

# **SEEA-Habitat Extent and Conditions Accounting-Tool**

Acknowledgement: For more information on the Ocean Extent and condition accounting tool please contact Aahlaad Musunuru.

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## Background

In this study, we have developed a tool using the R-Shiny application to support various stakeholders, including National Statistics Officers (NSOs), the Mangrove and Coral Reef Monitoring Center, the Ministry of Environment, Forest and Climate Change, as well as various non-profit organizations such as UNEP, UNDP, FAO, and others. The purpose of this tool is to monitor the extent and condition of habitats, and to generate SEEA (System of Environmental-Economic Accounts) extent and condition accounts tables and maps. Users are required to develop accounts by utilizing geo spatial data and reference statistical indicators. Prior to uploading the data as input to the R-Shiny application, the geo spatial datasets need to be preprocessed and prepared. Once the data is uploaded, users can generate various maps, accounting tables, and statistical reports.

## Overall Procedure:

The overall process is to develop several SEEA accounts is distinguished in to 3 different types which includes Data collection , Data preprocessing and generating accounts In this study, we explain the process of producing habitat extent and condition accounts. We have chosen Palau's Ngarchelong island as a case study to develop various types of accounts.



System of  
Environmental  
Economic  
Accounting



## SEEA-Habitat Extent and Conditions Accounting- Tool Workflow

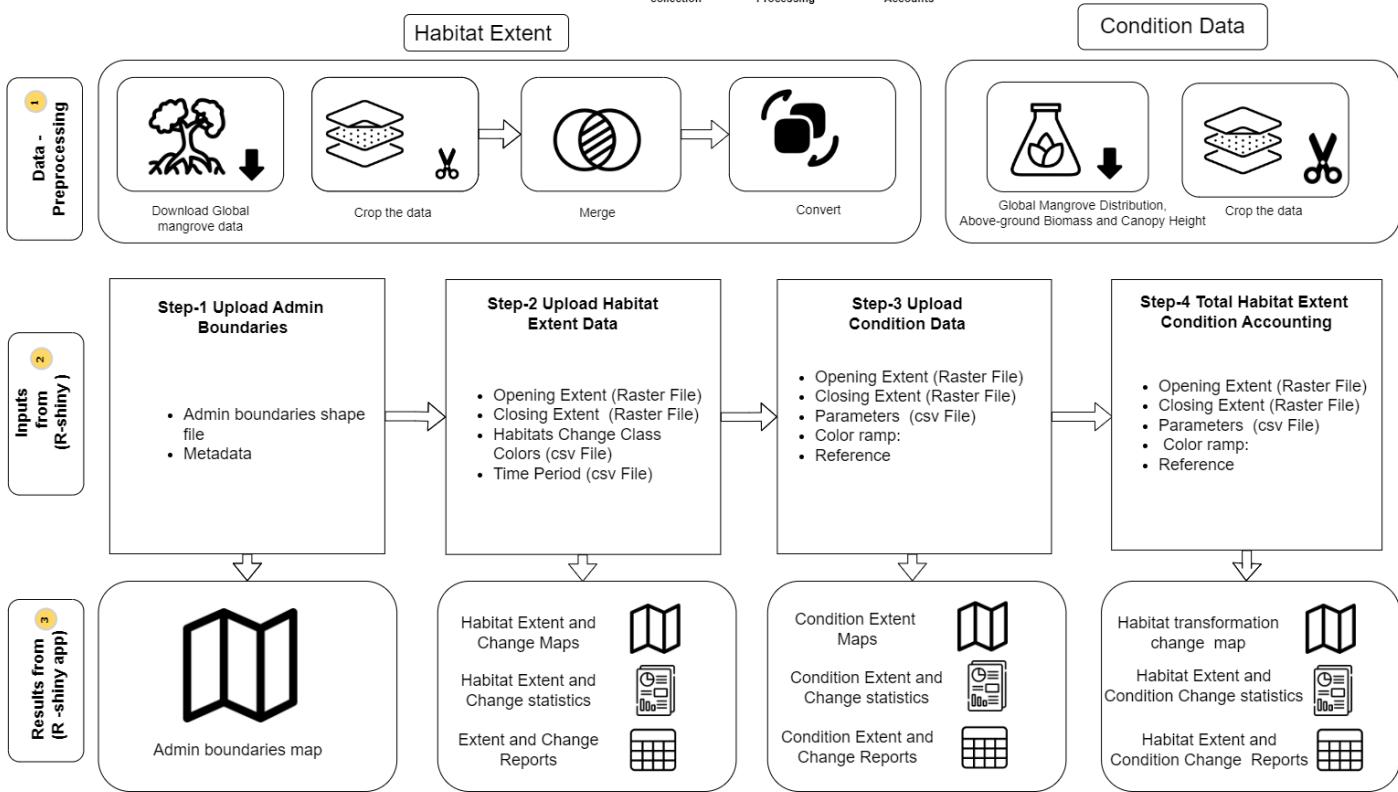


Figure 1 : Overall Procedure

## Step-1 Data Collection:

In Data Collection and preprocessing stage we are going to download and pre process the mangroves extent and condition indicators to the Ngarchelong admin boundaries.

### Step-1.1-Data Mangroves Data:

- In this study we can download the Global Mangrove Watch data from <https://data.unep-wcmc.org/datasets/45>. The data has been downloaded for two time periods 2007 and in 2016.

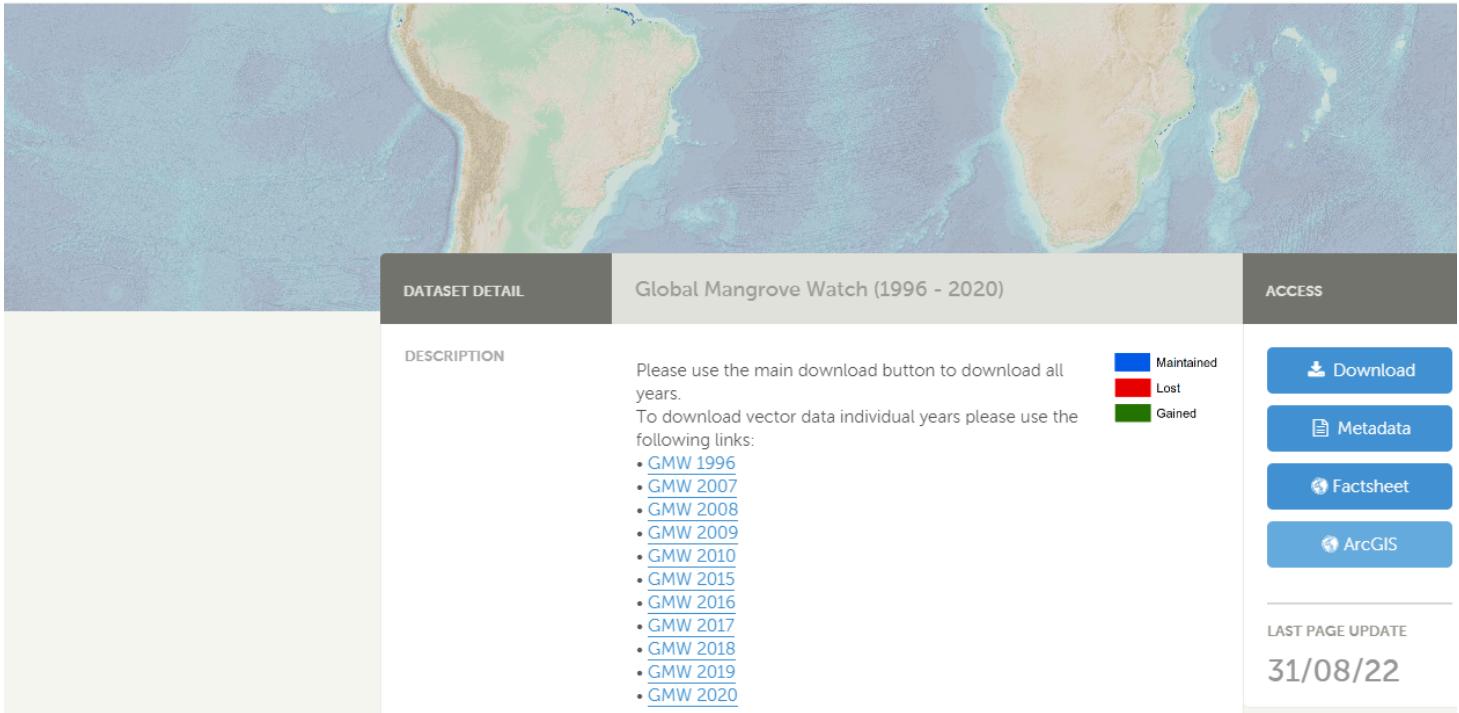


Figure 2 : Download mangroves data

- Once we have downloaded the data, we need to extract the global mangroves data for two time periods for year 2007 and 2016.
- Unzip the global mangroves data.

New Volume (D:) > Habitat Extent and Condition Accounting Tool > Mangrove Global >				▼	⟳	Search Mang
Name	Date modified	Type	Size			
GMW_v3_2007	23-02-2024 अपराह्न 12:26	WinRAR ZIP archive	1,89,295 KB			
gmw_v3_2007_vec.dbf	11-07-2022 अपराह्न 02:29	DBF File	12,452 KB			
gmw_v3_2007_vec.prj	11-07-2022 अपराह्न 02:27	PRJ File	1 KB			
gmw_v3_2007_vec.shp	11-07-2022 अपराह्न 02:29	SHP File	9,21,306 KB			
gmw_v3_2007_vec.shx	11-07-2022 अपराह्न 02:29	SHX File	9,962 KB			
GMW_v3_2016	23-02-2024 अपराह्न 12:26	WinRAR ZIP archive	1,83,005 KB			
gmw_v3_2016_vec.dbf	11-07-2022 अपराह्न 02:45	DBF File	11,429 KB			
gmw_v3_2016_vec.prj	11-07-2022 अपराह्न 02:42	PRJ File	1 KB			
gmw_v3_2016_vec.shp	11-07-2022 अपराह्न 02:45	SHP File	8,87,386 KB			
gmw_v3_2016_vec.shx	11-07-2022 अपराह्न 02:45	SHX File	9,143 KB			

Figure 3 : Unzip mangroves data

### **1.1.1 Downloading the Palau Admin boundaries:**

- Download the Palau admin boundaries data from DIVA-GIS (<https://www.diva-gis.org/gdata>) or any other source in a shape file formate. Once the data has been downloading the user can start preprocessing .\*

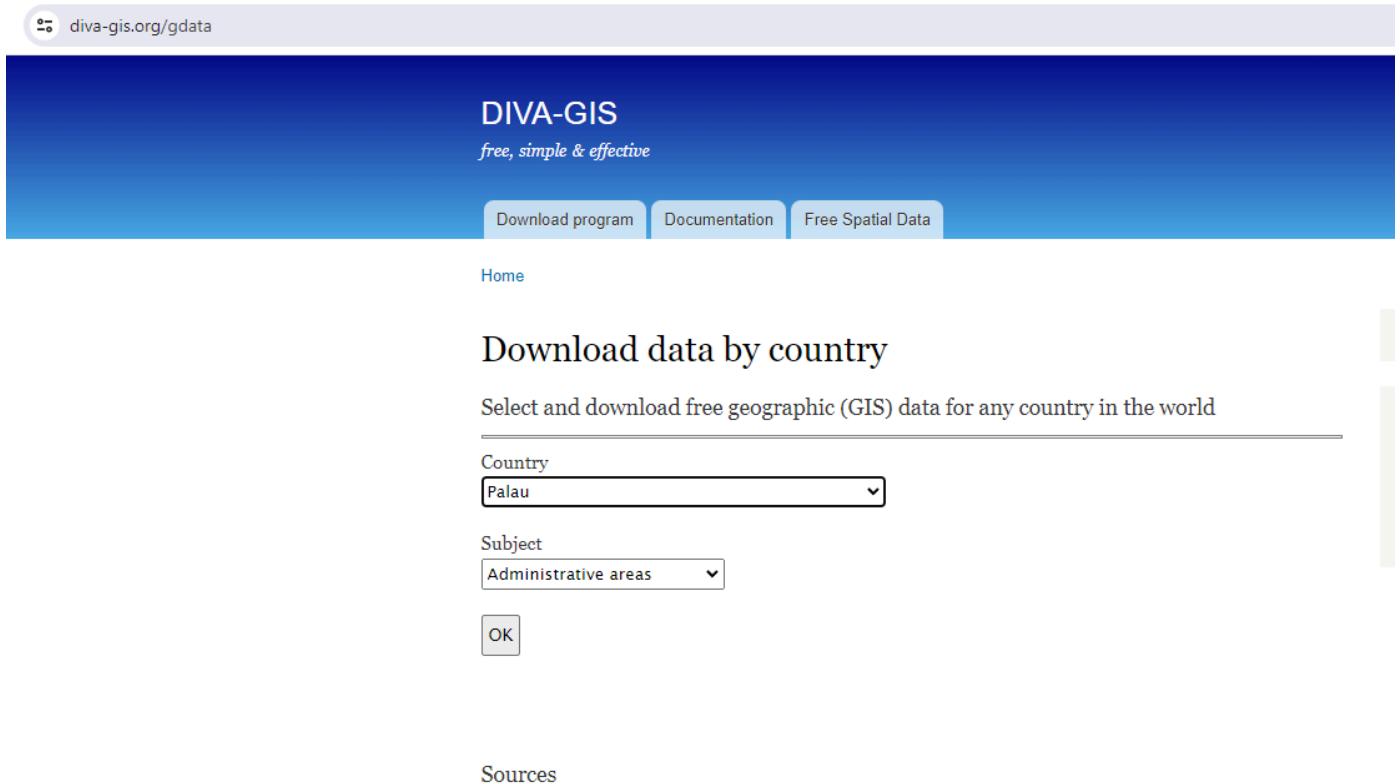


Figure 4 : Downloading the Palau Admin boundaries:

### **1.1.2 Download Mangroves Condition indicators data:**

Download Mangroves Condition indicators like Biomass, and Canopy Height from ORNL DAAC [https://daac.ornl.gov/cgi-bin/dsviewer.pl?ds\\_id=1665](https://daac.ornl.gov/cgi-bin/dsviewer.pl?ds_id=1665). To do this we first need to log in to the portal. Specifying the country name download the condition indicator namely Aboveground mangrove biomass, Mangrove basalarea weighted height and Mangrove canopy maximum height indicators for this use case we have download this three condition indicators Mangrove\_agb\_Palau, Mangrove\_hba95\_Palau and Mangrove\_hmax95\_Palau.

**Data Files**

Show 25 entries Filter

	Size	Start Date	End Date	N Lat	S Lat	E Long	W Long
<input checked="" type="checkbox"/> Mangrove_gb_Palau.tif	10.0 MB	2000-01-01	2009-12-31	8.16	2.91	134.82	131.03
<input checked="" type="checkbox"/> Mangrove_hbar95_Palau.tif	10.0 MB	2000-01-01	2009-12-31	8.16	2.91	134.82	131.03
<input checked="" type="checkbox"/> Mangrove_hmax95_Palau.tif	10.0 MB	2000-01-01	2009-12-31	8.16	2.91	134.82	131.03

Showing 1 to 3 of 3 entries (Filtered from 349 total entries)

Add Checked Items Add Dataset Cart

**Companion Files**

Figure 5 : Download mangroves Biomass data

## Step-2:- Data Pre-Processing

After downloading the data, the next action is data pre-processing using QGIS. QGIS is an open source geographic information system application that supports viewing, editing and analysis of geospatial data. More information on how to download and install and use QGIS is provided in the Appendix to this guide.

### 2.1.1: Add Admin Boundaries Data into QGIS

For this exercise, we created a new folder and named it “Data Pre-Processing”. We encourage the user to do the same or choose a folder name and location that is convenient.

Open QGIS Desktop with GRASS, and do the following:

- Click on [Layer](#)
- Go to [“Add Layer”](#)
- Select [“Add Vector Layer”](#) as shown in the picture below

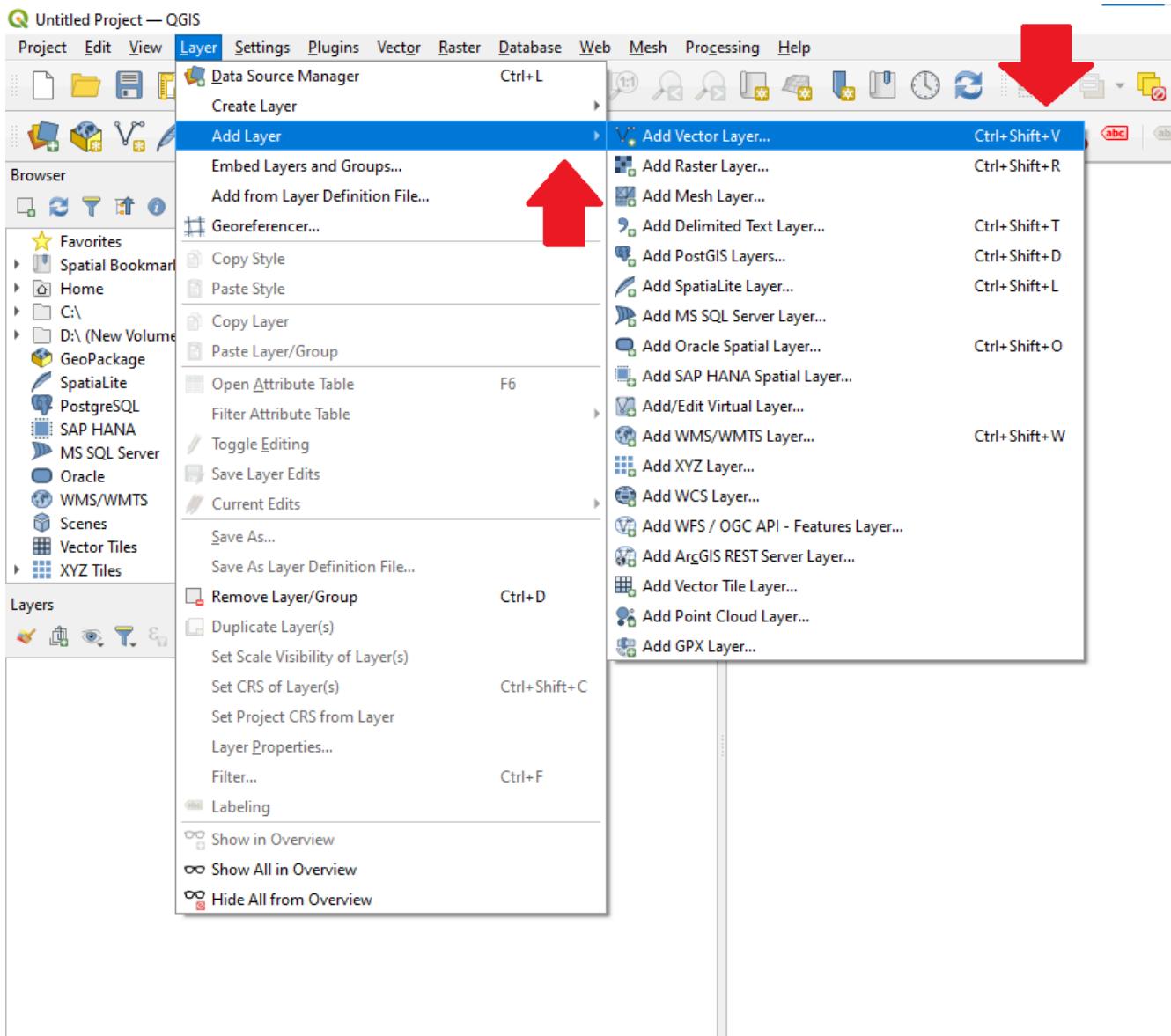


Figure 6 : Select Admin Boundaries layer

- Next, Click the Browse button and select the file [PLW\\_adm1.shp](#) in .shp file format
- Click [OpenP](#)
- Click “[Add](#)” and close the window.

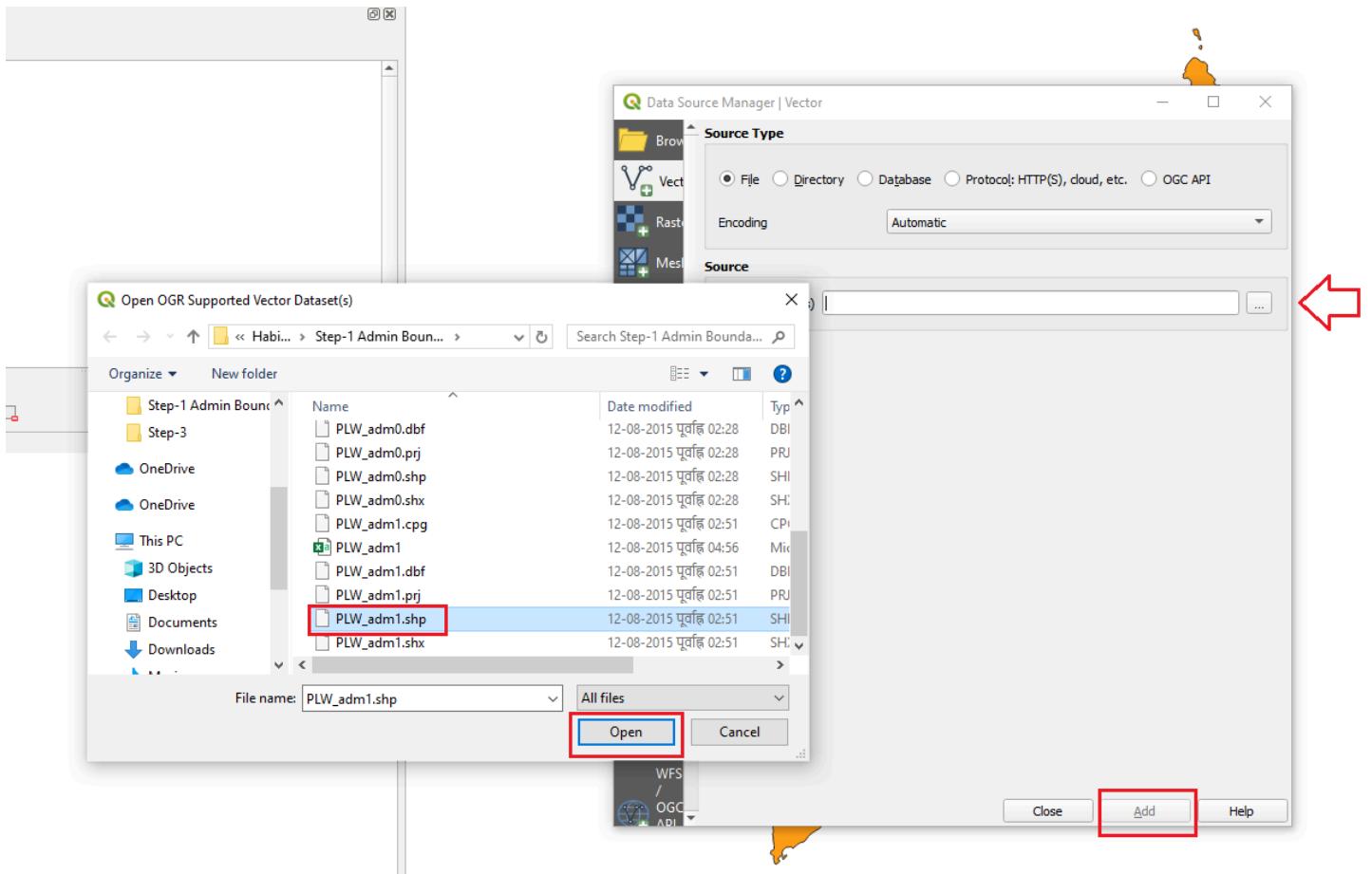


Figure 7 : Add Admin boundata PLW adm1

## 2.1.2: Filter the admin boundaries data

- Click on Select Feature By area button on top



- Now select the "Ngarchelong" region to filter the data.

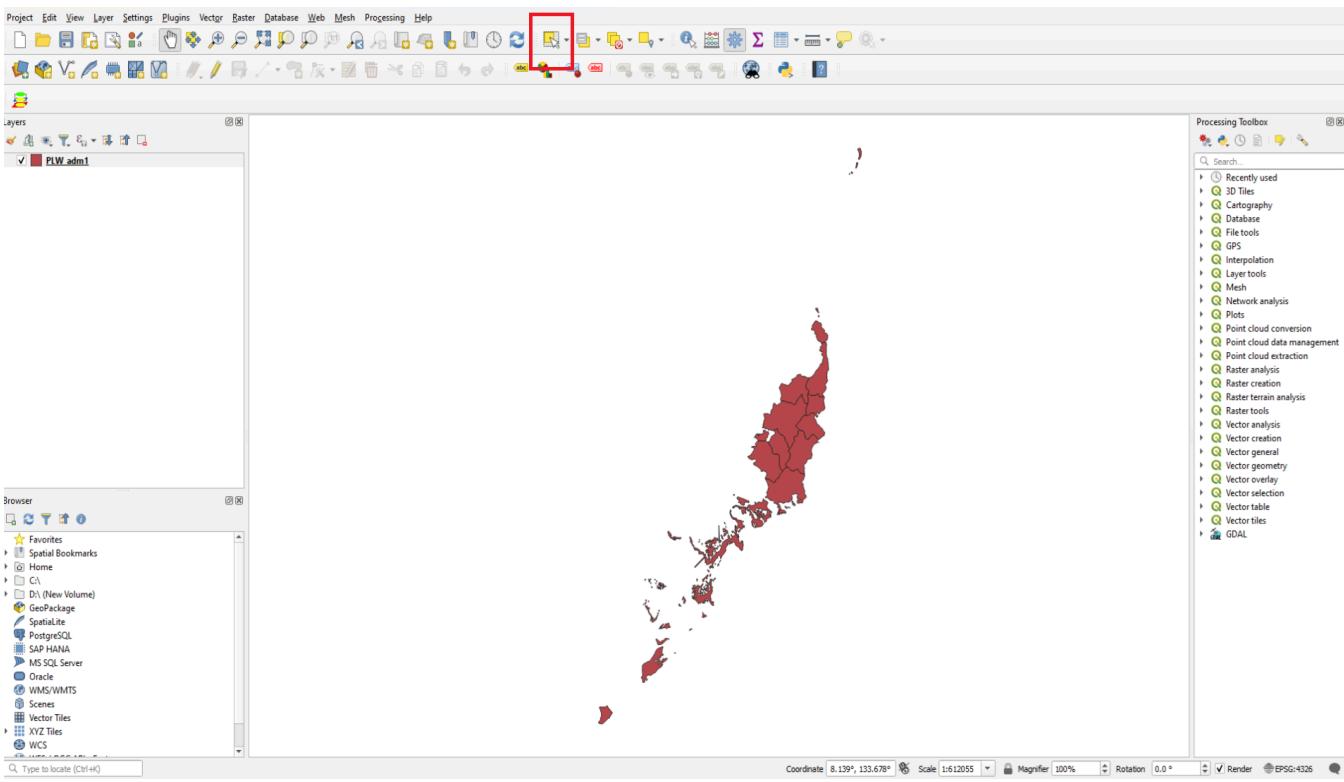


Figure 8: Open the attribute table

- Filter the Ngarchelong region from the PLW\_adm1
- Now right click on the PLW\_adm1 and click on Export and select Save Selected Features As...

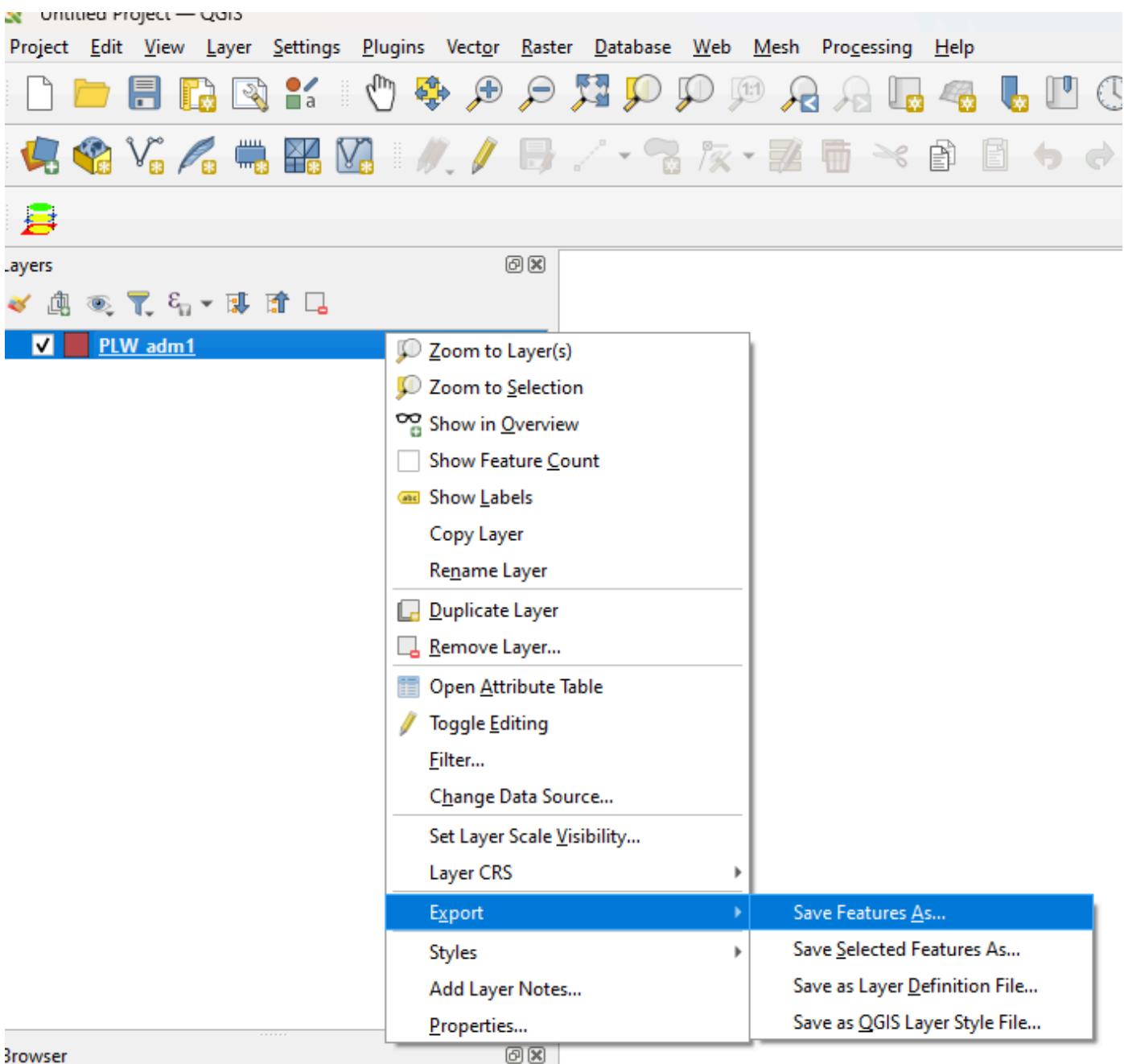


Figure 9: Export the Ngarchelong from PLW\_adm1.

- Export the Ngarchelong region as a shape-file to QGIS.

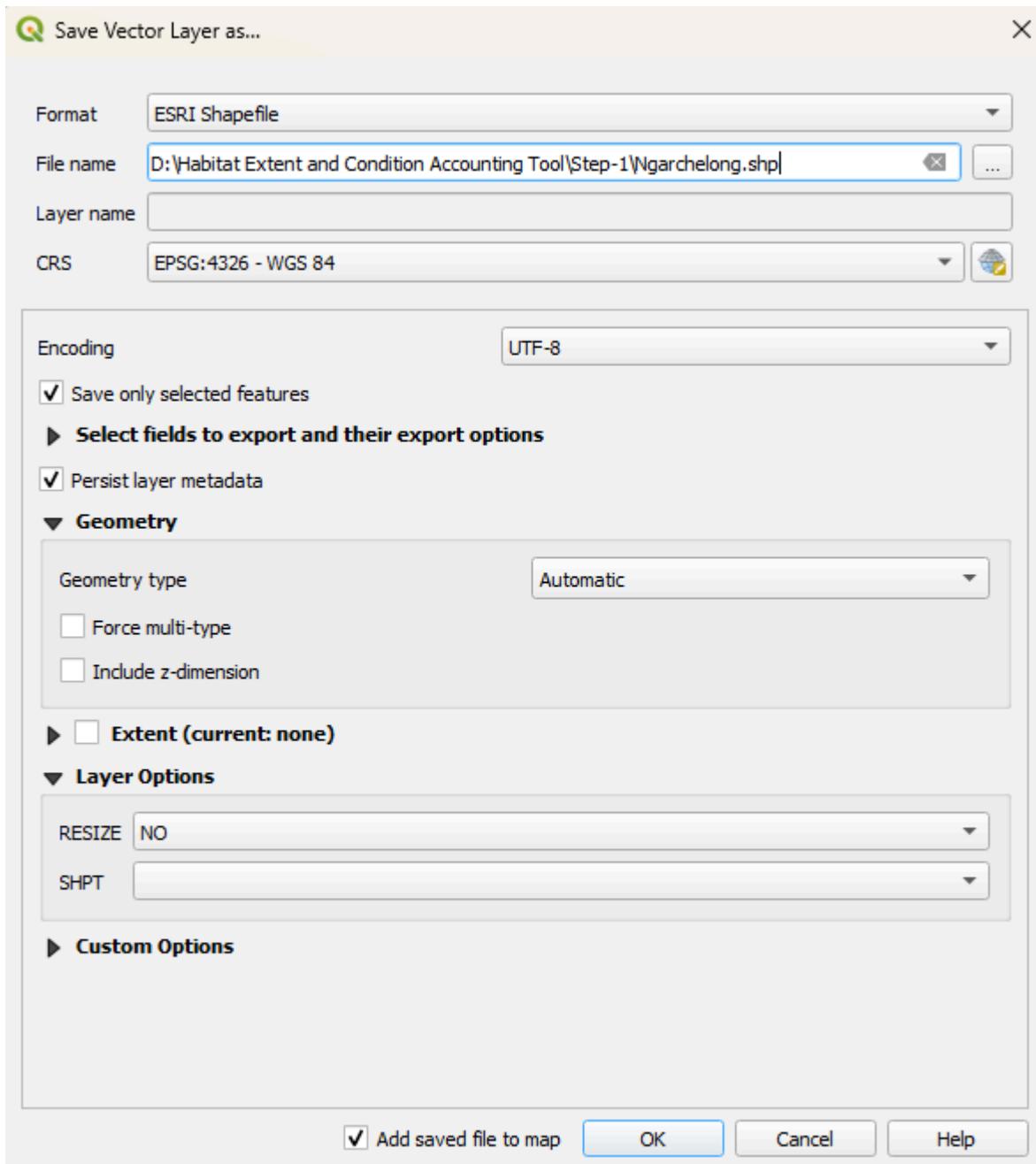


Figure 10: Export the Ngarchelong admin extent.

- Ok

### 2.1.3: Add Mangroves Data

- Click on Add Layer
- Select add vector layer
- Add global mangroves [gmw\\_v3\\_2007\\_vec.shp](#) and [gmw\\_v3\\_2016\\_vec.shp](#)

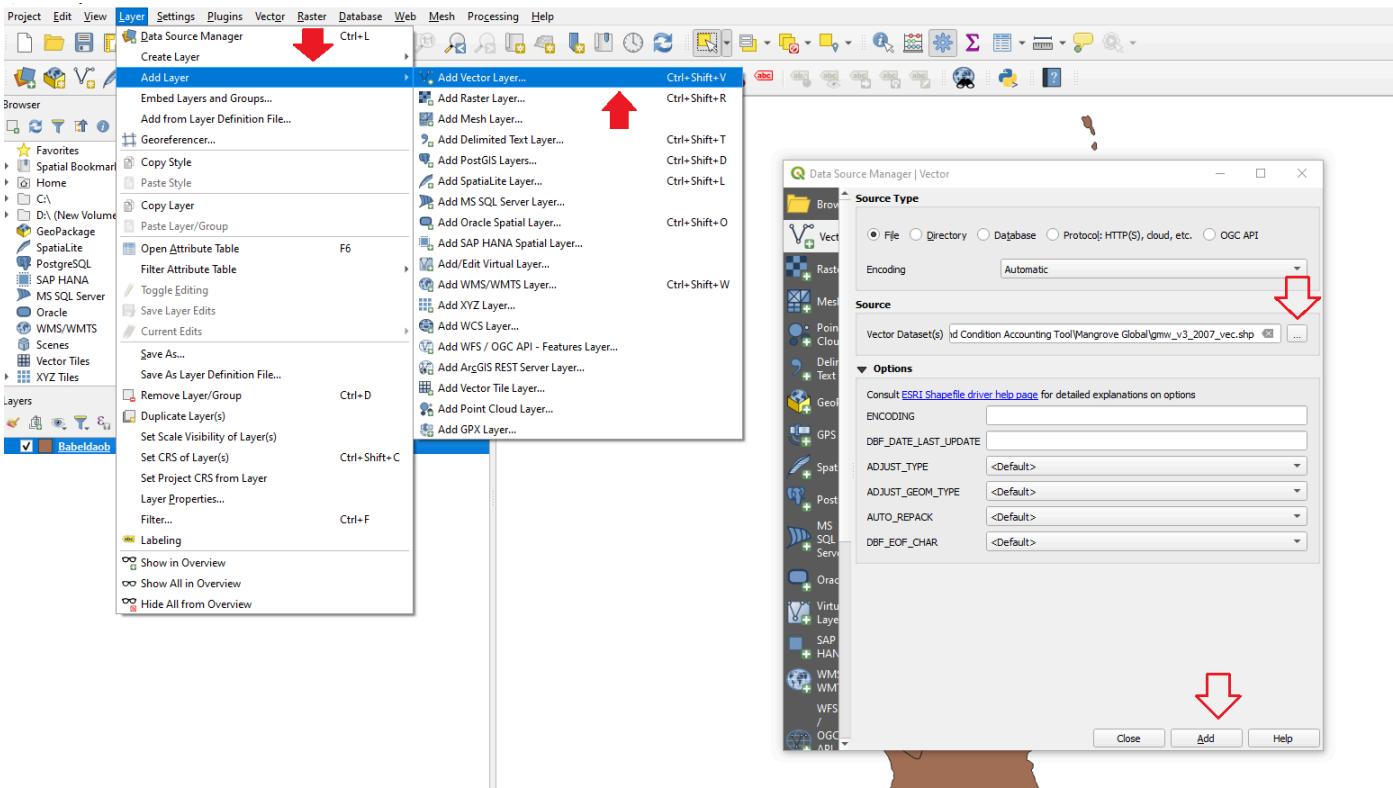


Figure 11: Add Vector layer

- Click on Add.

#### 2.1.4: Clip Mangroves Data

- In the processing tool box search for **Clip vector by extent**
- In the Input layer select **gmw\_v3\_2007\_vec**
- In the Clipping extent select **Ngarchelong**
- Click on select button and go to **Save to file**
- Save the file as **gmw\_v3\_2007\_Ngarchelong**
- Click on **Run**

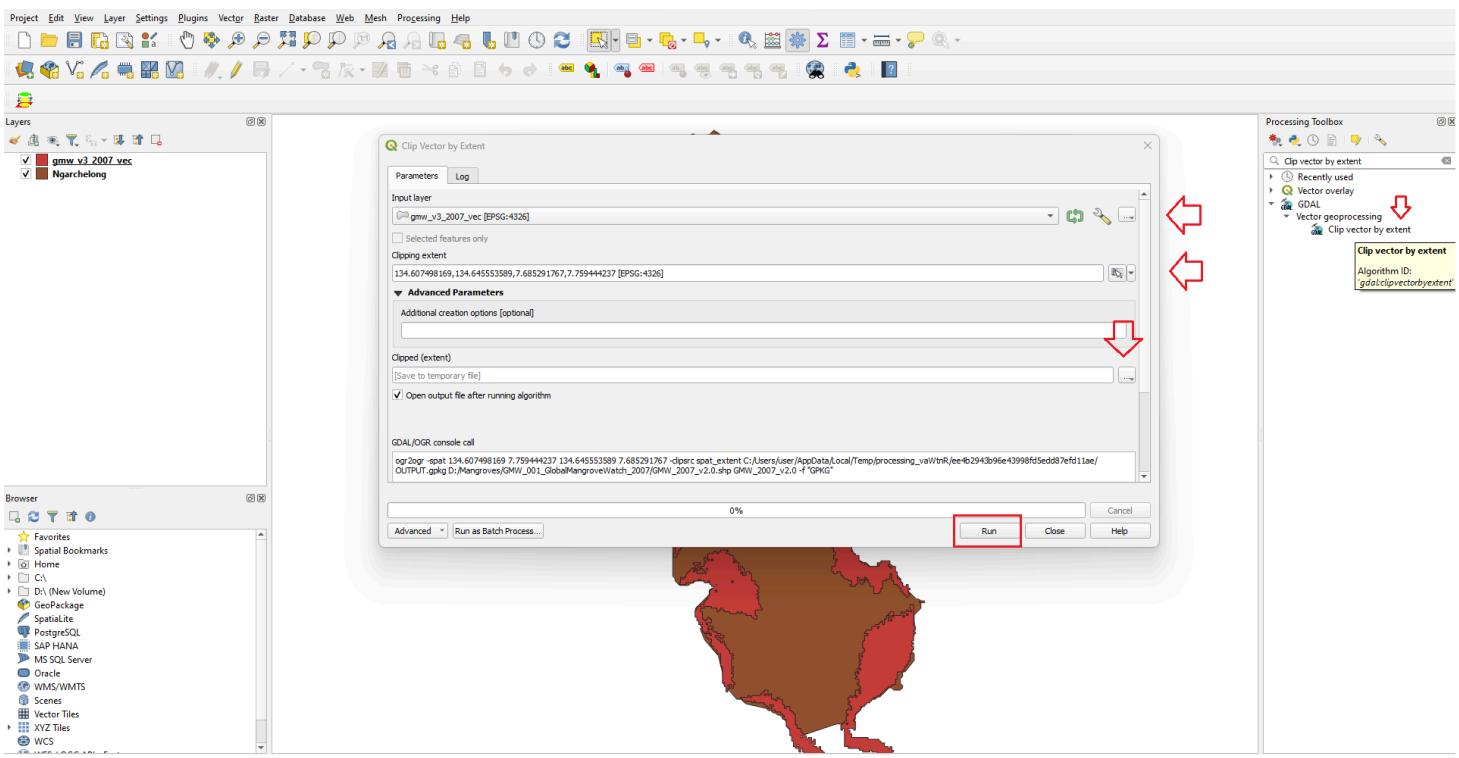


Figure 12: Clip the Global mangroves data

- Repeat the steps to clip the vector layer for [gmw\\_v3\\_2016\\_vec.shp](#) and save as [gmw\\_v3\\_2016\\_Ngarchelong.shp](#)

### 2.1.5: Merge mangroves and admin layers.

- Now right click and remove all other layers except [Ngarchelong](#), [gmw\\_v3\\_2007\\_Ngarchelong](#), and [gmw\\_v3\\_2016\\_Ngarchelong](#)
- In the input layers select [gmw\\_v3\\_2007\\_Ngarchelong](#) and [Ngarchelong](#)
- In the distribution we need to select on the [projection](#).
- Finally save the layer as [Year\\_2007\\_Ngarchelong\\_Mangroves\\_Non\\_Mangroves](#)
- Repeat the same steps and create a new merge layer and name as [Year\\_2016\\_Ngarchelong\\_Mangroves\\_Non\\_Mangroves](#)
- finally click on run to save the result.

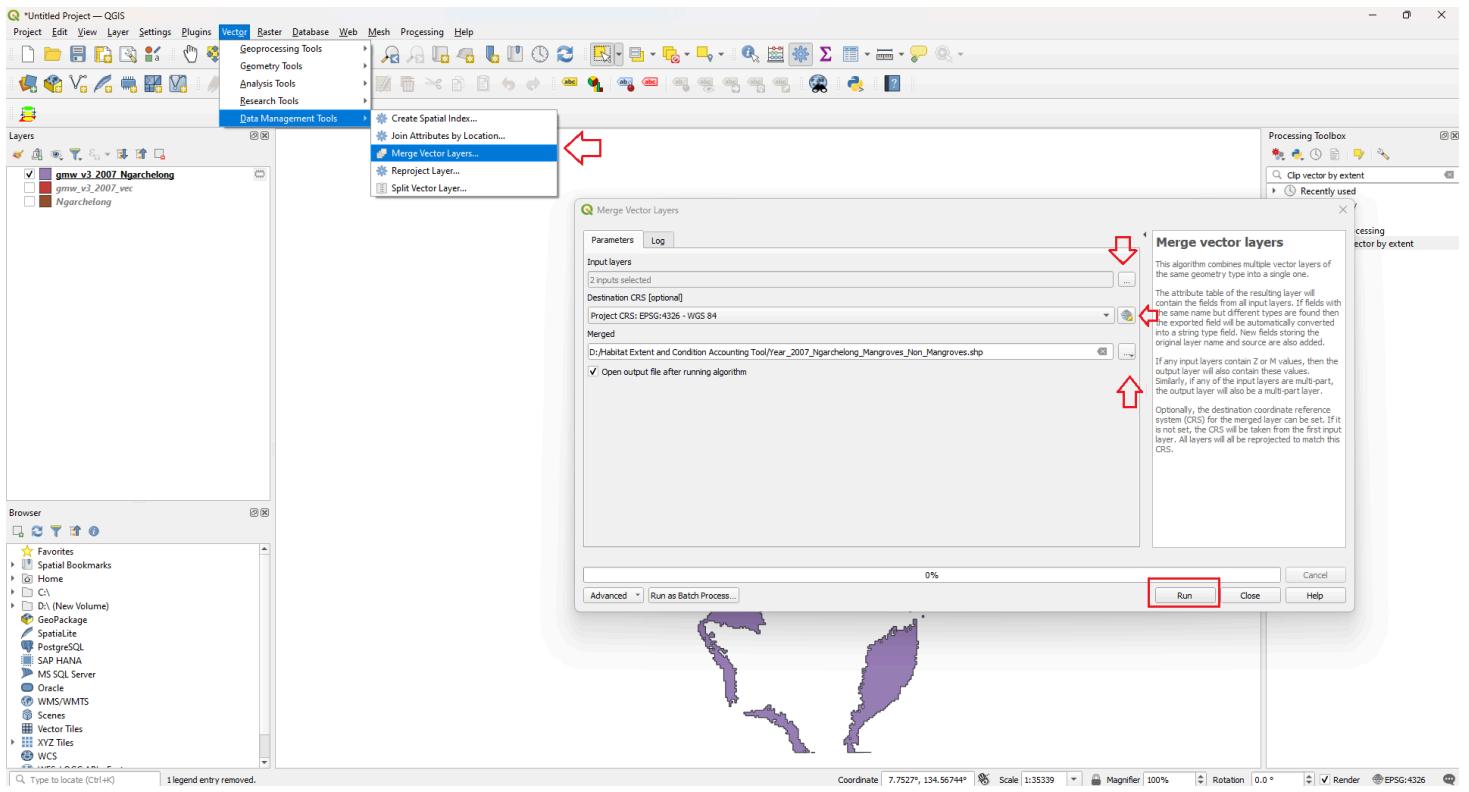


Figure 13: Merge Vector Layer

- Right click on the **Year\_2007\_Ngarchelong\_Mangroves\_Non\_Mangroves** Click on Open Attribute Table
- Click on the



on top of the attribute table.

- Next in the PXLVAL field replace Null value with "2".
- In the fid replace "Null" value with the 0.
- click on save edit button



finally stop the editing.

- Click on close button to close the attribute table.

Year\_2007\_Ngarchelong\_Mangroves\_Non\_Mangroves — Features Total: 12, Filtered: 12, Selected: 1

	fid	ogc_fid	pxlval	ID_0	ISO	NAME_0	ID_1	NAME_1	TYPE_1	ENGTYPE_1	NL_NAME_1	VARNAME_1	No
1	0	NULL	2	172	PLW	Palau	9	Ngarchelong	State	State	NULL	NULL	No
2	1	558940	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn
3	2	558941	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn
4	3	558942	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn
5	4	558943	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn
6	5	558944	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn
7	6	558945	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn
8	7	558946	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn
9	8	558947	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn
10	9	558948	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn
11	10	558949	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn
12	11	558951	1	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	gn

Figure 14: Open Attribute Table

## 2.1.6: Convert Raster to Vector

- To do this first click on **Raster** and select on conversion in which we need to convert from vector to raster.
- Input layer define [Year\\_2007\\_Ngarchelong\\_Mangroves\\_Non\\_Mangroves](#)
- Field to use for a burn in value [PXIVAL](#)
- Output raster size units [Georeferenced\\_units](#)
- Width/Horizontal resolution define [0.000300](#)
- Height/Vertical resolution define [0.000300](#)
- Output extent define as [Year\\_2007\\_Ngarchelong\\_Mangroves\\_Non\\_Mangroves](#)
- If we go down click on brows button and we can see rasterized and select on [save to file](#) save the raster image as [Year\\_2007\\_Ngarchelong\\_Mangroves\\_Non\\_Mangroves](#)
- Click on [Run](#)
- Repeat the same steps for the [Year\\_2016\\_Ngarchelong\\_Mangroves\\_Non\\_Mangroves](#)

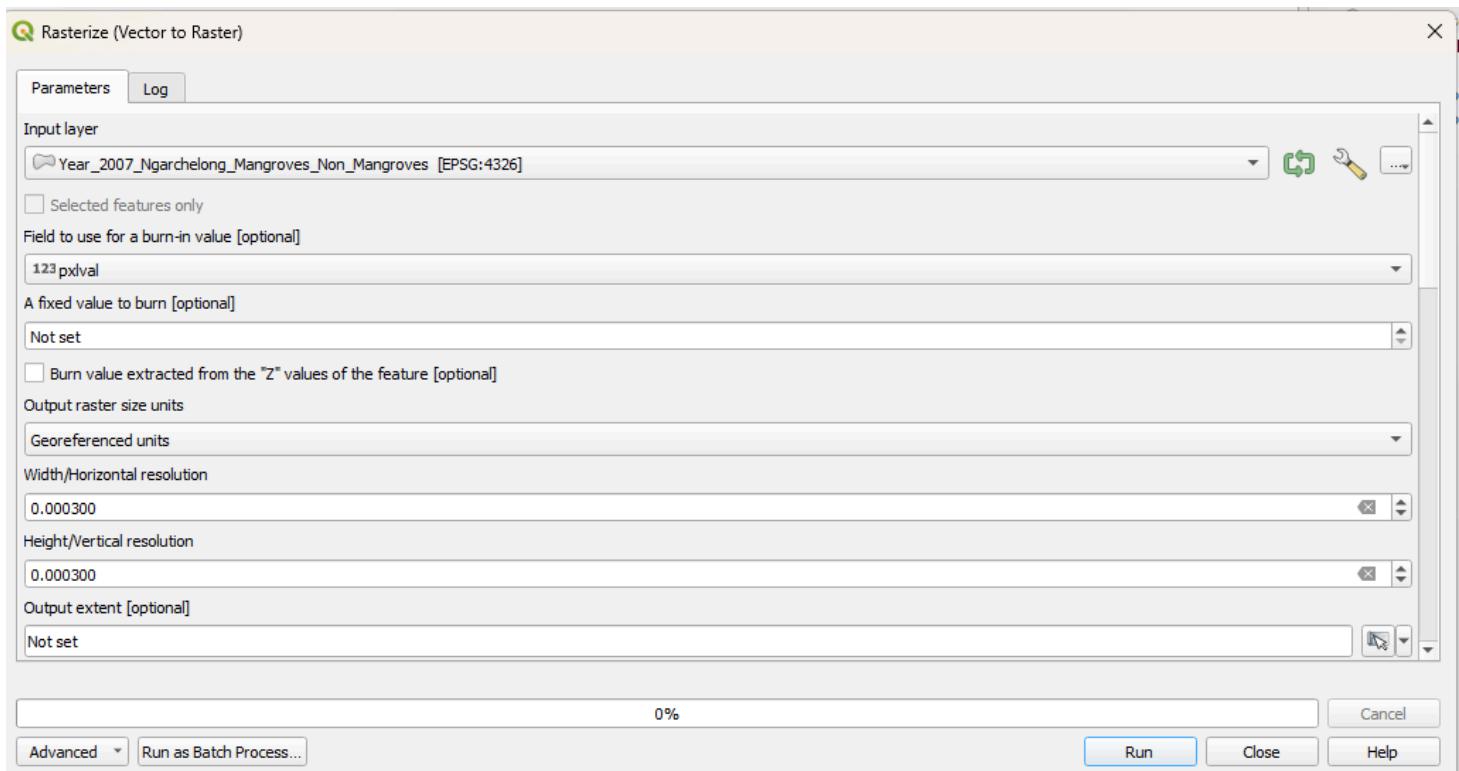


Figure 15: Convert Raster to Vector

- Right click and remove all the layers except  
`Year_2007_Ngarchelong_Mangroves_Non_Mangroves, Year_2016_Ngarchelong_Mangroves_Non_Mangroves` raster files more over the Ngarchelong layer.

## 2.1.7: Load all the Condition.

- Now click on Layers
- Next Select Add raser Layers
- Add all the condition raster layers in to QGIS  
`Mangrove_agb_Palau, Mangrove_hmax95_Palau` and `Mangrove_hba95_Palau`

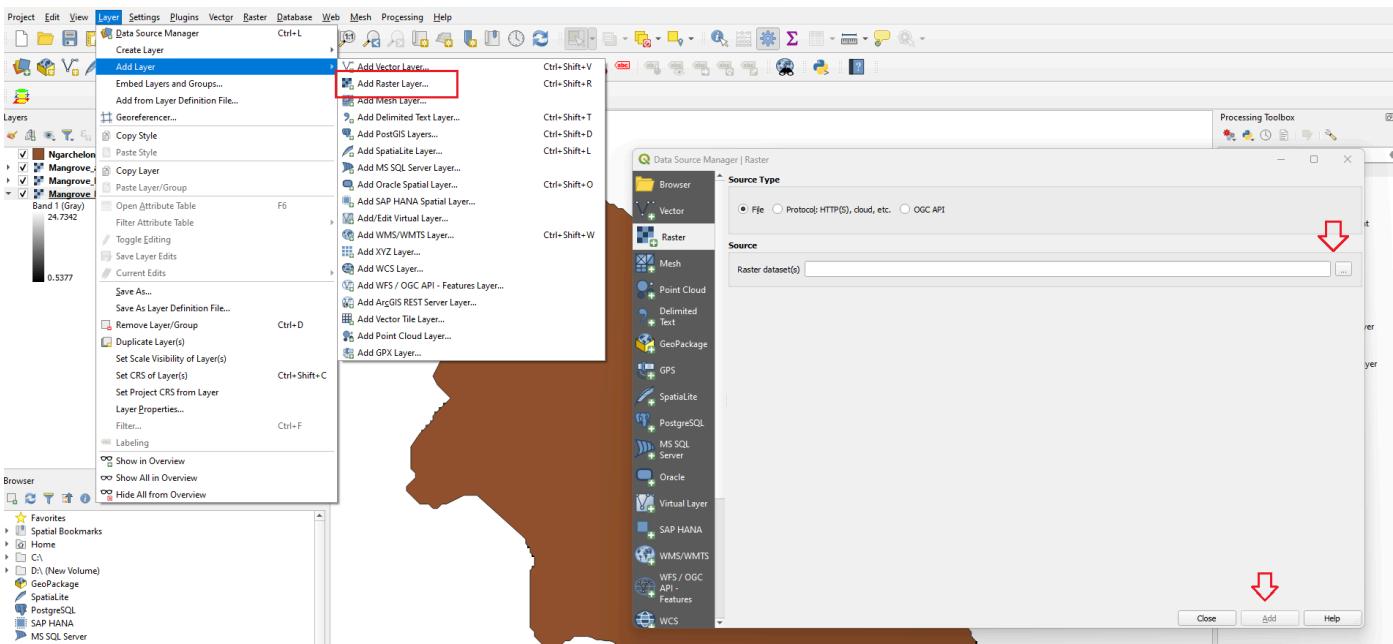


Figure 16: Load the Condition Raster

## 2.1.8: Clip the rasters to the condition Indicators.

- First click in raster and go to the [Extraction](#).
- Next Click on [Clip raster by mask layer](#)
- In the input layer define [Mangrove\\_agb\\_Palau](#)
- In the masking layer define [Ngarchelong](#)
- Define the [Projection](#)
- Click on [Run](#)
- Clip the raster for all three layers [Mangrove\\_agb\\_Palau](#), [Mangrove\\_hmax95\\_Palau](#) and [Mangrove\\_hba95\\_Palau](#)

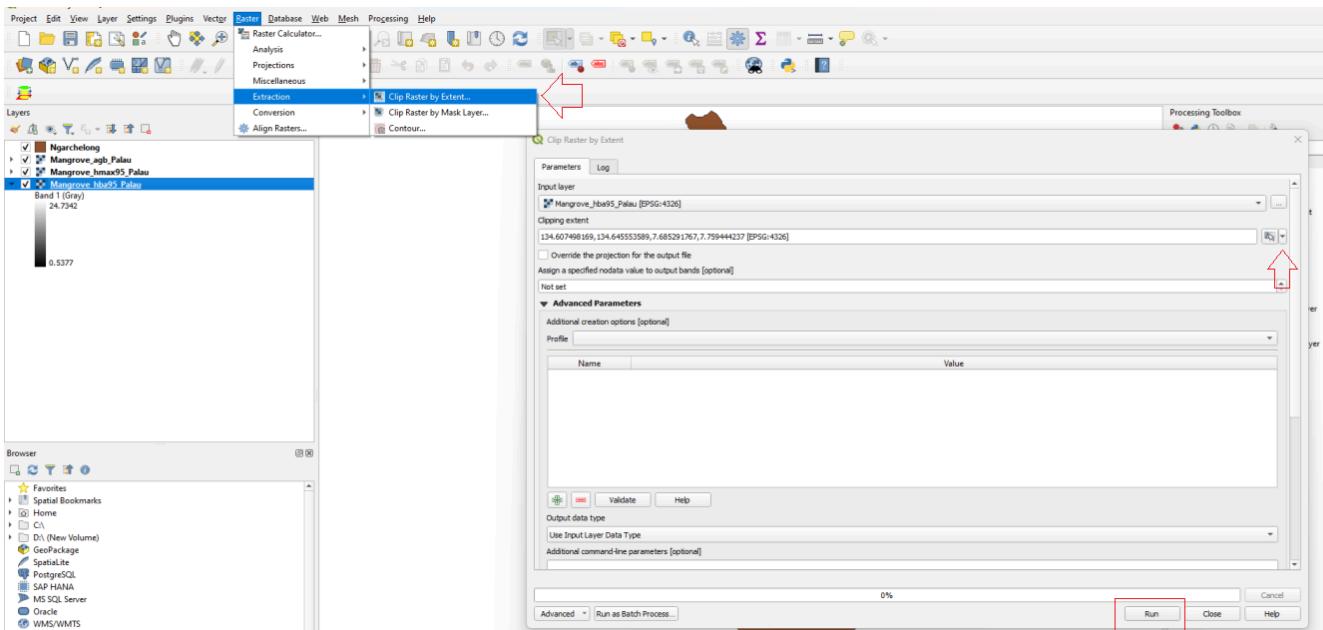


Figure 17: Clip Condition Indicators Raster

*\_ By this the total Data Processing is been completed.*

## **Step-3: Generating Habitat Extent and Condition Accounts Using R-Shiny (Ocean Extent And Condition Accounting):**

To generate Habitat extent and Condition Accounts in this study we have used R-Shiny application. Where any user can download different Accounts in different stages. Overall the tool is divided in to 4 different groups which are

- Step-1 Upload Admin Boundaries,
- Step-2 Upload Habitat Extent Data,
- Step-3 Upload Condition Data
- Step-4 Total Habitat Extent and Condition Accounting.

To Produce Habitat Extent and Condition Accounts in each stage different inputs data sets are need to be prepared. User need to provide both raster data and vector data in different stages fallowed with that they also need to provide some ".csv". When the user comes to final step, they can download overall Habitat change accounting report.

- The above data collection and pre processing stages can be skipped if the users have download the sample data.
- The data collection and pre processing steps above proved the process how to prepare the spacial data inputs to produce habitat extent and condition accounts.
- Users can click on "INSTRUCTIONAL VIDEO" to see how the Ocean extent and condition accounting tool works.
- The below steps provide more elaborative way how to use the Ocean Extent And Condition Accounting tool.

### **Step-3.1.1 Step-1: R-Shiny (Ocean Extent And Condition Accounting)**

- Click on this url to access this R-shiny tool. ([https://aahlaad-musunuru.shinyapps.io/SEEA\\_Ocean\\_Accounting/](https://aahlaad-musunuru.shinyapps.io/SEEA_Ocean_Accounting/))
- First the user need to click on "Get Started Now" Button.
- It will redirect to a "Step-1 Upload Admin Boundaries" window.

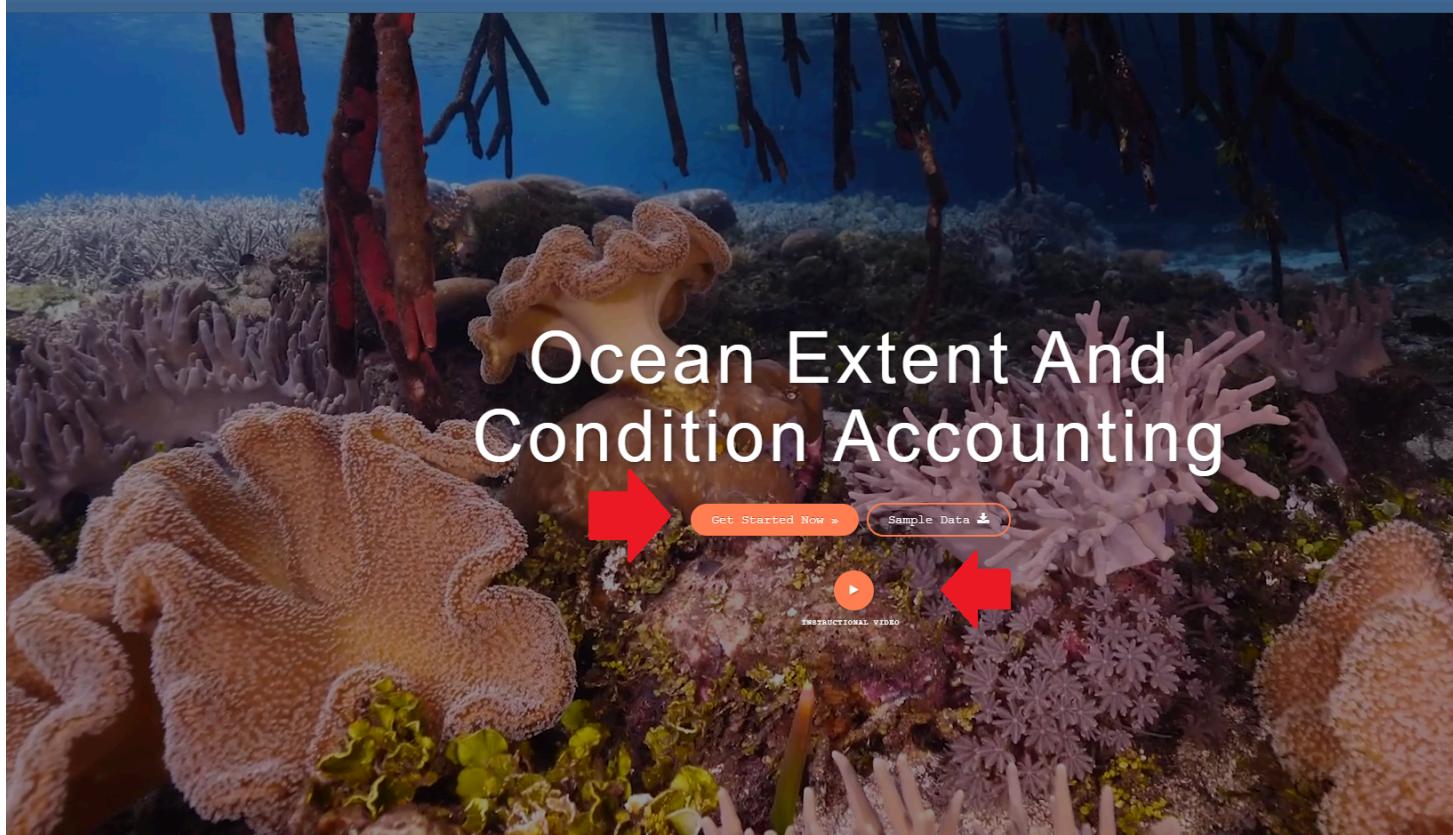


Figure 18: Get-Started

### Step-3.1.2 R-Shiny Step-1 Upload Admin Boundaries(Ocean Extent And Condition Accounting)

- In this step first the users need to upload the admin boundaries data which is in shape file formate. In this study we are using '[Ngarchelong.shp](#)'.
- They need to include all other files [.shp,.dbf,.sbn,.sbx,.shx,.prj](#) as well.
- Next the user need to click on Meta Data file and upload '[Habitent\\_metardata.csv](#)'.
- The below table gives the example of the '[Habitat Meta Data file](#)'.

Data Type	Satellite	Projection	Resolution	Format	Data Source
Mangroves	JERS-1, ALOS PALSAR, ALOS-2 PALSAR-2	WGS 1984	30 m	SHP	<a href="#">UNEP-WCMC</a>
World Database on Protected Areas		WGS 1984		SHP	<a href="#">IUCN - World Database</a>

Table 1: Metadata Table.

- From then two new dropdown we can see **Attribute Heading** user need to select specific attribute Heading to filter the admin **boundaries.In** this study we are selecting **Island**.
- From here the user will be able to select the **Attribute Name** in our case the attribute name is **Ngarchelong**.
- When the user click on the **Ngarchelong** on the Attribute name they will able to see the Ngarchelong admin boundaries map.
- Next click on **Next Step-2**.

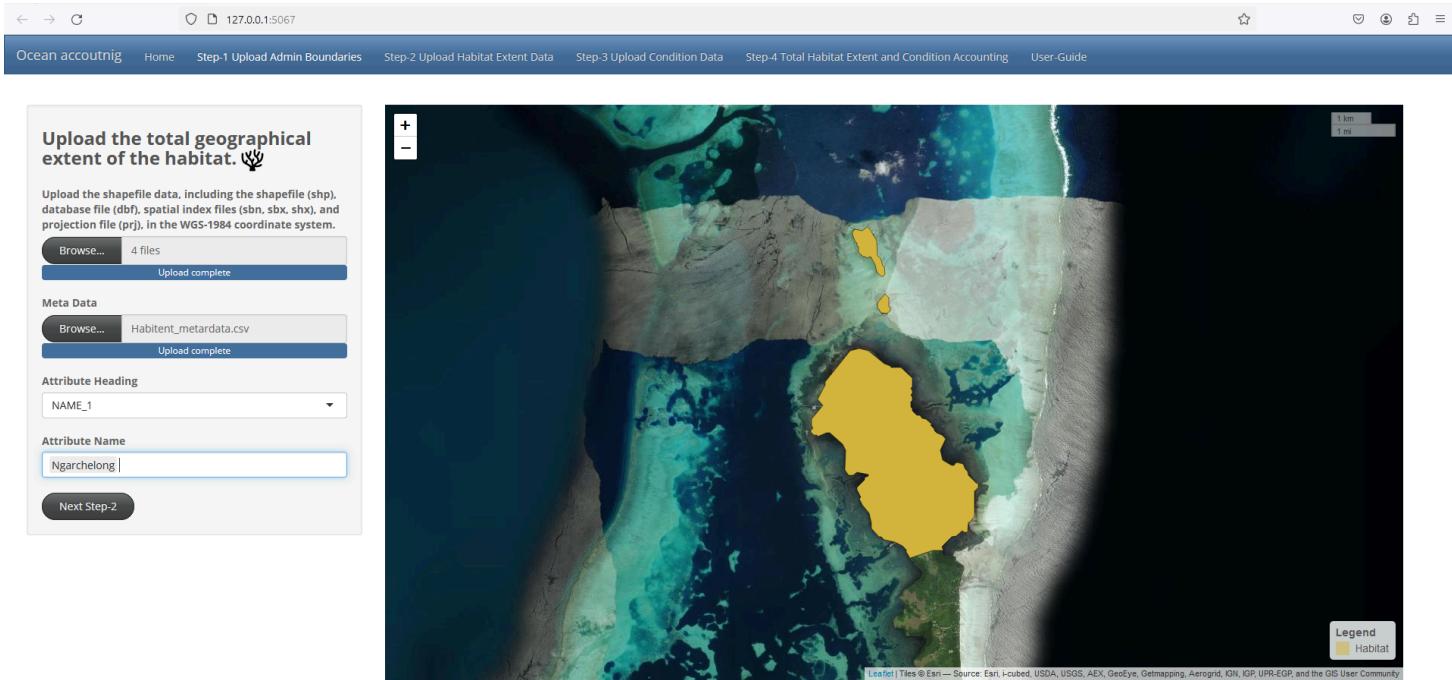


Figure 19: Ngarchelong admin boundaries map

### Step-3.1.3: R-Shiny Step-2 Upload Habitat Extent Data:

In this step in the side bar panel user need to update several parameters.

- In this step users need to provide opening extent raster data in this study we are providing clipped mangrove non mangroves raster data of "**Year2007.tif**"
- In the next step users need to provide closing extent raster data in this study we are providing clipped mangrove non mangroves raster data of "**Year2016.tif**"

## Upload habitat opening extent and closing extent raster data-set.

The opening and closing raster datasets should be in the WGS 1984 geographic coordinate system.

### Opening Extent

**Browse...** Year2007.tif

**Upload complete**

### Closing Extent

**Browse...** Year2016.tif

**Upload complete**

## Upload the necessary parameters.

The parameters to style the raster datasets should be in CSV file format.

### Habitats Change Class Colors

**Browse...** Habitent.csv

**Upload complete**

### Time Period

**Browse...** Years\_Data.csv

**Upload complete**

**Next Step-3**

Figure 20: Upload habitat opening extent closing extent data and parameters

- Next the user need to upload the '[Habitant.csv](#)' file.
- The column names are defined as [ID, Classes and Colors](#).
- The ID which represents the Pixel ID of the raster.
- Next the user need to provide the habitat classes which gives the information about the habitat names.

- More on we can see the habitat colors.
- This file need to saved as a [Habitant.csv](#) file formate.

ID	Habitat	Colors
1	Mangroves	#064635
2	Non Mangroves	#F7F7F7

Table 2: Habitant Classifications.

- Finally they need to upload the time period data '[Years\\_Data.csv](#)' file.

Years
Year 2007
Year 2017

Table 3: Time Period.

- First In the main panel the user need to click on the run button



in the opening extent map.

- Mangrove opening extent map will appear on the display.
- User need to click on



download button on the right to download the opening extent accounting report.

- Next the user need to go and click on "[Opening Extent Statistics](#)" panel if they want to see the statices tables.
- Finally they need to click on



download button to download the statices table.

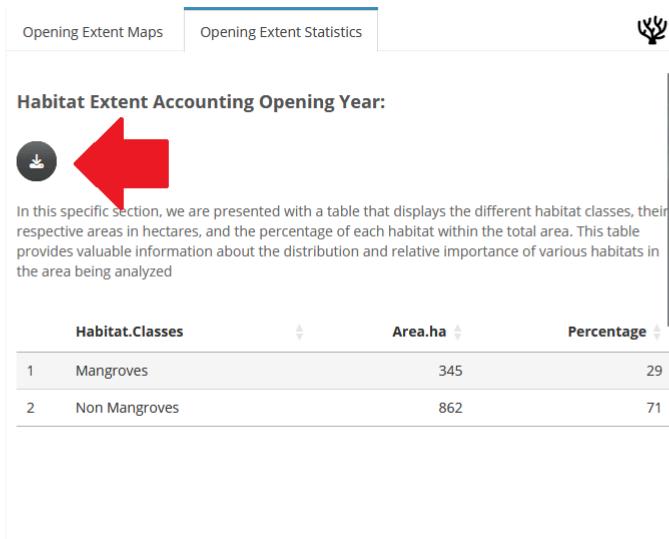
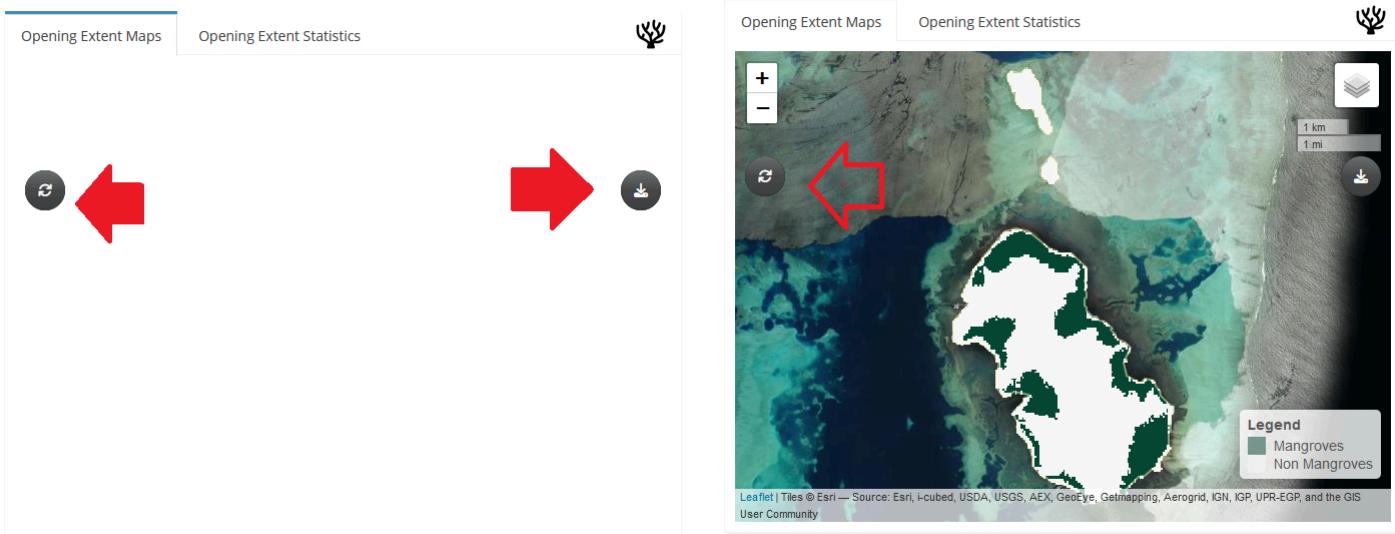


Figure 21: Opening Extent Maps and Statics

- In the main panel the user need to click on the run button



in in the closing extent map.

- Mangrove closing extent map will appear on the display.
- User need to click on



download button on the right to download the closing extent accounting report.

- Next the user need to go and click on "closing Extent Statistics" panel if they want to see the statices tables.

- Finally they need to click on



download button to download the statices table.

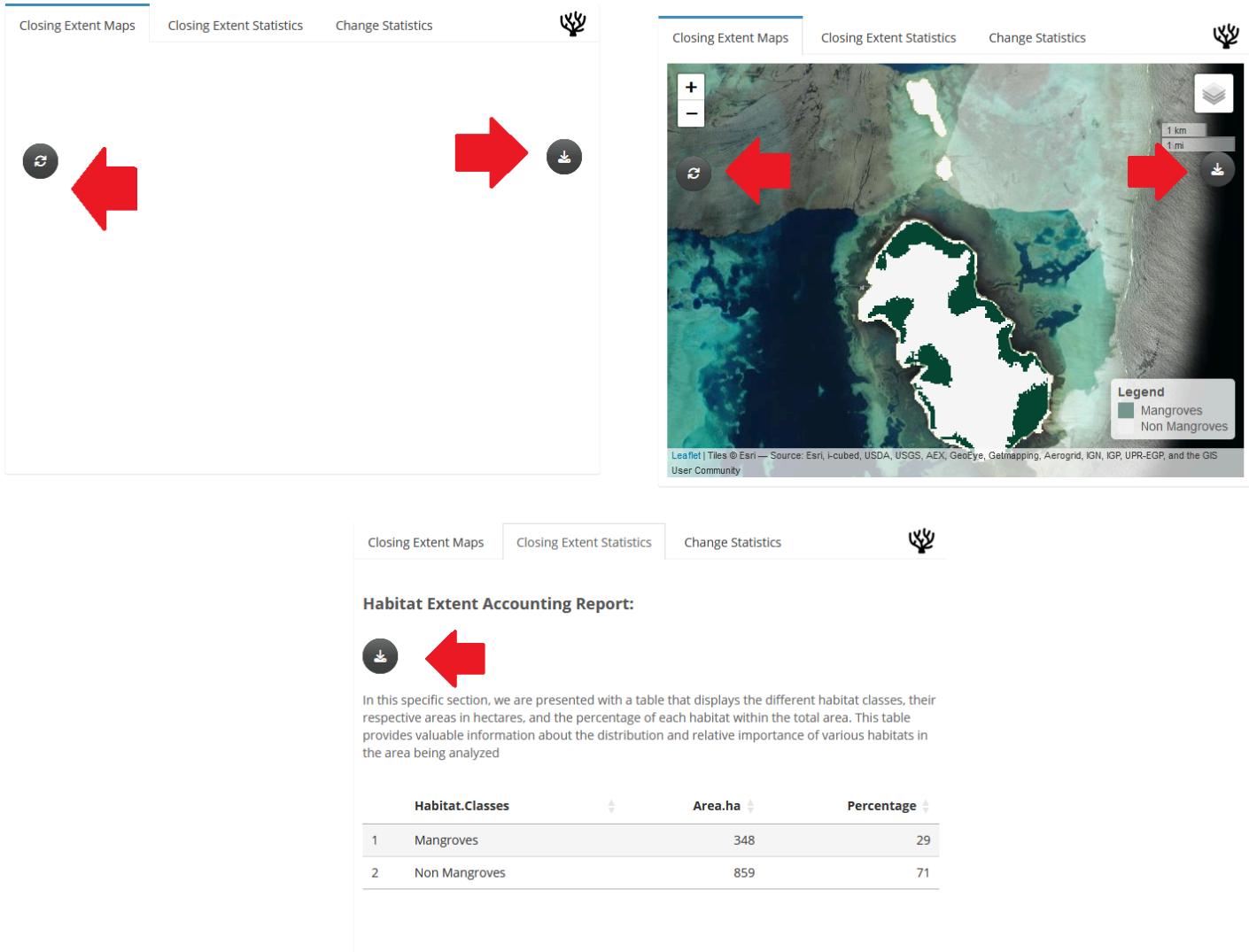


Figure 22: Closing Extent Maps and Statics

- Now the user need to go to the "[Habitat transformation hot spot maps](#)" window.
- First In the main panel the user need to click on the run button



user will able to see the Habitats transformation hot spot maps.

- On the left side the user need to change the dropdown window to change "[Habitat transformation hot spot maps](#)".
- User need to click on



download button on the right to download the Habitat transformation hot spot and report.

- Similar to this the users can download the "Habitat transformation markers marks maps".
- Users need to click on the change statistics panel and they can download the habitat change accounting tables and reports.

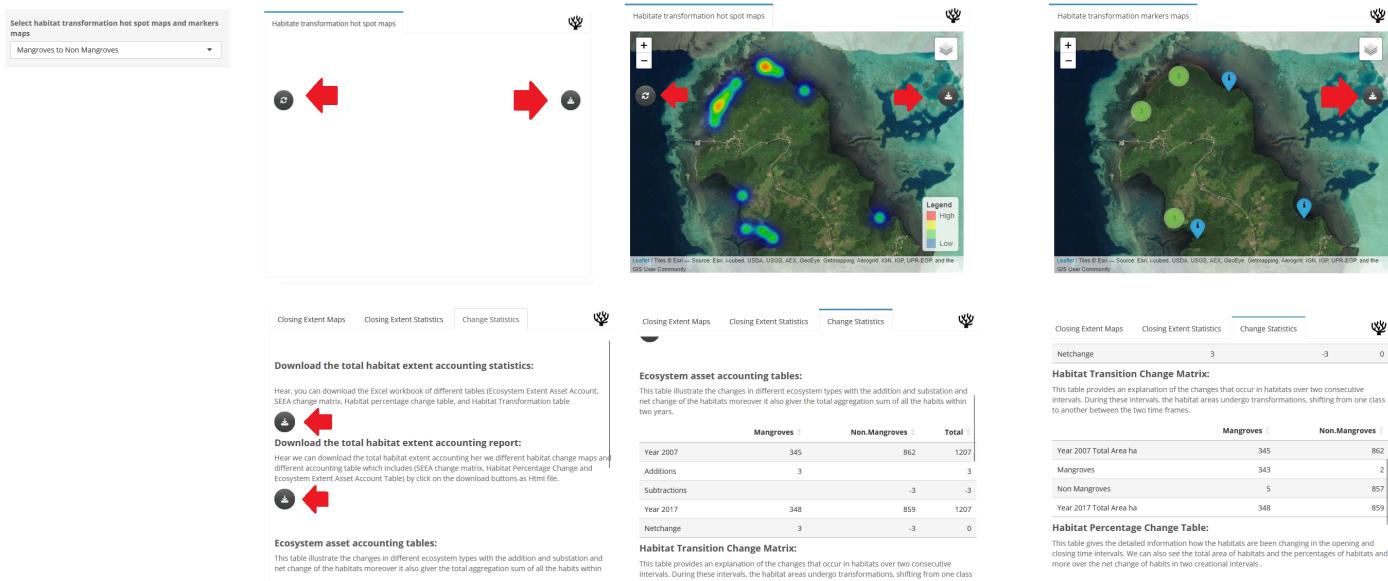


Figure 23: Change Statics

- By the end of the section the users will be able to download different opening and closing statistics.
  - a) Opening Extent Html report.
  - b) Opening Extent Statistics which shows the Area.ha and percentage of habitat.
  - c) Closing Extent Html report.
  - d) Closing Extent Statistics which shows the Area.ha and percentage of habitat.
- Users can download the habitat change statistics and habitat transformation maps.
  - a) Ecosystem asset accounting tables.
  - b) Habitat Transition Change Matrix.
  - c) Habitat Percentage Change Table.
  - d) Habitat Transformation Table.
  - e) Habitat transformation hot spot maps report.

- f) Habitat transformation markers maps report.

### **Step-3.1.4: Inputs (Step-3 Upload Condition Data):**

- In this step the users need to upload the inputs files of opening and closing time periods in raster file format in to the side bar panel.

## Condition Accounting.

**Condition Opening Extent (Raster File format)**

Browse...
3 files
Upload complete

**Parameters of the Condition Data (.csv File format)**

Browse...
ecosystem\_condition\_opening.csv
Upload complete

**Select a color ramp:**

PuRd
 ▼

**Condition Closing Extent (Raster File format)**

Browse...
3 files
Upload complete

**Parameters of the condition data (.csv File format)**

Browse...
ecosystem\_condition\_closing.csv
Upload complete

**Select a color ramp:**

PuRd
 ▼

**Reference**

Browse...
References\_Condition\_Total.csv
Upload complete

Next Step-4

Figure 24: Condition Accounting Side bar panel.

- In the first step the user need to upload the condition indicators for opening time period.
  - Mangrove\_agb\_Palau.tif
  - Mangrove\_hba95\_Palau.tif
  - Mangrove\_hmax95\_Palau.tif
- Followed by this they need to upload the condition indicator parameters table in opening time periods.[ecosystem\\_condition\\_opening.csv](#)

Condition Indicator	Time Interval	Measurement Unit
Aboveground mangrove biomass	2010	Mg ha <sup>-1</sup>
Mangrove basal area weighted height	2010	meters
Mangrove canopy maximum height	2010	meters

Table 2: Ecosystem Condition Opening Accounting table.

- Next if the user intrusted they need to change the color ramp.
- Similar to the opening time period user ned to upload the condition indicators for closing time period.
- In this case we are uploading same parameters for the closing time periods due to lack of available data in closing time periods.
  - Mangrove\_agb\_Palau.tif
  - Mangrove\_hba95\_Palau.tif
  - Mangrove\_hmax95\_Palau.tif
- Followed by this they need to upload the condition indicator parameters table in Closing time periods.[ecosystem\\_condition\\_closing.csv](#)

Condition Indicator	Time Interval	Measurement Unit
Aboveground mangrove biomass	2010	Mg ha <sup>-1</sup>
Mangrove basal area weighted height	2010	meters
Mangrove canopy maximum height	2010	meters

Table 3: Ecosystem Condition Closing Accounting table.

- In the main panel in opening condition accounting user need to click on run



button to generate opening extent map and statistics and generate opening accounting report.

- User can change the drop downs on the maps to see different condition indicators.
- Next the user can download the accounting report by clicking on download button on right



- In the Opening Statistics user can download different accounting tables.

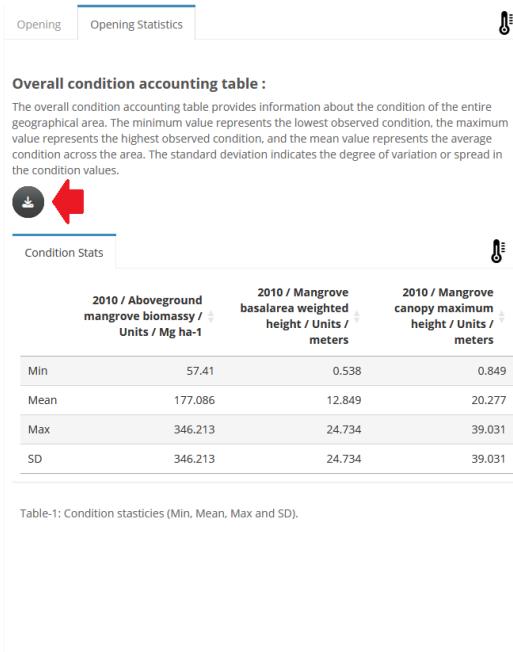
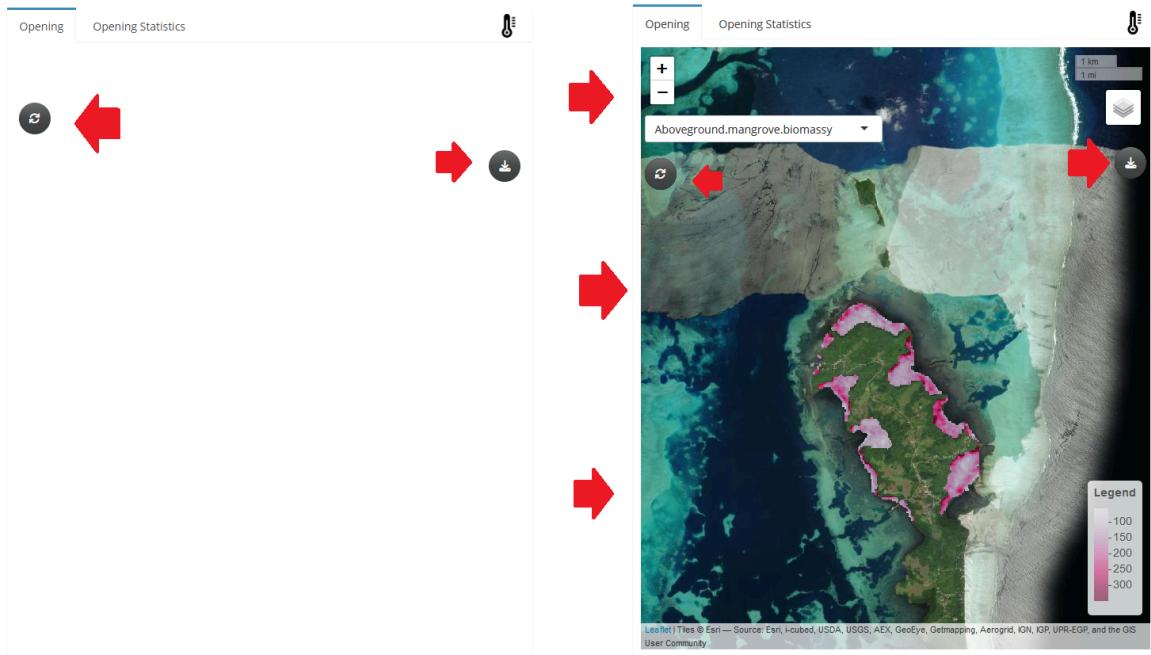


Figure 25: Conation Opening Extent panel

- In the main panel in closing condition accounting user need to click on run



button to generate closing extent map and statistics and generate closing and condition change accounting report.

- Next the user will be able to see the different condition indicators on top left.
- In the closing Statistics user can



closing statistics table.

- Next in the condition change statistics table user can download condition change statistics table and accounting report.

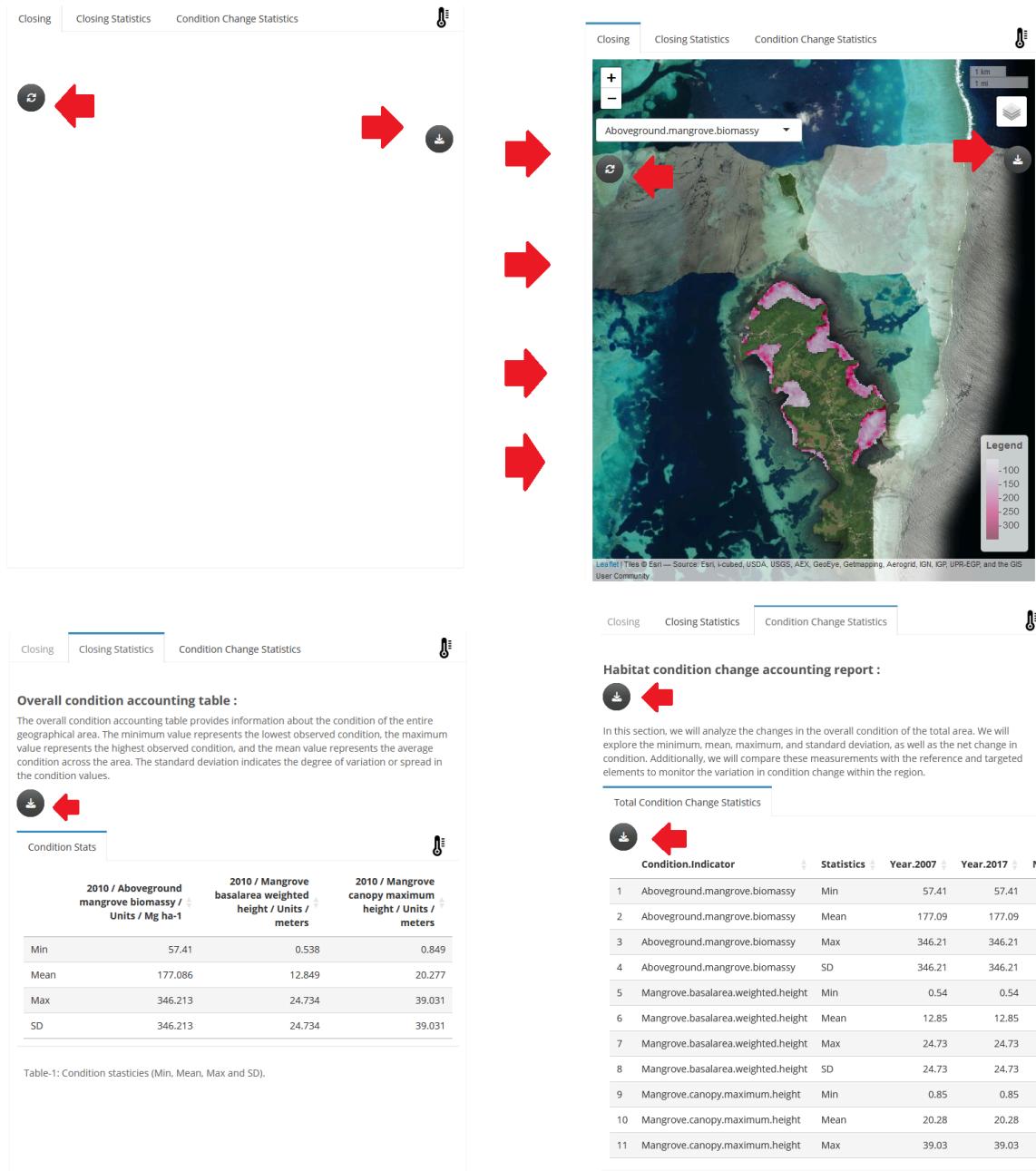


Figure 26: Conation Closing Extent panel

- By the end of the this section the user will be able to produce the habitat condition accenting and reports as show bellow.
- a) Condition Opening statices (Min, Mean, Max and SD) table.

- b) Condition Opening statices report.
- c) Condition Closing statices (Min, Mean, Max and SD) table.
- d) Condition Change Accounting statices table.csv.
- e) Condition Change statices report.html.
- f) Condition Change Accounting report.html.

### **Step-3.1.5: Inputs (Step-4 Total Habitat Extent and Condition Accounting):**

- In this step the user will able to see and download the total Habitat extent and condition Accounting statistics.

**In this section we can download the total habitate extent and condition stastics** 

**Habitat Change in Area Hectors and Percentage Change**

Mangroves

**Habitent Transformation Markers**

Mangroves to Non Mangroves

**Habitent\_Condition Reference**

Browse... References\_Habitats.csv

Upload complete

Please upload all the necessary parameters from step one to step four. Once completed, you can generate the overall accounting tables for the habitat extent and habitat condition data sets by clicking on the download button below.



Figure 27: Input panel for total habitat Extent and Condition Accounting window.

- Users need to upload the "References\_Habitats.csv" file table to generate habitat change statics.

<b>Statistics</b>	<b>Condition</b>	<b>Habitat</b>	<b>Reference Level/Target</b>
Min	Aboveground mangrove biomass	Mangroves	
Mean	Aboveground mangrove biomass	Mangroves	
Max	Aboveground mangrove biomass	Mangroves	
SD	Aboveground mangrove biomass	Mangroves	
Min	Mangrove basal area weighted height	Mangroves	
Mean	Mangrove basal area weighted height	Mangroves	
Max	Mangrove basal area weighted height	Mangroves	
SD	Mangrove basal area weighted height	Mangroves	
Min	Mangrove canopy maximum height	Mangroves	
Mean	Mangrove canopy maximum height	Mangroves	
Max	Mangrove canopy maximum height	Mangroves	
SD	Mangrove canopy maximum height	Mangroves	
Min	Aboveground mangrove biomass	Non Mangroves	
Mean	Aboveground mangrove biomass	Non Mangroves	
Max	Aboveground mangrove biomass	Non Mangroves	
SD	Aboveground mangrove biomass	Non Mangroves	
Min	Mangrove basal area weighted height	Non Mangroves	

Statistics	Condition	Habitat	Reference Level/Target
Mean	Mangrove basal area weighted height	Non Mangroves	
Max	Mangrove basal area weighted height	Non Mangroves	
SD	Mangrove basal area weighted height	Non Mangroves	
Min	Mangrove canopy maximum height	Non Mangroves	
Mean	Mangrove canopy maximum height	Non Mangroves	
Max	Mangrove canopy maximum height	Non Mangroves	
SD	Mangrove canopy maximum height	Non Mangroves	

Table 4: References Habitats.

- The will also able to see the data integrated accounting habitat transformation markers maps.
- On the right side of the map users can download the "Habitat transformation markers map" report.

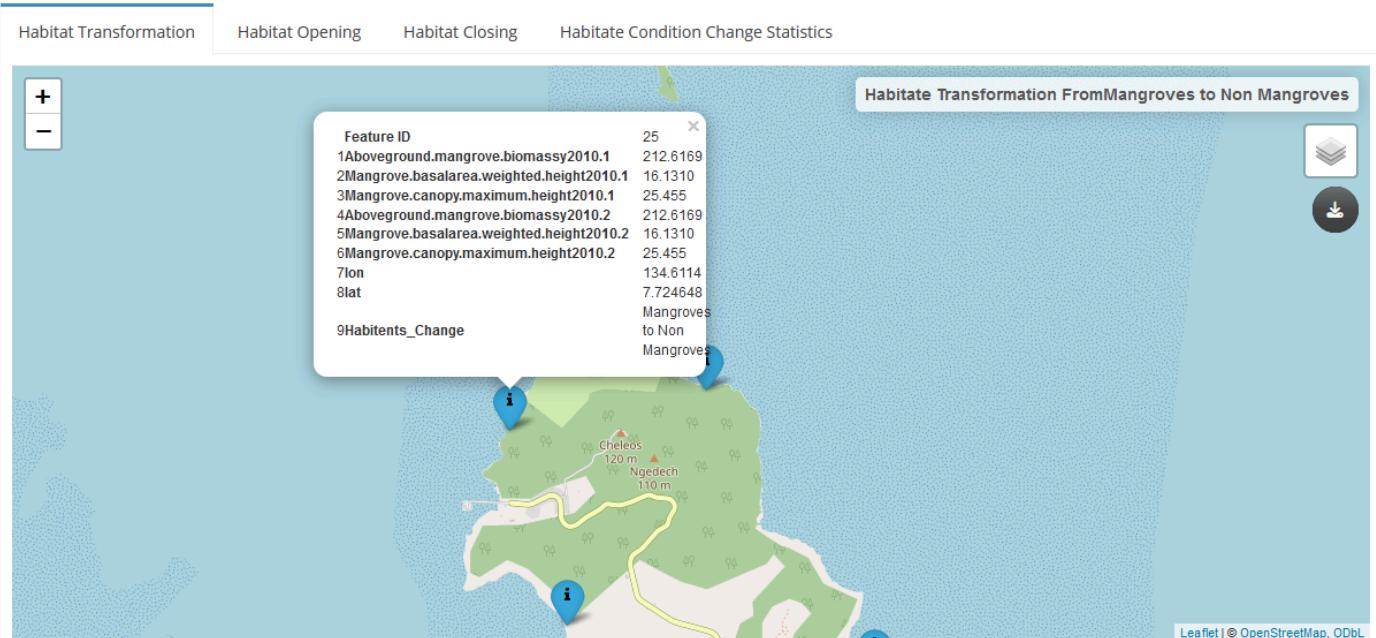


Figure 28: Habitat Transformation markers map

- Next the user can download the "[Habitat Opening](#)" statistics and report in Habitat Opening tab. Where the user will get the Min,Mean,Max and SD for the Habitat condition. For the Opening year followed by this the user can download the [Habitat\\_opening\\_accounting\\_report](#).

Habitat Transformation    Habitat Opening    Habitat Closing    Habitate Condition Change Statistics

**Habitat condition accounting table :**

The habitat condition accounting table provides specific information about the condition of different habitat classes within the opening time. This table includes the minimum, mean, maximum, and standard deviation statistics for each habitat class

	Min	Mean	Max	SD	Temperature
<b>Habitat</b>					
1 Mangroves		57.41		0.538	0.849
2 Non Mangroves		57.41		0.538	0.849

Figure 29: Habitat Condition Statistics

- Next the user can download the "[Habitat Closing](#)" statistics and report in Habitat Closing tab. Where the user will get the Min,Mean,Max and SD for the Habitat condition for the Closing year followed by this the user can download the [Habitat\\_Closing accounting report](#) in the closing time period.

Habitat Transformation    Habitat Opening    Habitat Closing    Habitate Condition Change Statistics

**Habitat condition accounting table :**

The habitat condition accounting table provides specific information about the condition of different habitat classes within the closing time. This table includes the minimum, mean, maximum, and standard deviation statistics for each habitat class

	Min	Mean	Max	SD	Temperature
<b>Habitat</b>					
1 Mangroves		57.41		0.538	0.849
2 Non Mangroves		57.41		0.538	0.849

Figure 30: Habitat Condition Closing Statistics

- In the "Habitat Condition Change Statistics" table users can download the Habitat Condition Change Statistics as a excel work book more over they can download the habitat Extent Condition Change accounting report as a html file. To understand the condition of the habitats in two time frames.
- Followed by this the "Reference Level/Target" helps the users to get the reference number to monitor how much the condition of the habitat is been varied from the specif reference point.

**Habitat condition accounting table :**

The habitat condition accounting table provides specific information about the condition of different habitat classes within the opening time and closing time and the netchange . This table includes the minimum, mean, maximum, and standard deviation statistics for each habitat class

Habitat	Statistics	Condition	X2010	X2010.1	Nectchange	Units	Reference.Level.Target
1	Max	Aboveground mangrove biomassy	346.213	172.897	-173.316	Mg ha-1	7
2	Max	Mangrove basalarea weighted height	24.734	12.549	-12.185	meters	37
3	Max	Mangrove canopy maximum height	39.031	19.803	-19.228	meters	37
4	Mean	Aboveground mangrove biomassy	173.043	172.897	-0.146	Mg ha-1	6
5	Mean	Mangrove basalarea weighted height	12.561	12.549	-0.012	meters	36
6	Mean	Mangrove canopy maximum height	19.821	19.803	-0.018	meters	36

Figure 31: Habitat Condition Change Statistics

- In the final section the users will be able to download different types of accounting reports maps and tables.
- a) Habitat condition accounting table opening:
- b) Habitat condition accounting opening report:
- c) Habitat condition accounting table closing:
- d) Habitat condition accounting closing report:
- e) Habitat condition accounting table change:
- f) Total Habitat extent and condition accounting report .html file.

## Appendix

The Appendix gives a brief overview of QGIS, which is the open-source programs used in the exercise outlined in this guide and shows how to download and install these programs for use.

# QGIS

QGIS is a cross-platform desktop geographic information system that supports viewing, editing and analysis of geo-spatial data.

We used the most recent version of QGIS available, and we advise that you do the same.

- GRASS – Geographic Resource Analysis Support System
- SAGA – System of Automated Geoscientific Analysis
- GDAL – Geographic Data Abstraction Library

## Downloading and Installing QGIS

1. Go to the QGIS website (<https://qgis.org/en/site/forusers/download.html>)
2. Download the resent version.

### Download QGIS for your platform

Binary packages (installers) are available from this page.

The current version is QGIS 3.36.0 'Maidenhead' and was released on 23.02.2024.

The long-term repositories currently offer QGIS 3.34.4 'Prizren'.

QGIS is available on Windows, macOS, Linux, Android and iOS.

[INSTALLATION DOWNLOADS](#) [ALL RELEASES](#) [SOURCES](#)

#### Download for Windows

 [Download QGIS 3.36](#)

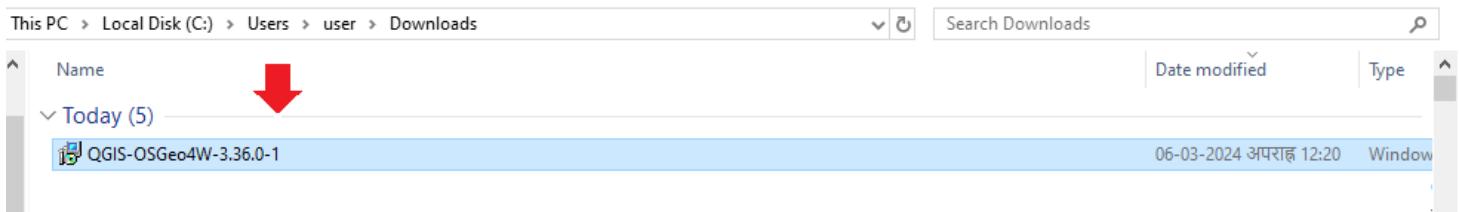
Looking for the most stable version? Get QGIS 3.34 LTR

 OSGeo4W Network Installer

The OSGeo4W installer is recommended for regular users or organization deployments. *It allows to have several QGIS versions in one place, and to keep each component up-to-date individually without having to download the whole package.*

Since QGIS 3.20 we only ship 64-bit Windows executables.

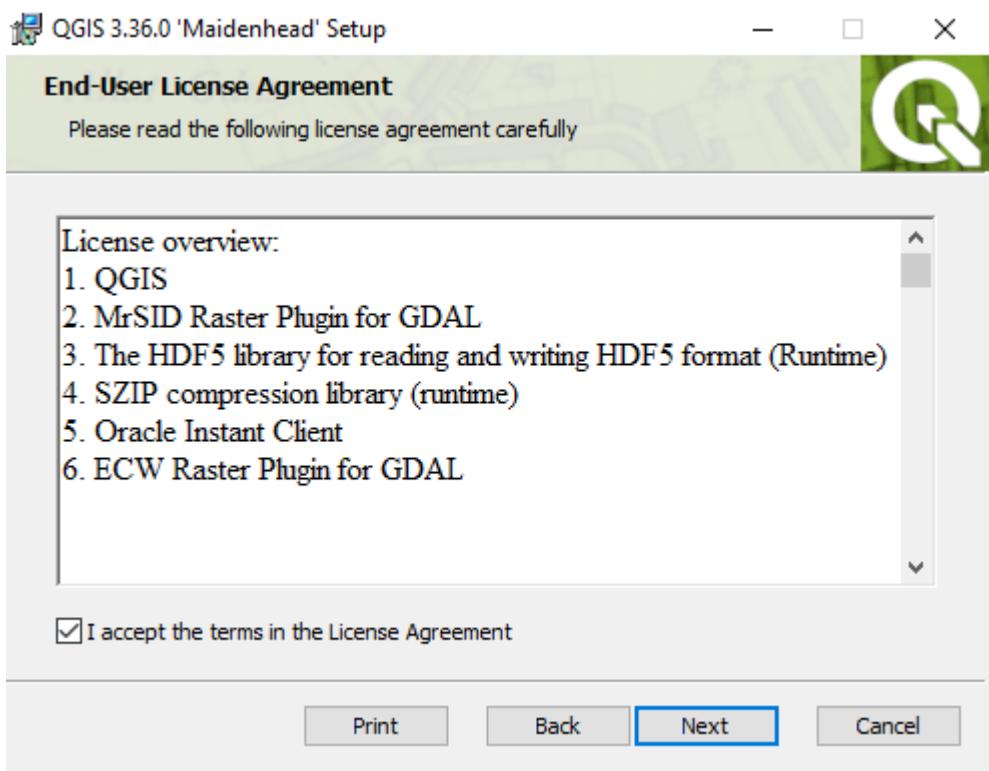
3. We have used the resent version to download and install Qgis.



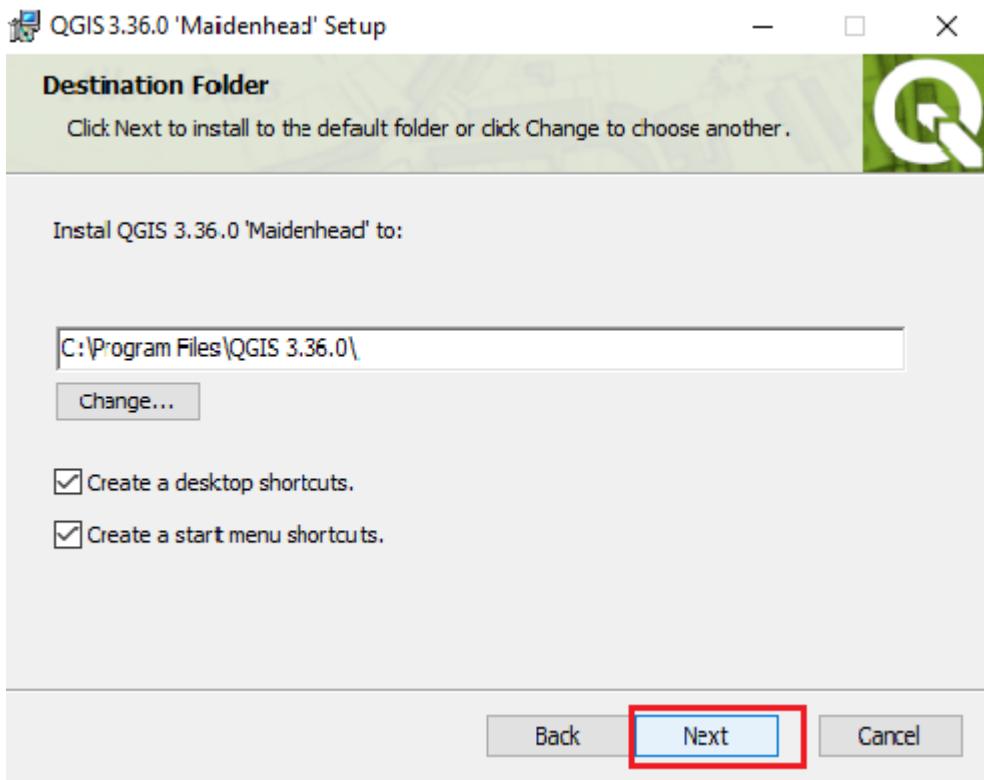
4. Click on Next button to start installing QGIS.



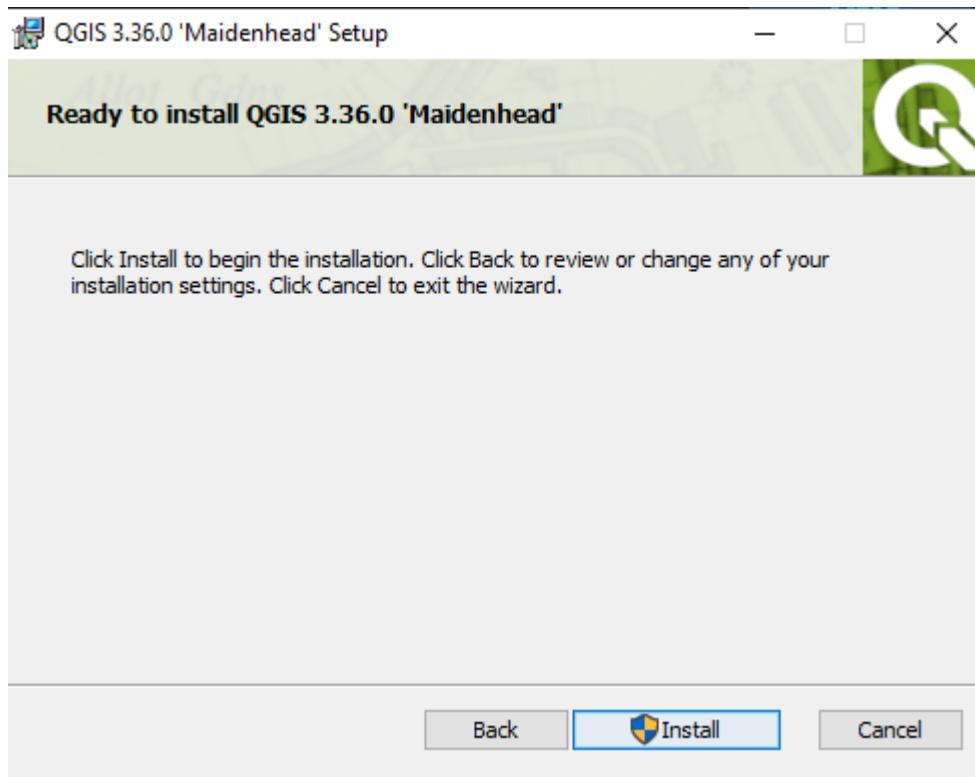
6. Click on I Agree for license agreement as seen below:



7. Click on Next in Choose Install Location, as seen in picture below:



8. At the end click on install button to install the QGIS.



## Open QGIS

- Now Open the Installed QGIS and Click on New Empty project to start.

