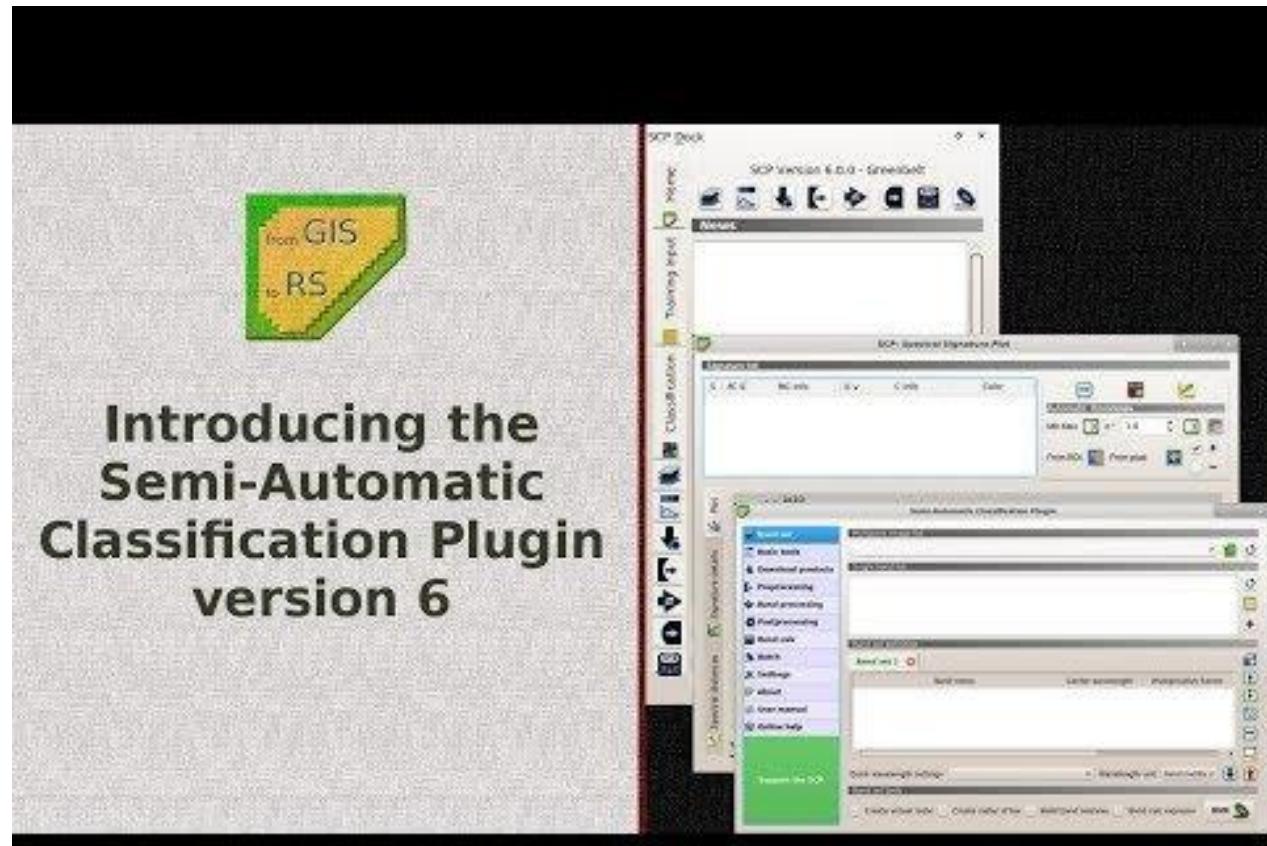


1. Setting UP

Optional:
Video on SCP

This tool enables us to download satellite data quickly without the need to visit several satellite websites.

It can also autofilter based on cloud cover %



2. Operating

Load Satellite Data

Compute FAPAR For Areas with Vegetation

Compute NDWI for Water Areas

I suggest we use “WGS 84” as our CRS

Now that we have our subset, we can move on to the main part of the project. Mapping water based on its reflectivity. To do this we have to calculate the [NDWI](#) using the formula:

$$NDWI = \frac{(X_{green} - X_{nir})}{(X_{green} + X_{nir})}$$

fapar= ((B8-B4)/(B8+B4) * (1.25-0.025))

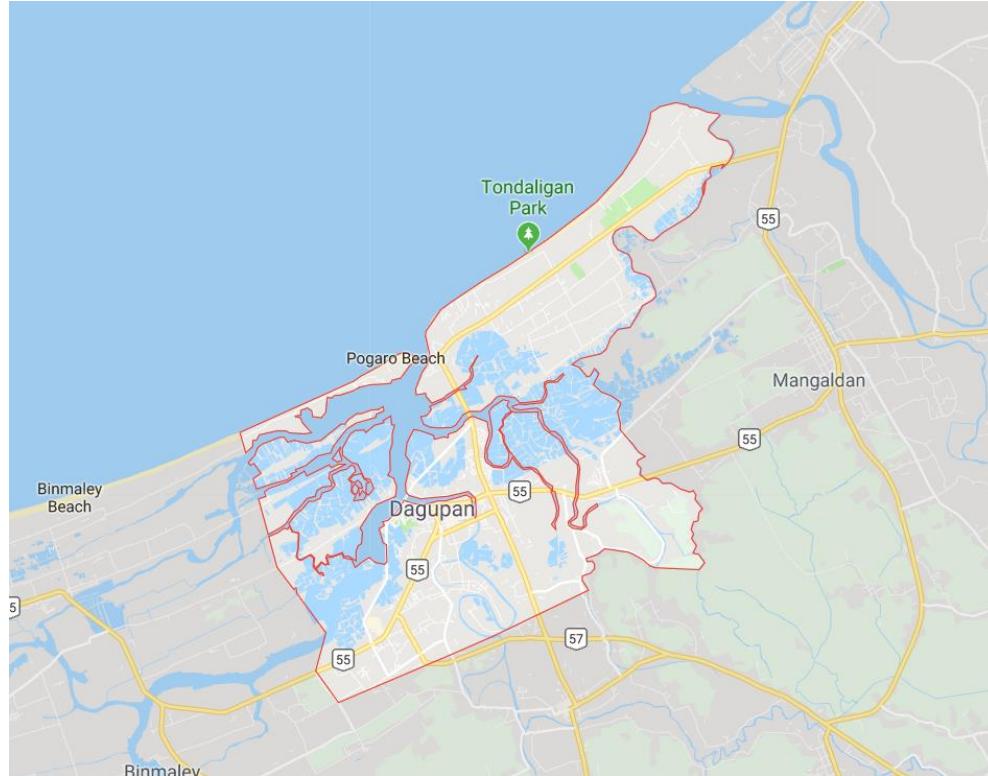
2. Operating - Load Satellite Data

Imagine drawing a rectangle around the area, then get the Upper Left(UL) and Lower right(LR) corners of that rectangle.

Here, we pick dagupan and use maps.google.com and get the Upper Left and lower Right Coordinates (right click, What's here?)

Upper Left 16.110642, 120.277002

Lower Right 16.000581, 120.301448



2. Operating - Load Satellite Data

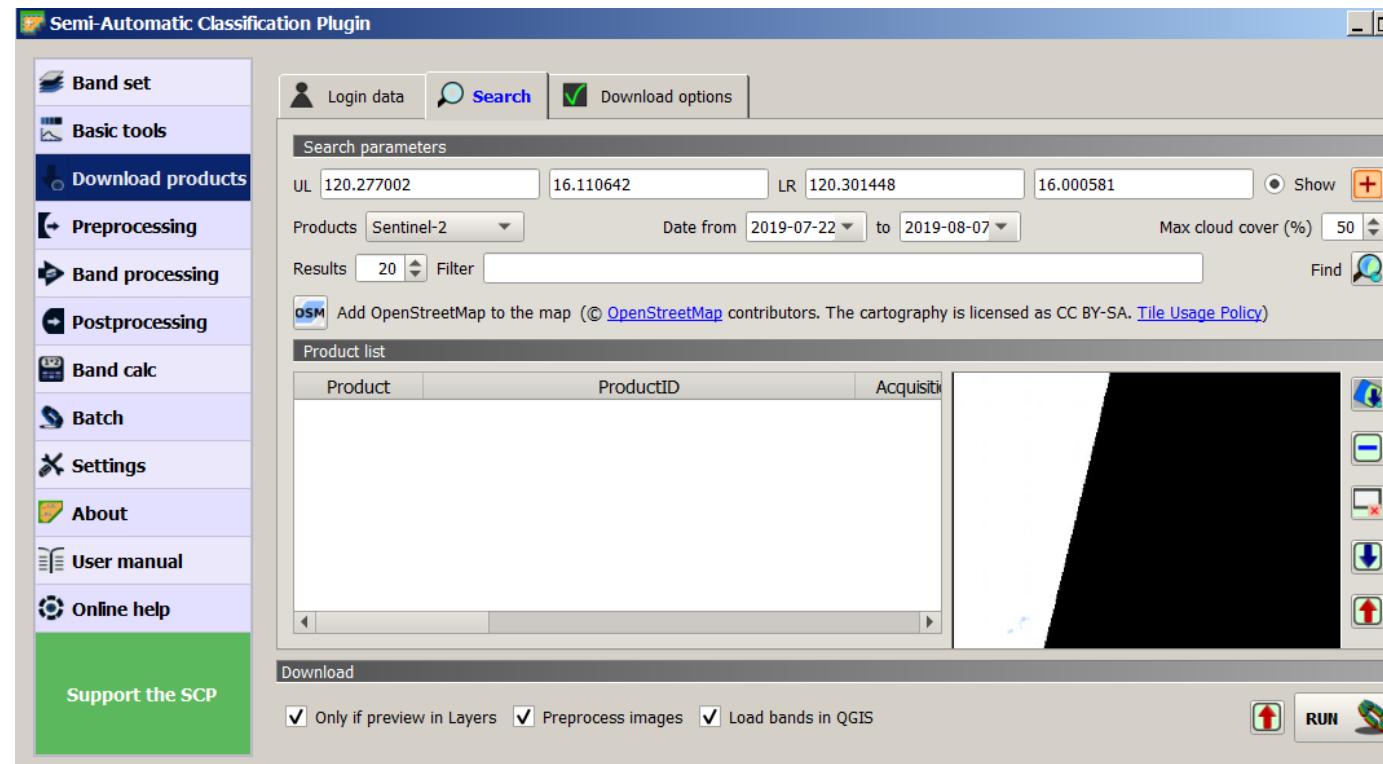
On the **top menu**, select [SCP] then [Download Products].

Enter the Coordinates into the SEARCH parameters, including the date range and Max cloud cover (40-50%)

Upper Left 16.110642, 120.277002

Lower Right 16.000581, 120.301448

Then hit **FIND** to list the available satellite feeds that match your criteria.



2. Operating - Load Satellite Data

Choose the BEST satellite image from the batch of data made available.

Take note that the **less cloud cover, the better.**

Note: You may need to [Display Preview First], **BEFORE** you click on [RUN]

Semi-Automatic Classification Plugin

Band set Basic tools Download products Preprocessing Band processing Postprocessing Band calc Batch Settings About User manual Online help Support the SCP

Login data Search Download options

Search parameters

UL 120.277002 16.110642 LR 120.301448 16.000581 Show +
Products Sentinel-2 Date from 2019-07-22 to 2019-08-07 Max cloud cover (%) 50 Find

Results 20 Filter

Add OpenStreetMap to the map (© OpenStreetMap contributors. The cartography is licensed as CC BY-SA. [Tile Usage Policy](#))

Product list

Product	ProductID	AcquisitionDate
1 Sentinel-2	L2A_T50PRC_A021350_20190725T023828	2019-07-25T02
2 Sentinel-2	L2A_T51PTT_A021350_20190725T023828	2019-07-25T02
3 Sentinel-2	L1C_T51PTT_A021350_20190725T023828	2019-07-25T02
4 Sentinel-2	L1C_T50PRC_A021350_20190725T023828	2019-07-25T02

Download

Only if preview in Layers Preprocess images Load bands in QGIS

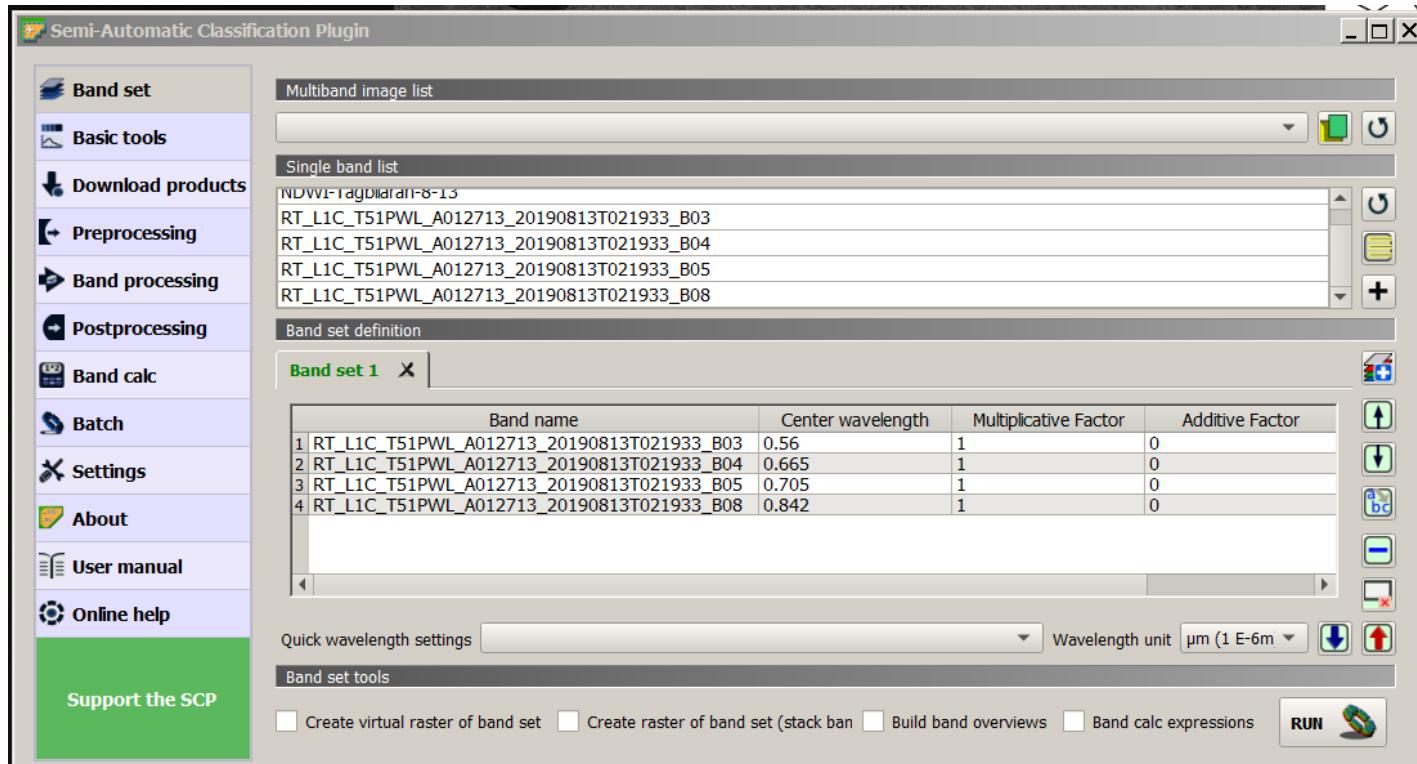
Up RUN Down

2. Operating - Load Satellite Data

Click on RUN to save the satellite data to a chosen folder.

In the BAND SET, you will now see B03, B04 and B08 corresponding to bandset 3,4 and 8

If you see NOTHING, hit the Refresh ICON



2. Operating - Compute for Water Areas

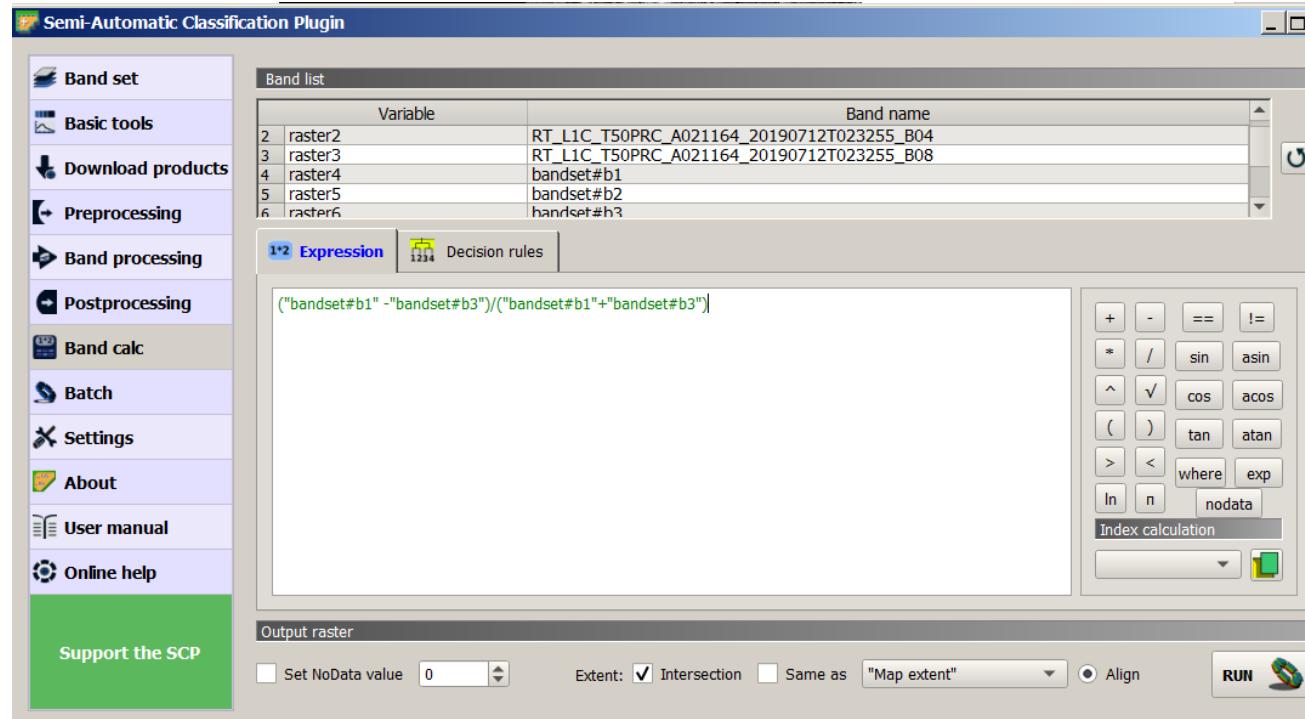
Go to [Band Calc] and in the [Expression] tab, Compute NDWI by pasting the formula below:

For Rural Areas:

$(\text{"bandset#\#b1"} - \text{"bandset#\#b4"}) / (\text{"bandset#\#b1"} + \text{"bandset#\#b4"})$

For Urbanized Areas:

$(\text{"bandset#\#b1"} - \text{"bandset#\#b3"}) / (\text{"bandset#\#b1"} + \text{"bandset#\#b3"})$

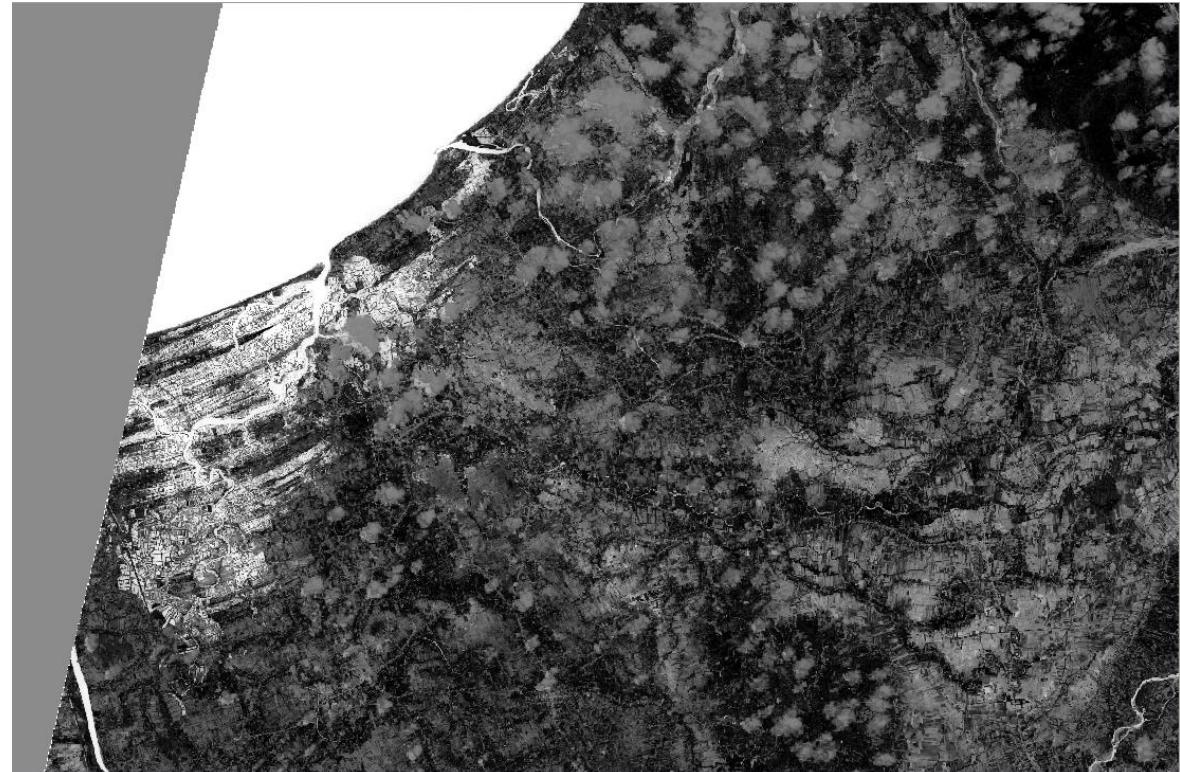


2. Operating - Display Water Areas

Save the file as NDWI.tif

Your output will look
something similar to this:

Areas in White are water
areas due to their high
reflectance.

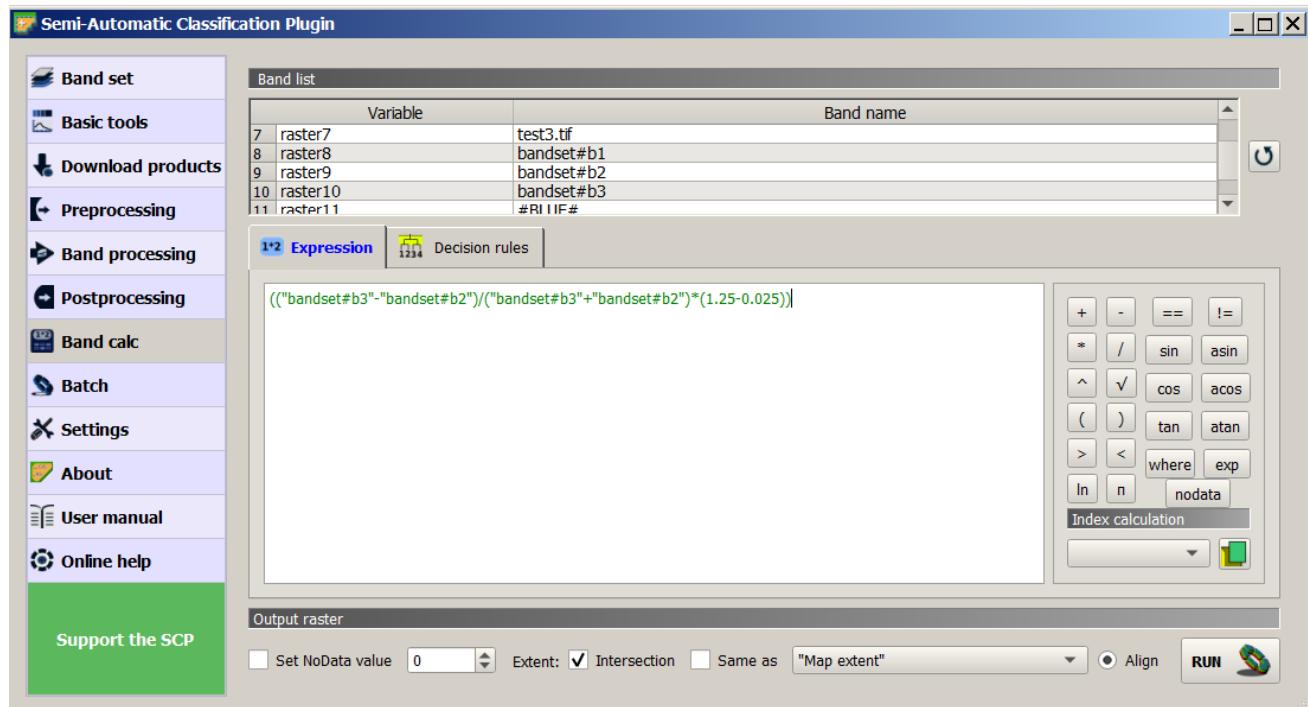


2. Operating - Computer for Areas with Vegetation

Do the same for FAPAR Computation (please paste the formula below)

```
((("bandset#b3"-  
"bandset#b2")/("bandset  
#b3"+"bandset#b2")*(1.2  
5-0.025))
```

Then click [RUN]



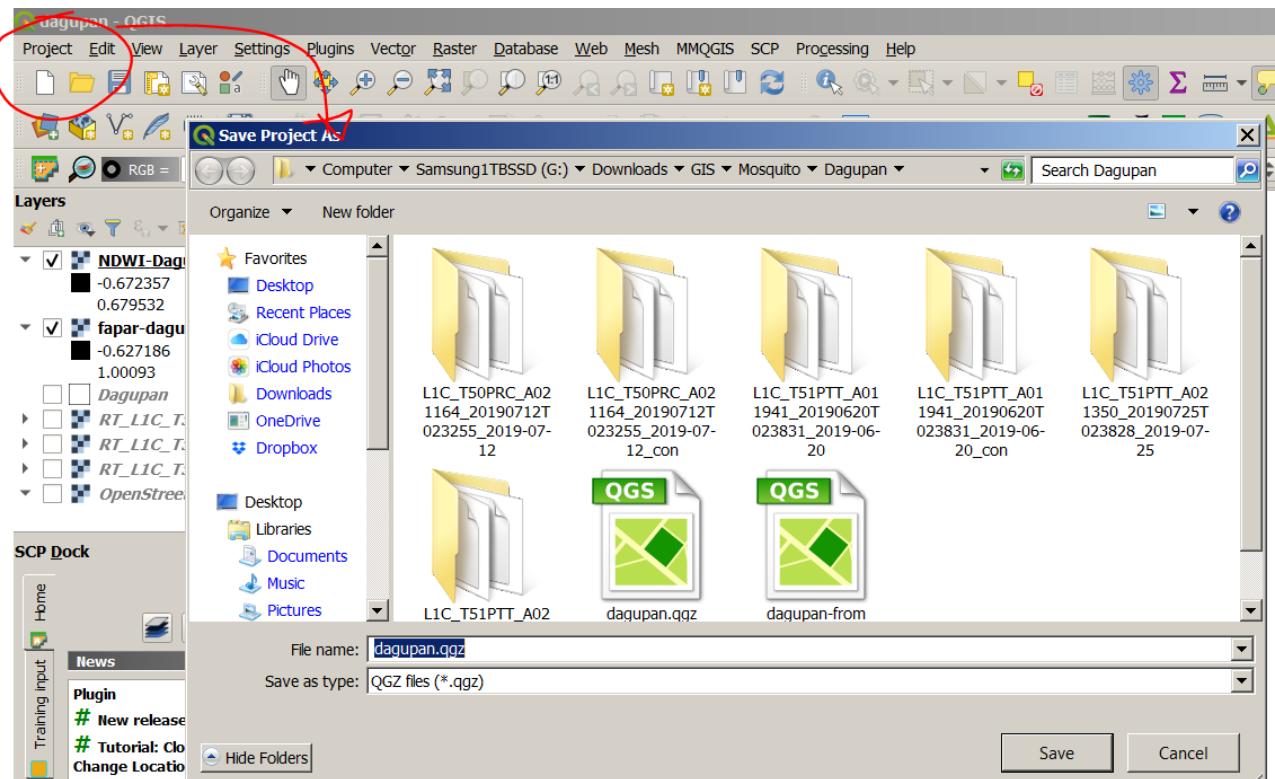
2. Operating - Display Areas with Vegetation

FAPAR Compute results
should look something
like the one on the right



2. Operating - Saving the Project

At this point, please **SAVE** your work.



3. Generating

Import Barangays.shp for PhilGIS.org

Compute For Stagnant Water

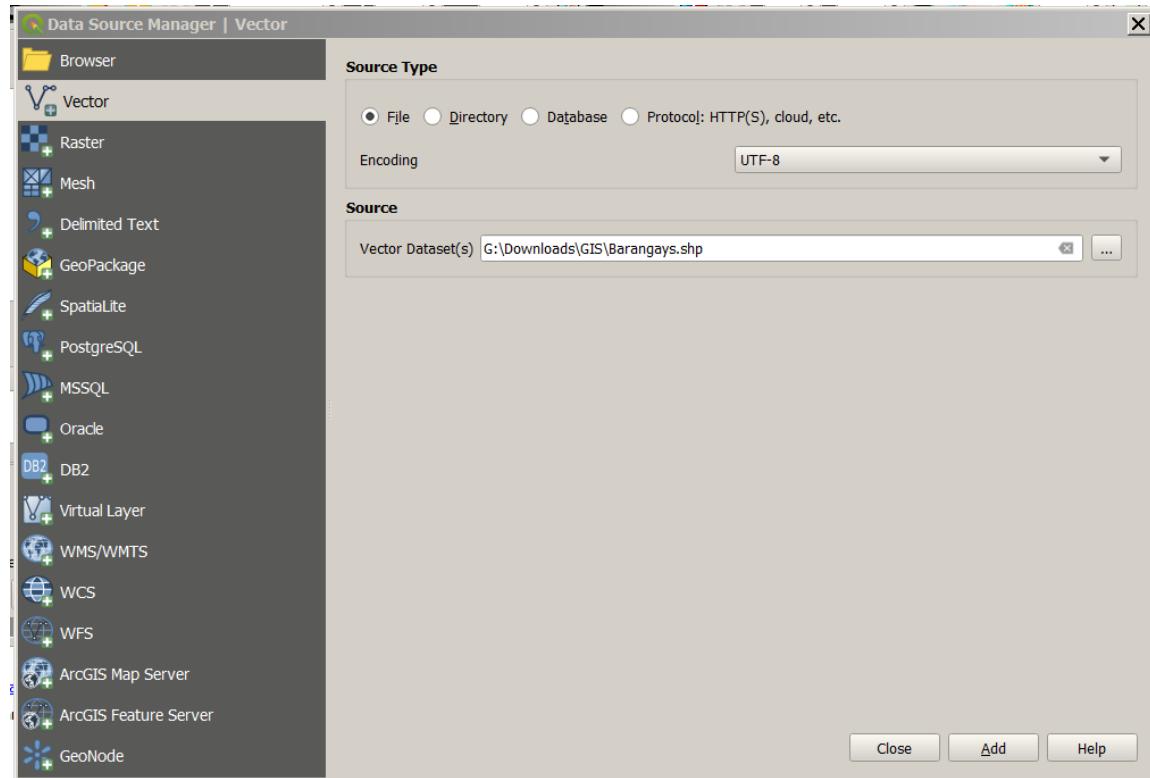


Biological control using *Gambusia Affinis*
(mosquito fish)

3. Generating - Importing Barangay Shape File

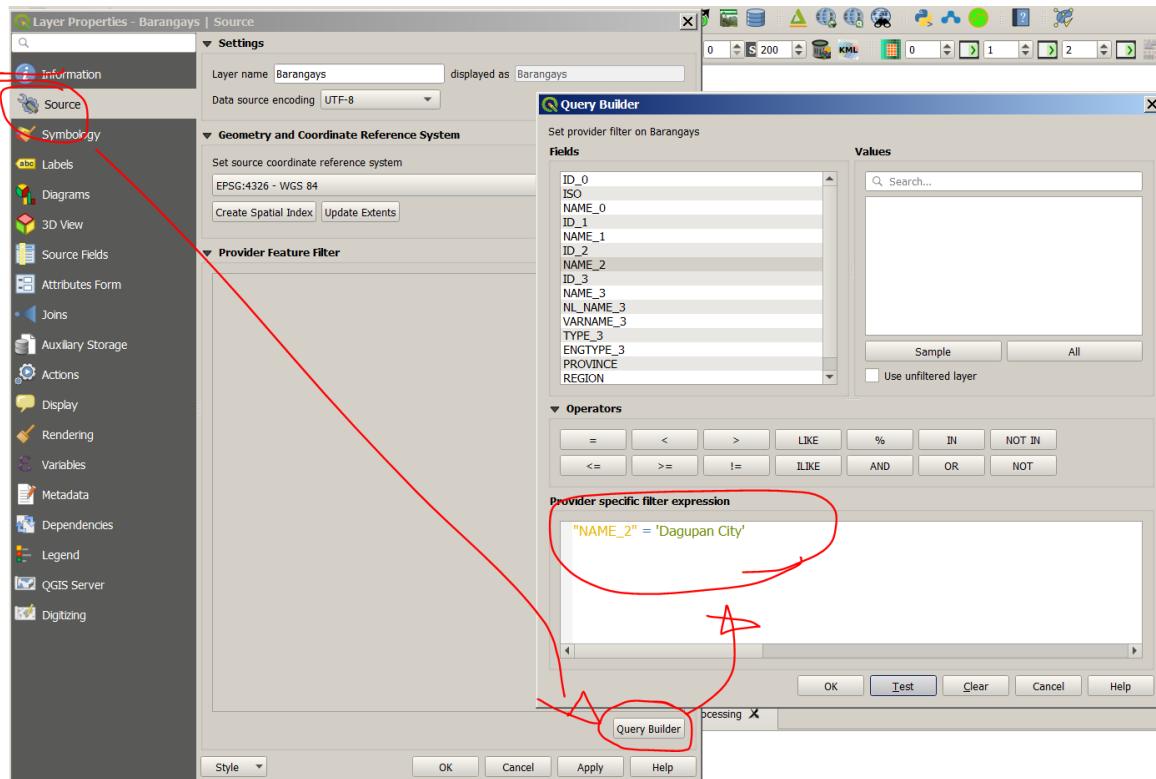
The Barangays.shp helps us define the geo-political boundaries and later, we will use it to 'clip the edges' of our satellite images

Note: we have a special shp file with DepED Public Schools in them.



3. Generating - Importing Barangay Shape File

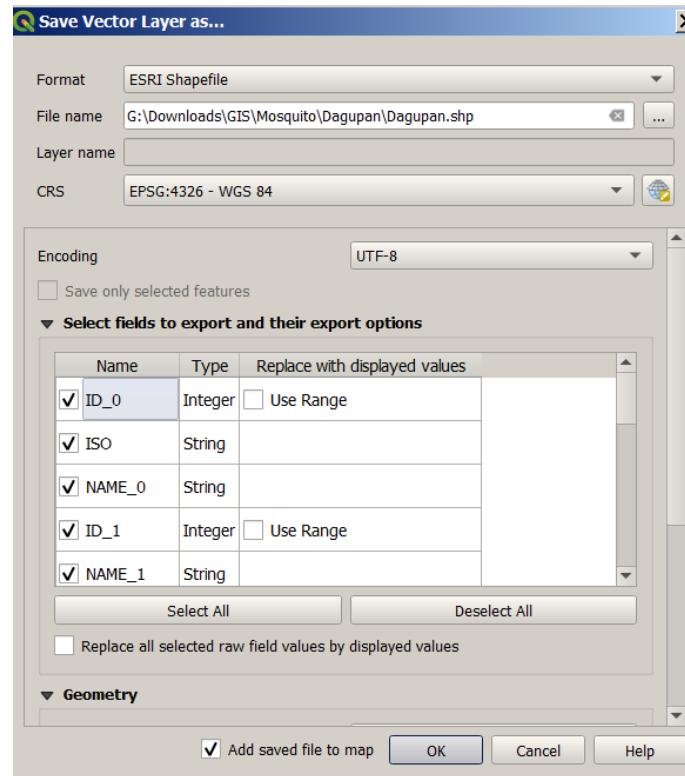
We only need
Dagupan. So in the
properties we filter
so only Name2
matches "Dagupan
City"



3. Generating - Export as Dagupan.shp File

Right Click on
Barangays and select

'Export Save Features
as"

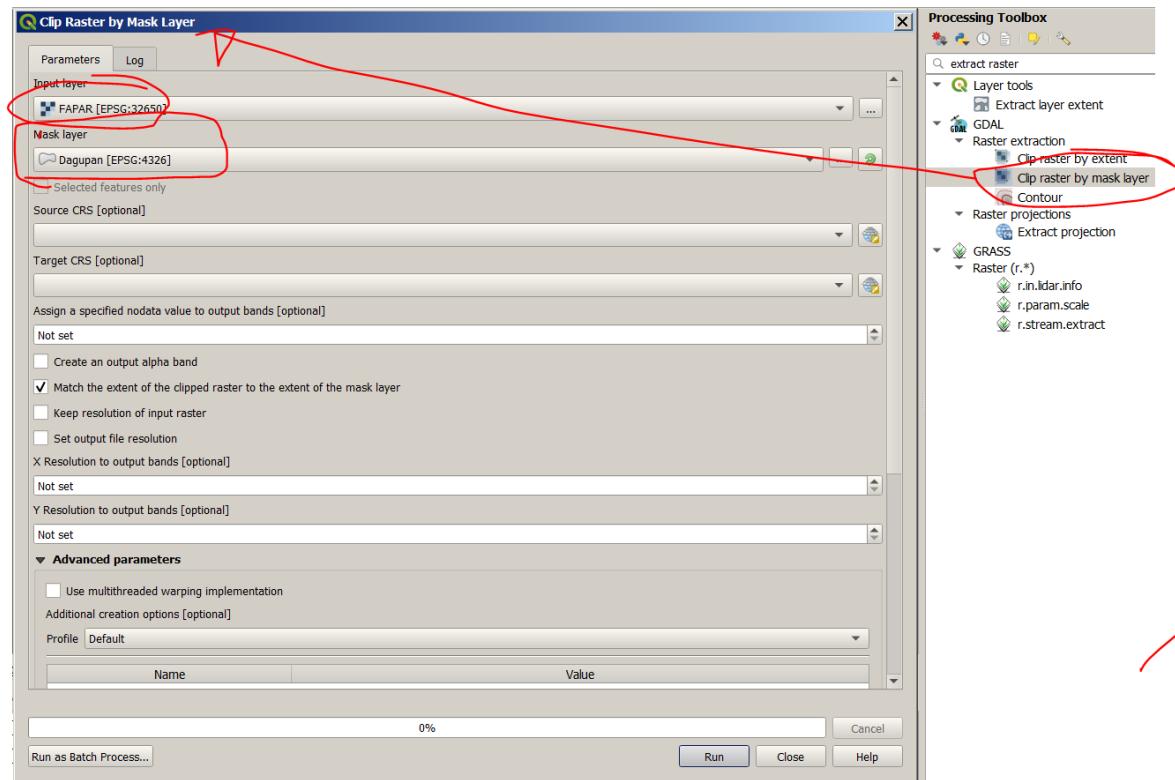


3. Generating - Using Dagupan.shp to Trim TIF

In the Processing Toolbox, find and use the “Clip Raster by mask layer”

Use the
Dagupan.shp as the
MASK on both Fapar
and NDWI

The result will be a
smaller file for both

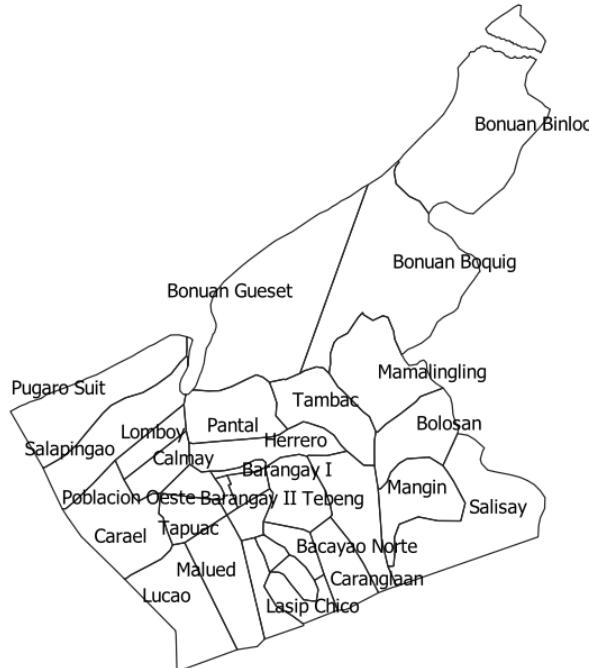


3. Generating - Compute Stagnant Water Areas

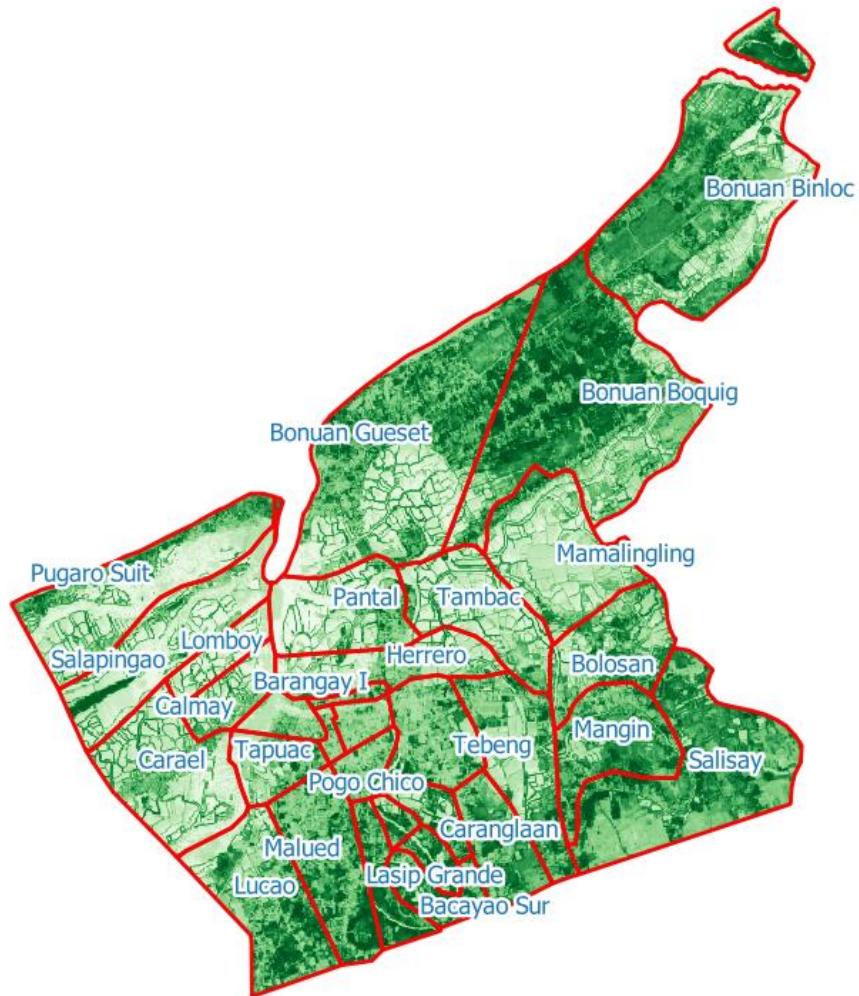
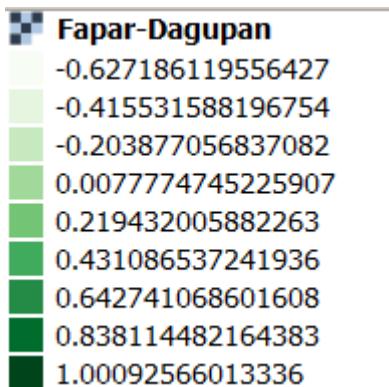
You should get
something that looks like
this:

(i used transparent fill on
barangays.shp file)

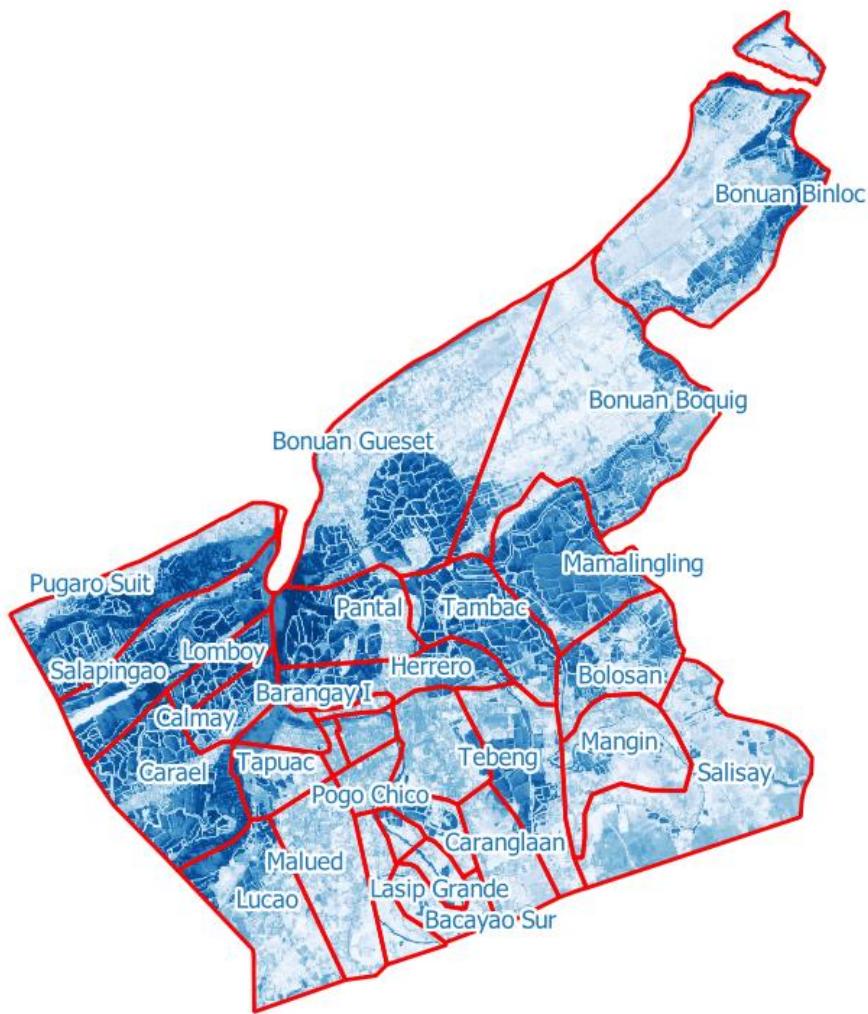
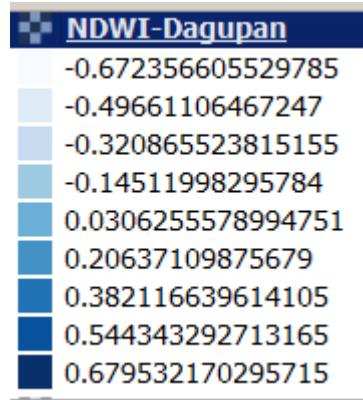
(I also added Labels, so
we can see each
barangay name)



FAPAR (Vegetation) Map



NDWI Water Map



3. Generating - Compute Stagnant Water Areas

Use Raster Calculator to compute this:

WithWater =

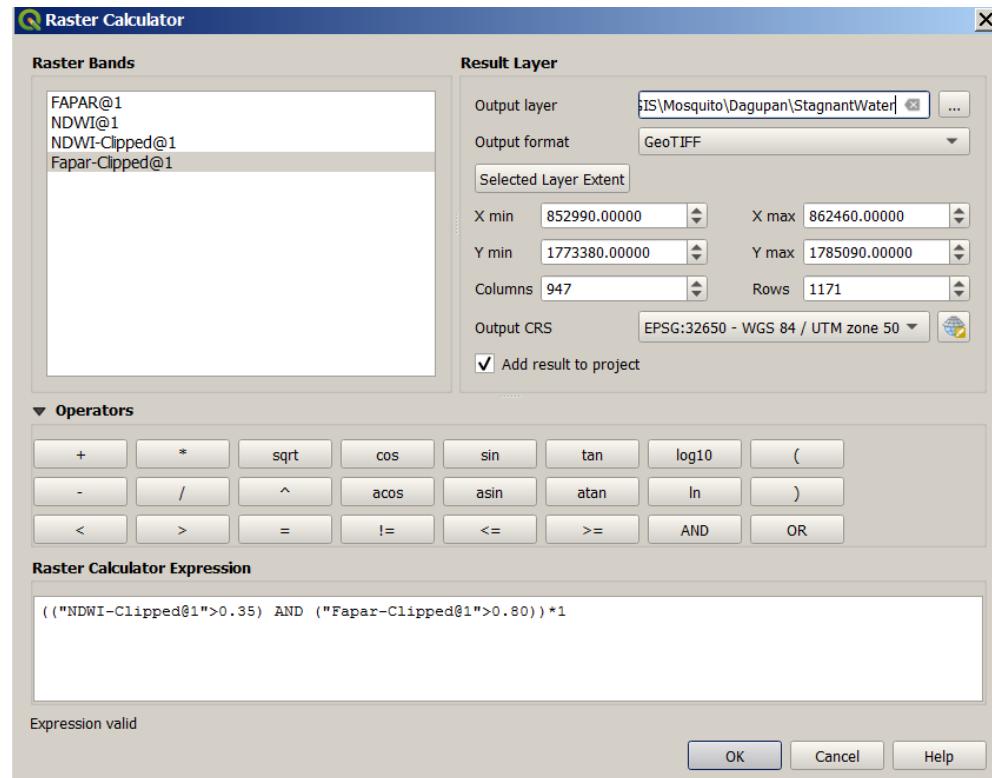
$((\text{"NDWI.tif@1"} > 0.\text{xx}))$

WithVegetation =

$(\text{"FAPAR.tif@1"} > 0.\text{xx})) * 1$

StagnantWater =

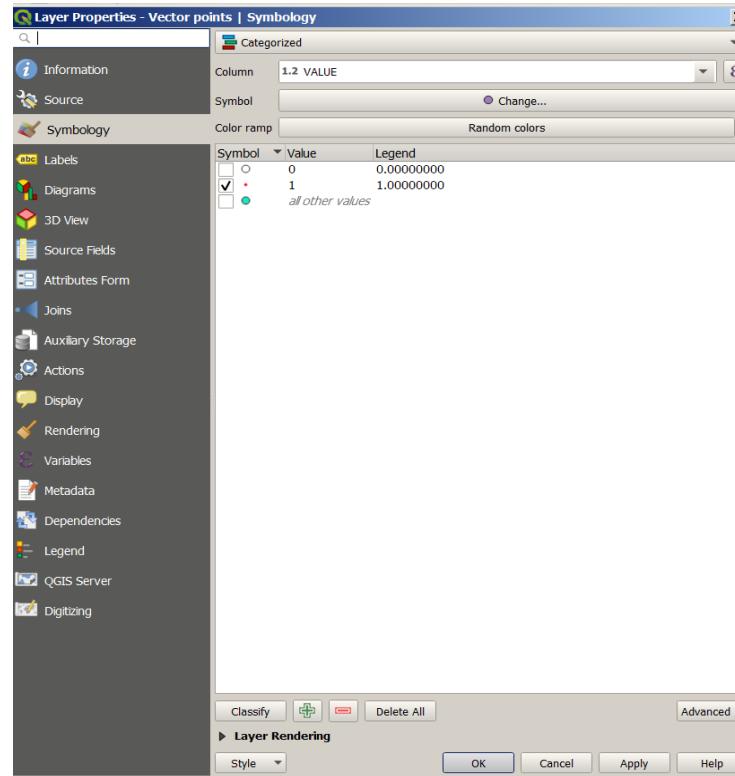
WithWater AND
withVegetation



3. Generating - Display Stagnant Water Areas

Use Raster to Points Tool
to convert STAGWATER.tif
to shape file
(Vector_Points).

Then, we increase the
size of the points to make
them visible.



4. Reporting

Displaying the Map

Adding Barangay Data

Exporting the Map

Sorting on Excel

APRIL 26, 2016

Bacteria-breeding coconuts may control mosquitoes that transmit zika and malaria

CONTRIBUTOR: ROB GOODIER



Salitral is a breeding ground for mosquitoes. Photo courtesy of Palmira Ventosilla

Salitral is a fine place for mosquitoes to breed. Species that spread malaria thrive in its ponds, agricultural canals, year-round temperate weather and periodic monsoon-type rains.

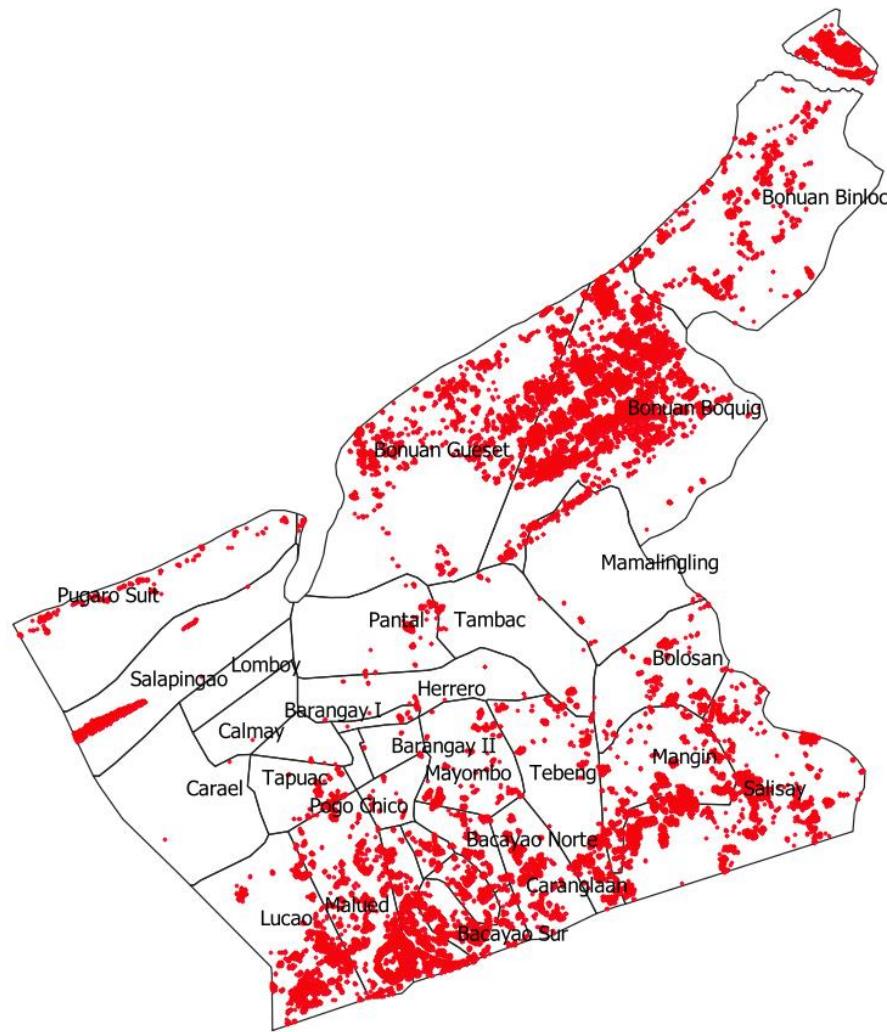
But for 12 days in 1995, eight ponds in Salitral were nearly free of mosquito larva. Their populations were decimated by a high concentration of *Bacillus thuringiensis israelensis*, or Bti. And the delivery system was coconuts.

The microbiologist Dr. Palmira Ventosilla developed the homegrown method for incubating Bti at the Experimental Microbiology Lab at the Universidad Peruana Cayetano Heredia in Lima, Peru. She put together a Bti kit. With it, anyone with basic know-how can inoculate a coconut, wait for the Bti population to grow suitably potent, and then crack the coconut and toss it in a pond.

These biological coconut bombs are apparently harmless to people and most other organisms. The World Health Organization [issued a guideline](#) saying that even in drinking water, Bti is not known to be harmful to people. But it is lethal to the mosquito species that spread disease in the world's tropics.

4. Reporting

Displaying the Map



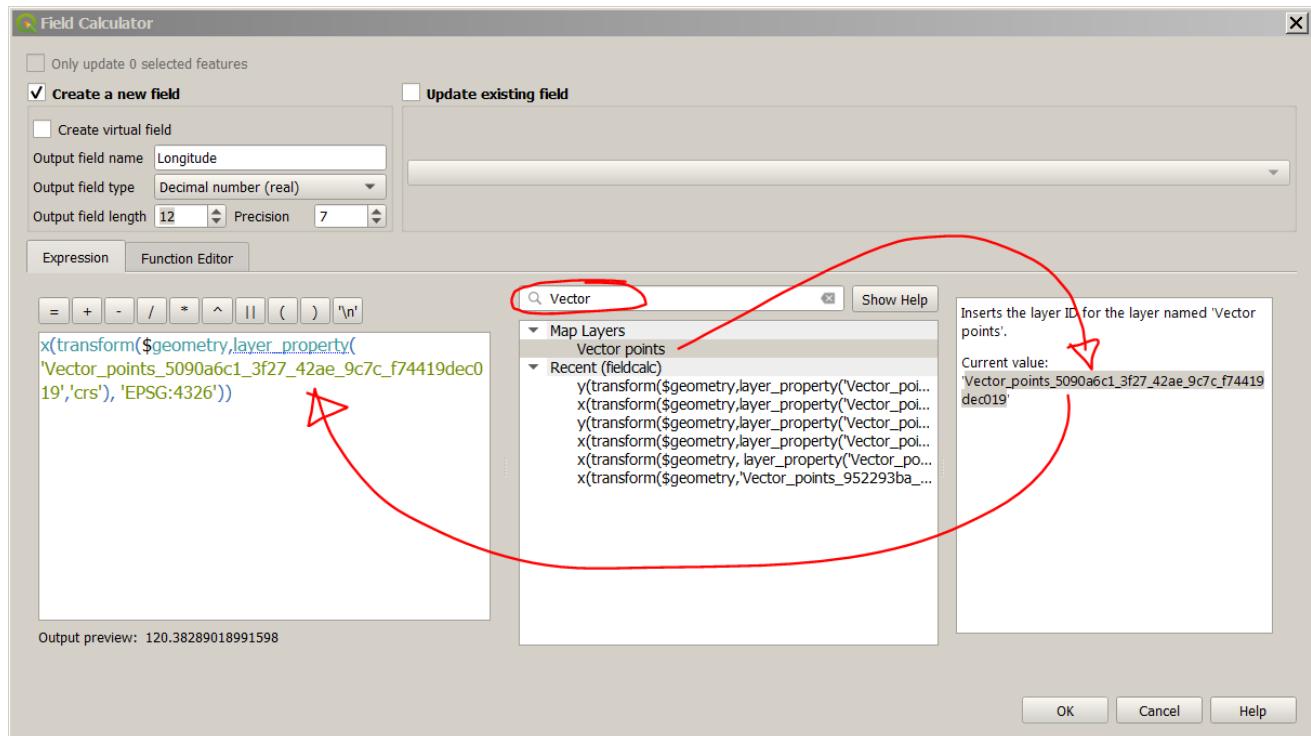
4. Reporting

Adding/converting X and Y coordinates to GPS

Toggle Edit Mode, then [Open Attribute Table] and [Field Calculator]

Create **Longitude** and **Latitude** field by using the formulas.

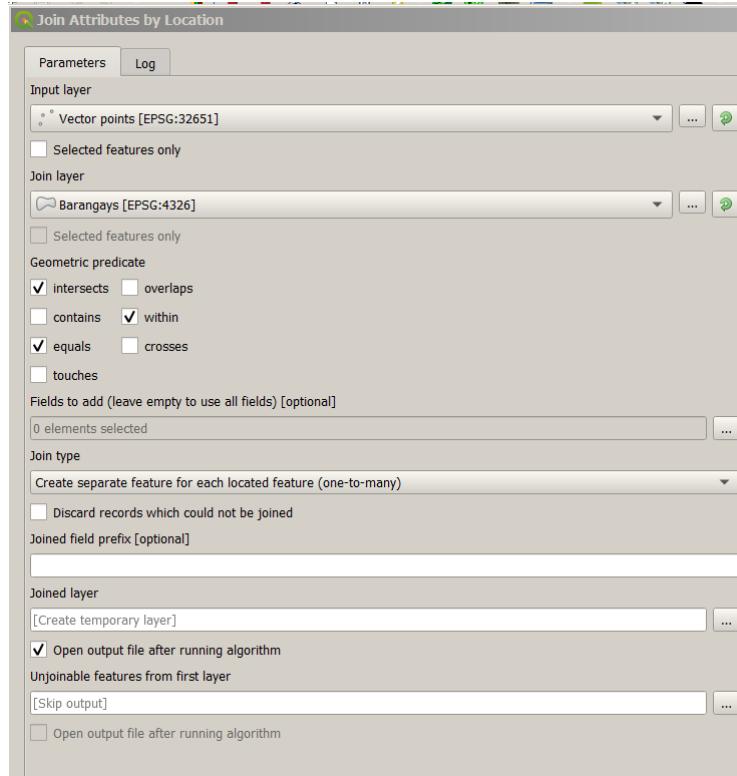
Note: Substitute the Vector Point.



4. Reporting

Adding Barangay Names
to the table.

Use the **“Join Attribute
by Location”** command



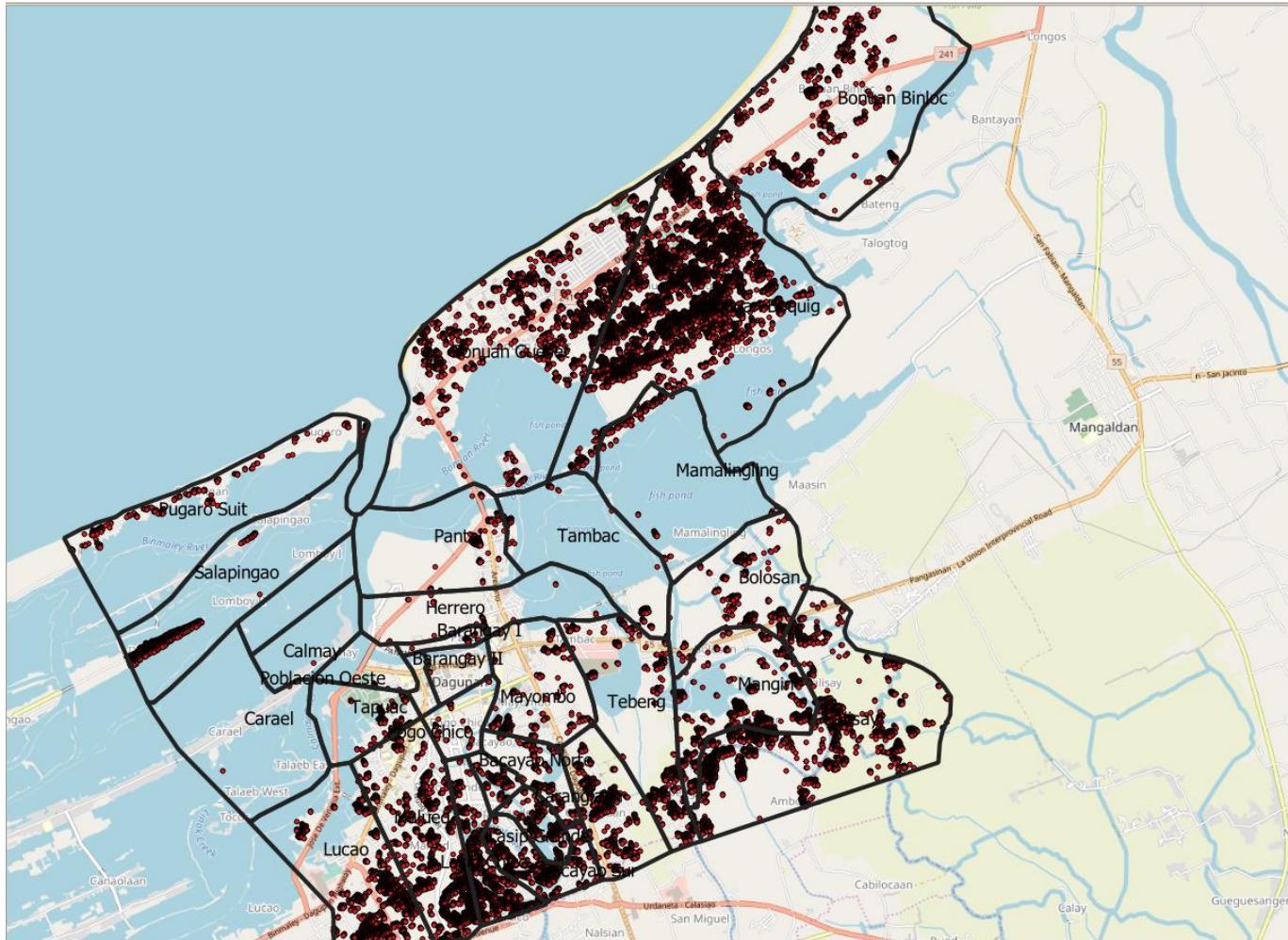
4. Reporting

The Joined Table now has Lat, Long, and Barangay Names, Municipal Names

	VALUE	Longitude	Latitude	ID_0	ISO	NAME_0	ID_1	NAME_1	ID_2	NAME_2	ID_3	NAME_3	NL_NAME_3	VARNAME_3	TYPE_3
1	1.00000000	120.341556980...	16.0374768944...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
2	1.00000000	120.341650362...	16.0374780528...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
3	1.00000000	120.341743743...	16.0374792112...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
4	1.00000000	120.341837125...	16.0374803695...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
5	1.00000000	120.341930506...	16.0374815278...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
6	1.00000000	120.341558178...	16.0373865884...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
7	1.00000000	120.341651559...	16.0373877468...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
8	1.00000000	120.341744941...	16.0373889052...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
9	1.00000000	120.341838322...	16.0373900635...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
10	1.00000000	120.341931704...	16.0373912218...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
11	1.00000000	120.342025086...	16.0373923800...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
12	1.00000000	120.341465994...	16.0372951241...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
13	1.00000000	120.341559376...	16.0372962825...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
14	1.00000000	120.341652757...	16.0372974409...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
15	1.00000000	120.341746139...	16.0372985992...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
16	1.00000000	120.341839520...	16.0372997575...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
17	1.00000000	120.341932902...	16.0373009158...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
18	1.00000000	120.341467192...	16.0372048181...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
19	1.00000000	120.341560574...	16.0372059765...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
20	1.00000000	120.341653955...	16.0372071349...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
21	1.00000000	120.341747336...	16.0372082933...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay
22	1.00000000	120.341468390...	16.0371145122...	177	PHL	Philippines	61	Pangasinan		1255	Dagupan City	32412	Bacaya Norte		Barangay

4. Reporting

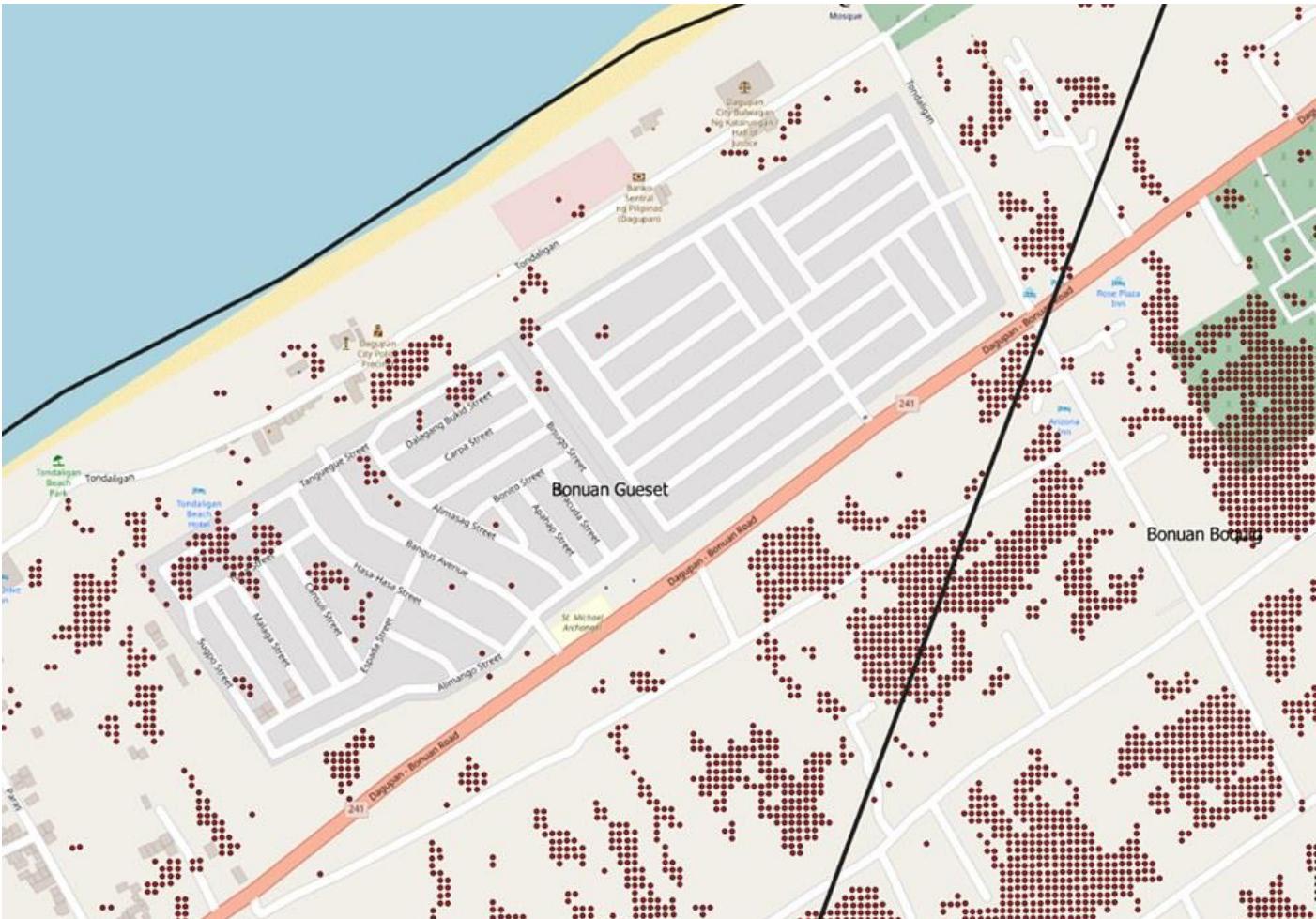
With
OpenStreetMaps as
background



4. Reporting

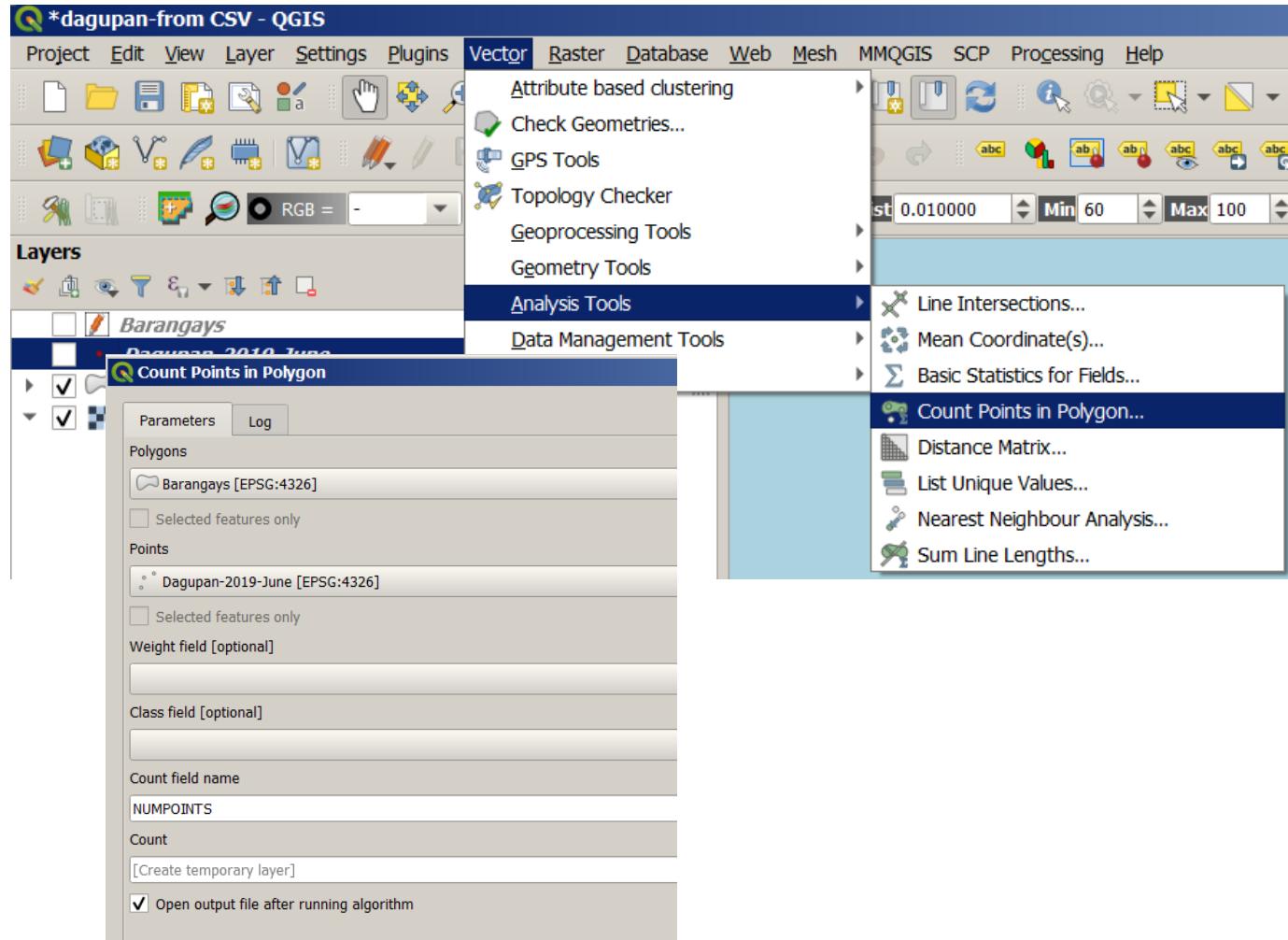
With
OpenStreetMaps as
background

Zoomed INTO a
subdivision



4. Reporting

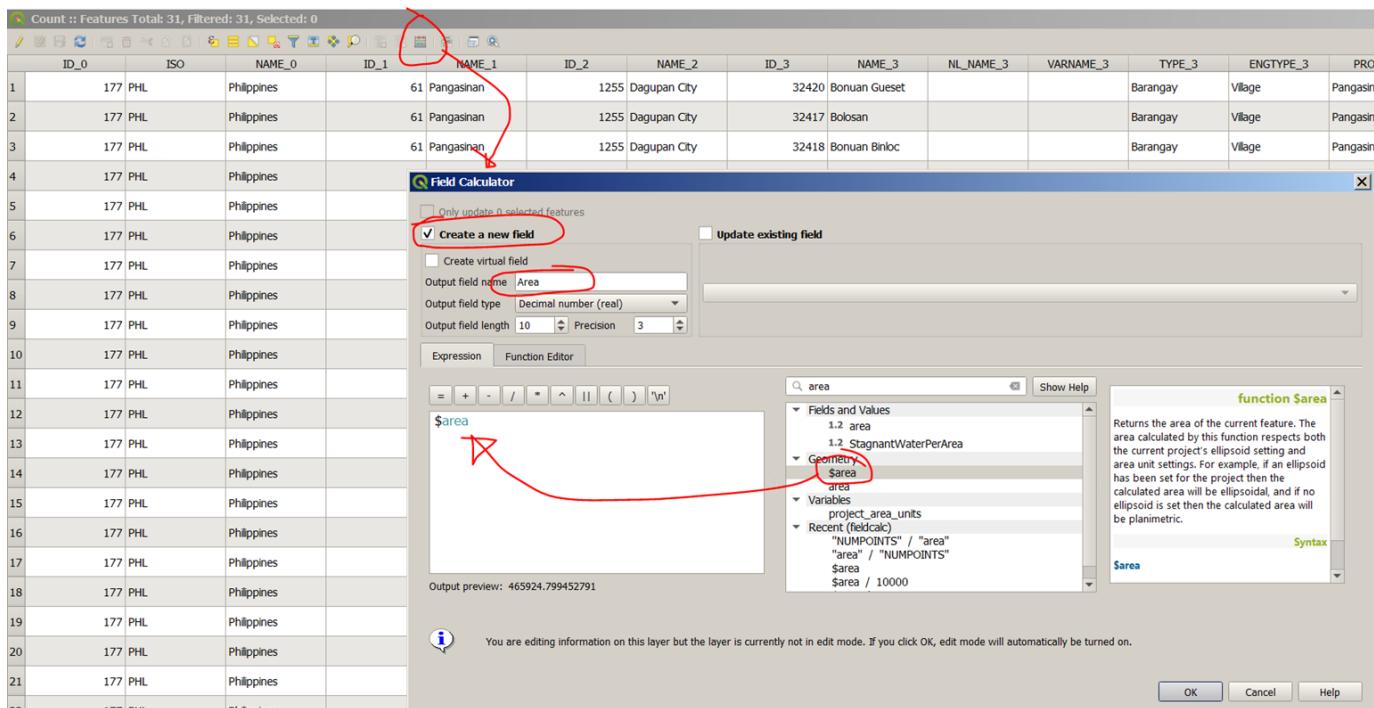
Counting the
stagnant water Per
barangay Using
Vector **Analysis**
Tools- Count Points
in Polygon



4. Reporting

Calculating Area per geographic unit (barangay)

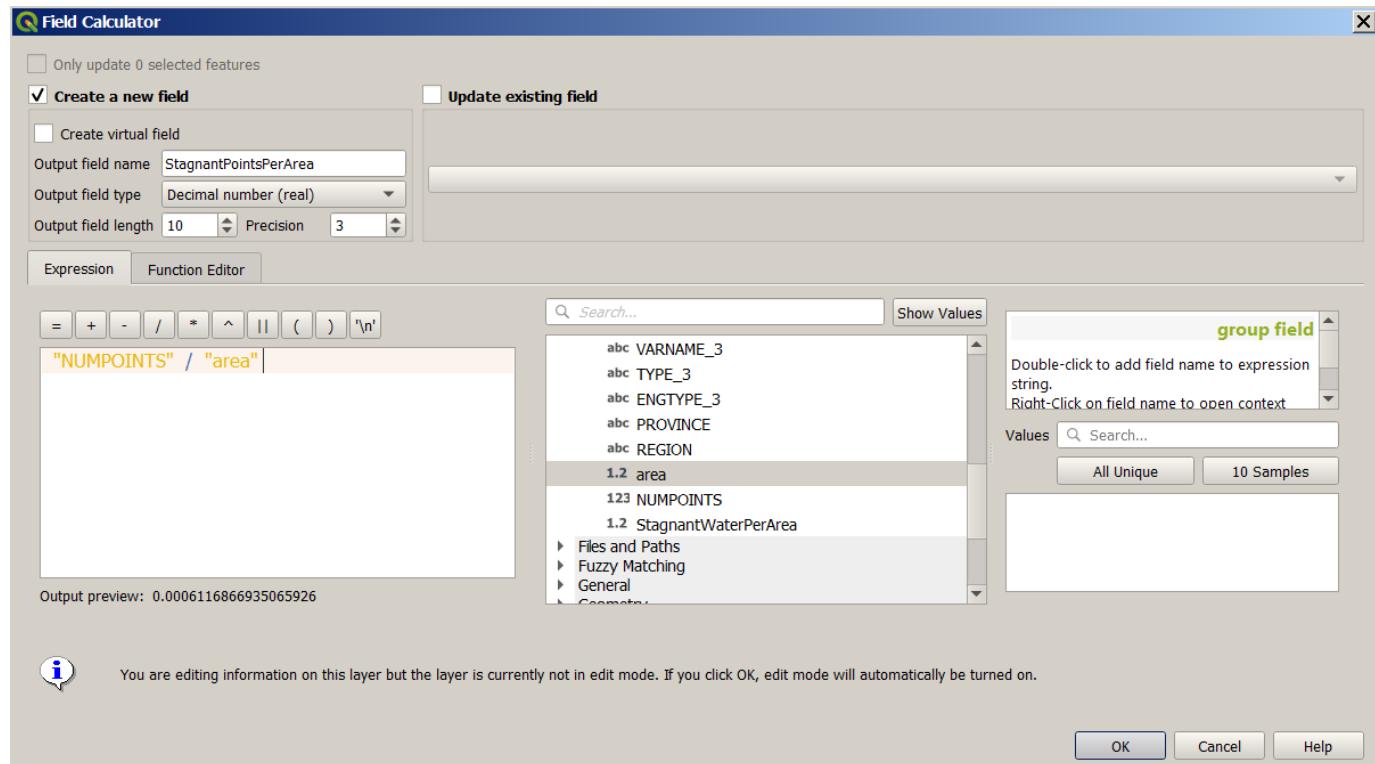
Toggle Editing
Field Calculator



4. Reporting

Calculating
StagnantWaterSpot
s per geographic
unit (barangay)

Toggle Editing
Field Calculator



4. Reporting

Rending the Visual
using
StagnantWaterPer
Area and Graduated

Layer Properties - Count | Symbology

Graduated

Information Column 1.2 StagnantWaterPerArea

Source Symbol

Symbology Legend format %1 - %2 Precision 6 Trim

Labels Method Color

Diagrams

3D View

Source Fields

Attributes Form

Joins

Auxiliary Storage

Actions

Display

Rendering

Variables

Metadata

Dependencies

Legend

QGIS Server

Digitizing

Color ramp

Classes Histogram

Symbol	Values	Legend
<input checked="" type="checkbox"/>	0.0000000 - 0.00048022	0.000000 - 0.000480
<input checked="" type="checkbox"/>	0.00048022 - 0.00096044	0.000480 - 0.000960
<input checked="" type="checkbox"/>	0.00096044 - 0.00144066	0.000960 - 0.001441
<input checked="" type="checkbox"/>	0.00144066 - 0.00192088	0.001441 - 0.001921
<input checked="" type="checkbox"/>	0.00192088 - 0.00240110	0.001921 - 0.002401

Mode Equal Interval Classes 5

Symmetric Classification

Advanced

Link class boundaries

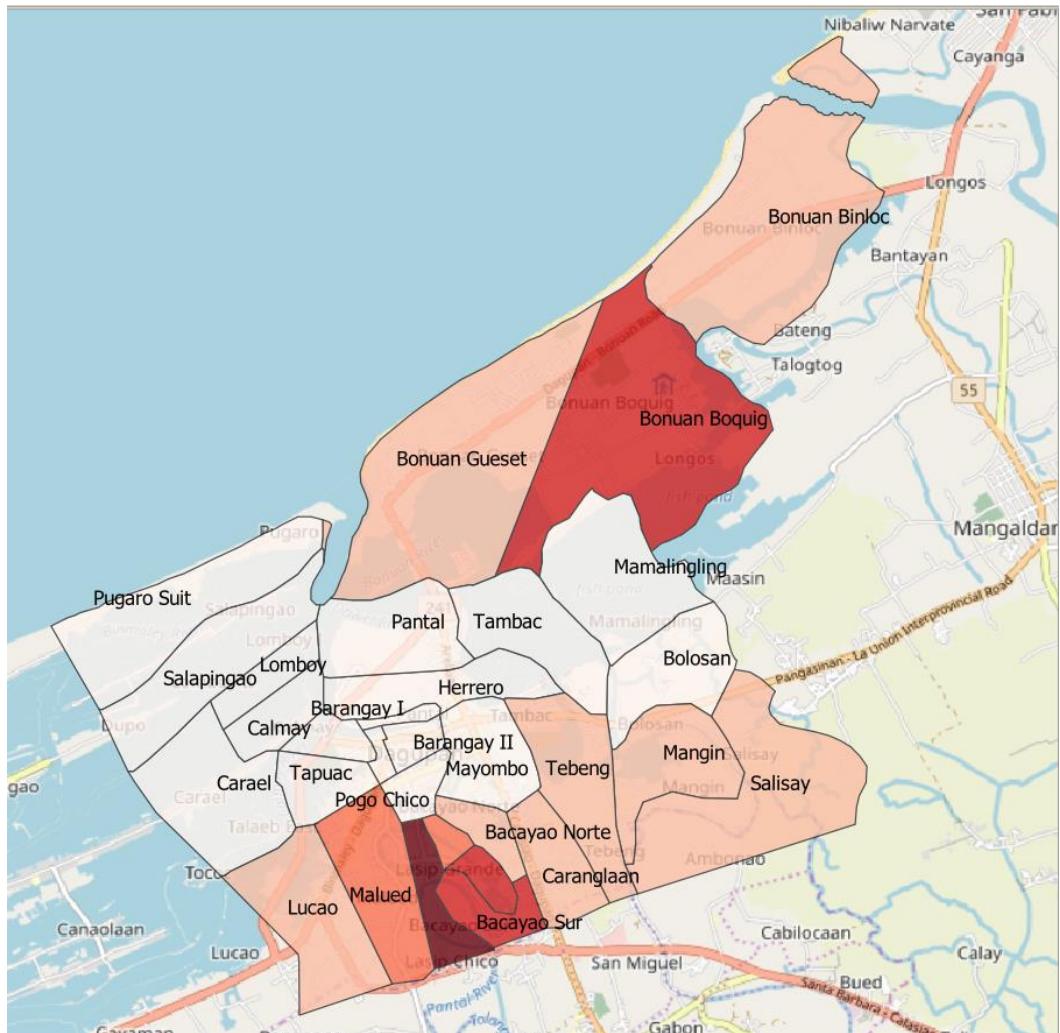
Layer Rendering

Style

OK Cancel Apply Help

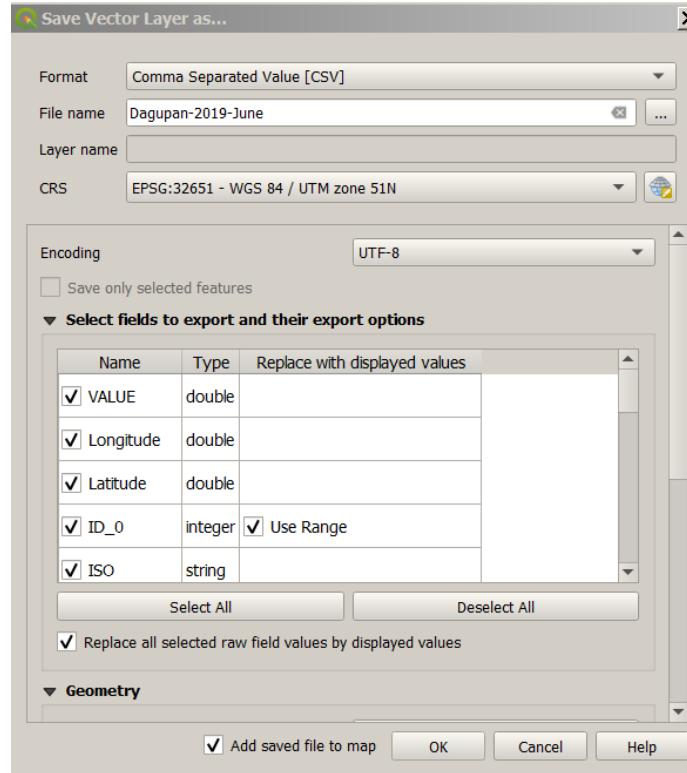
4. Reporting

To quickly show
potential Dengue
HotSpots



4. Reporting

Export the Joined File
in CSV format



What do we do now?

Overlay with Dengue Case Data?

Create Machine Learning models to predict disease outbreaks?

Use Stagnant and Dengue Maps to prioritise efforts



Share your Visualization with us

We would love to know about how you have taken this methodology forward and how it has helped your community.

Do drop us a note with your visuals and send over a copy of your CSV exports.

We will add them to our growing dataset for future project by data scientist.



Pay it Forward.
Share this with
others.

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