SRA_Ch5: Creating and interpreting a final spatial risk map

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Introduction

"The processes to this point have completed SRA-GIS steps up to and including Step 4 (Figure 5.1). The final two steps involve combining the spatial risk layers into a single risk surface and critical evaluation of the final SRA map."

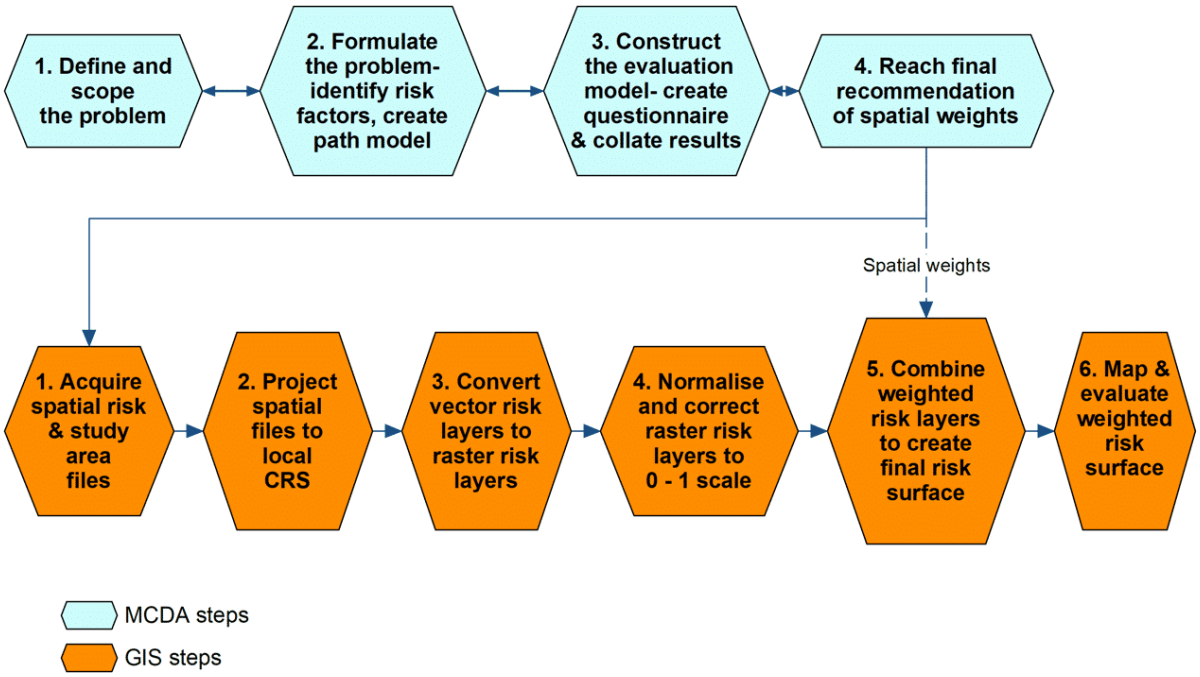


Figure 5.1: Spatial risk assessment steps

CONTINUE

5.1 Create final raster risk layer

"We apply MCDA weights to each final risk factor layer for FMD occurrence and add together to create a final raster layer. For the purpose of this exercise we use the following MCDA weights: Major roads = 0.18, Minor roads = 0.18, Cattle population density = 0.24, Pig population density = 0.18, Livestock markets = 0.40. See Figure 5.2:

- **Menu Bar: Raster -> Raster Calculator -> Dialog box:**

1. **Output layer: "RiskFactorWgtd" in the "Geo-Final" folder**
2. **Raster Calculator Expression: Add together weighted risk layers**
3. **Click OK**

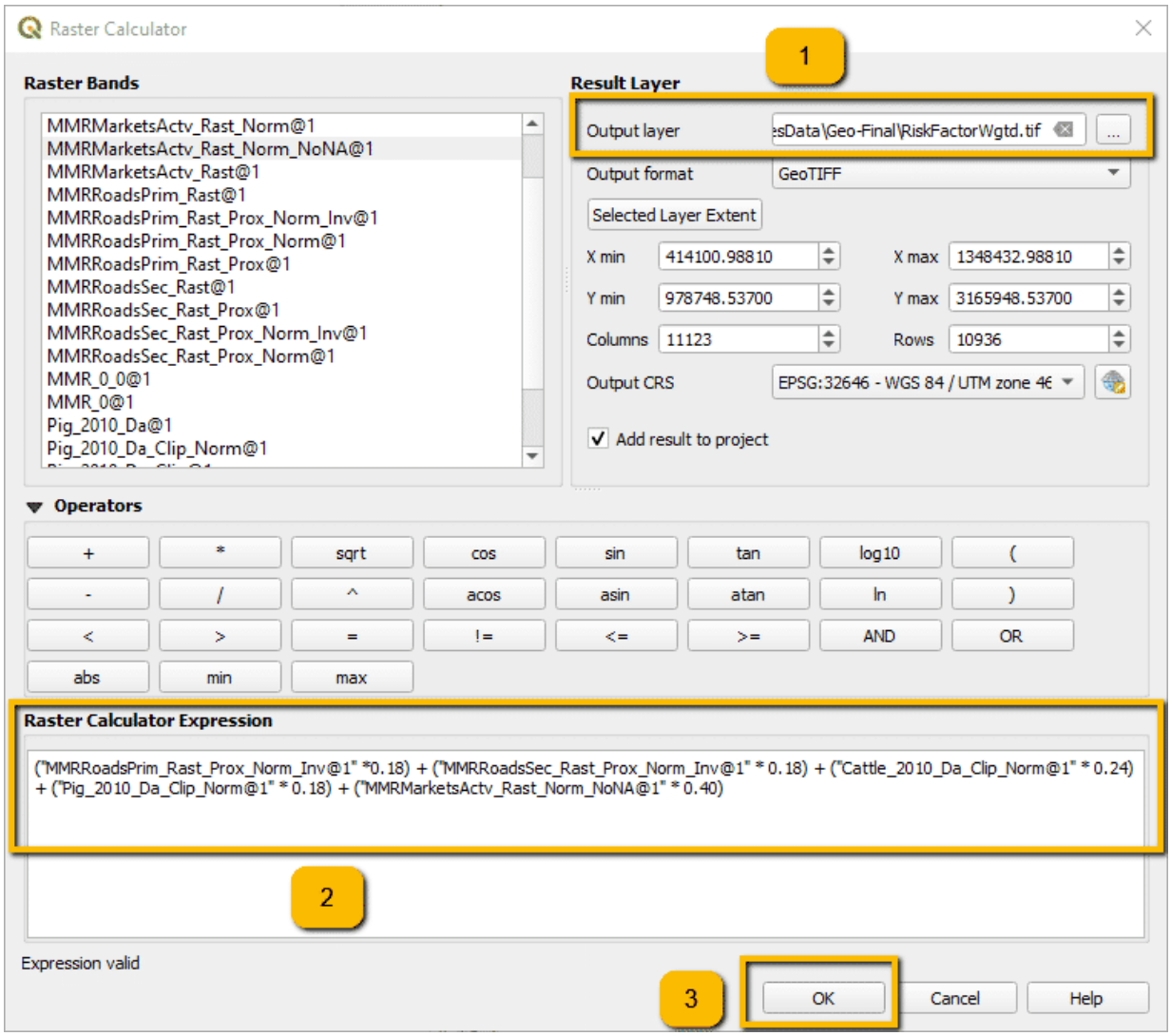


Figure 5.2: Combining weighted risk layers

CONTINUE

“Clip raster to the study area using the study area as a mask.

- **Menu Bar: Raster -> Extraction -> Clip raster by mask layer… -> Dialog box (see Figure Figure 5.3):**

1. **Input layer: “RiskFactorWgtd”**
2. **Mask layer: MMR_0**
3. **Click Run**

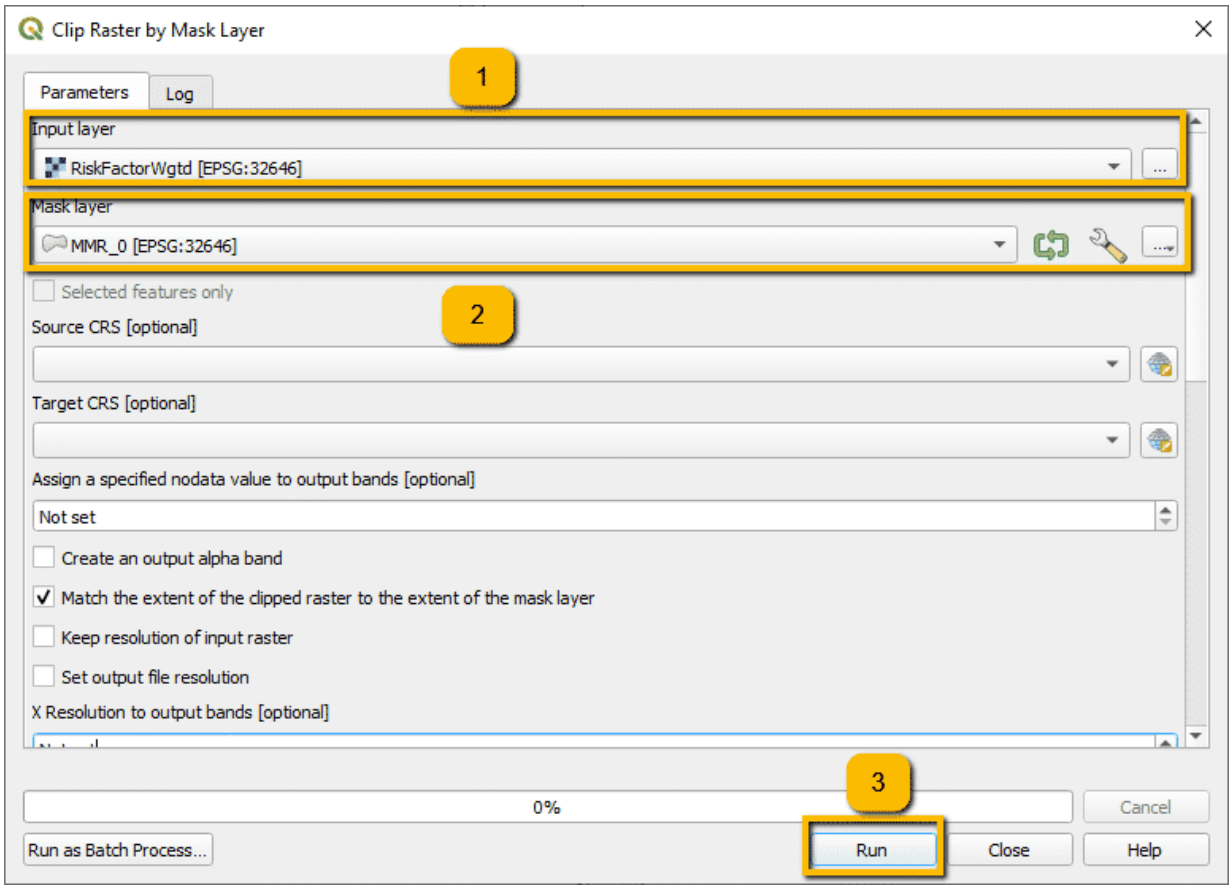


Figure 5.3: Clipping final raster risk surface to study boundary

CONTINUE

“Save clipped final risk factor layer with a new name:

- **Right click newly-created clipped RiskFactorLayer: Export -> Save As … Dialog box**
- **File name: “RiskFactorWgtd_clip” in “ResData-Final" folder**
- **View final risk map in map palette (see Figure 5.4)**

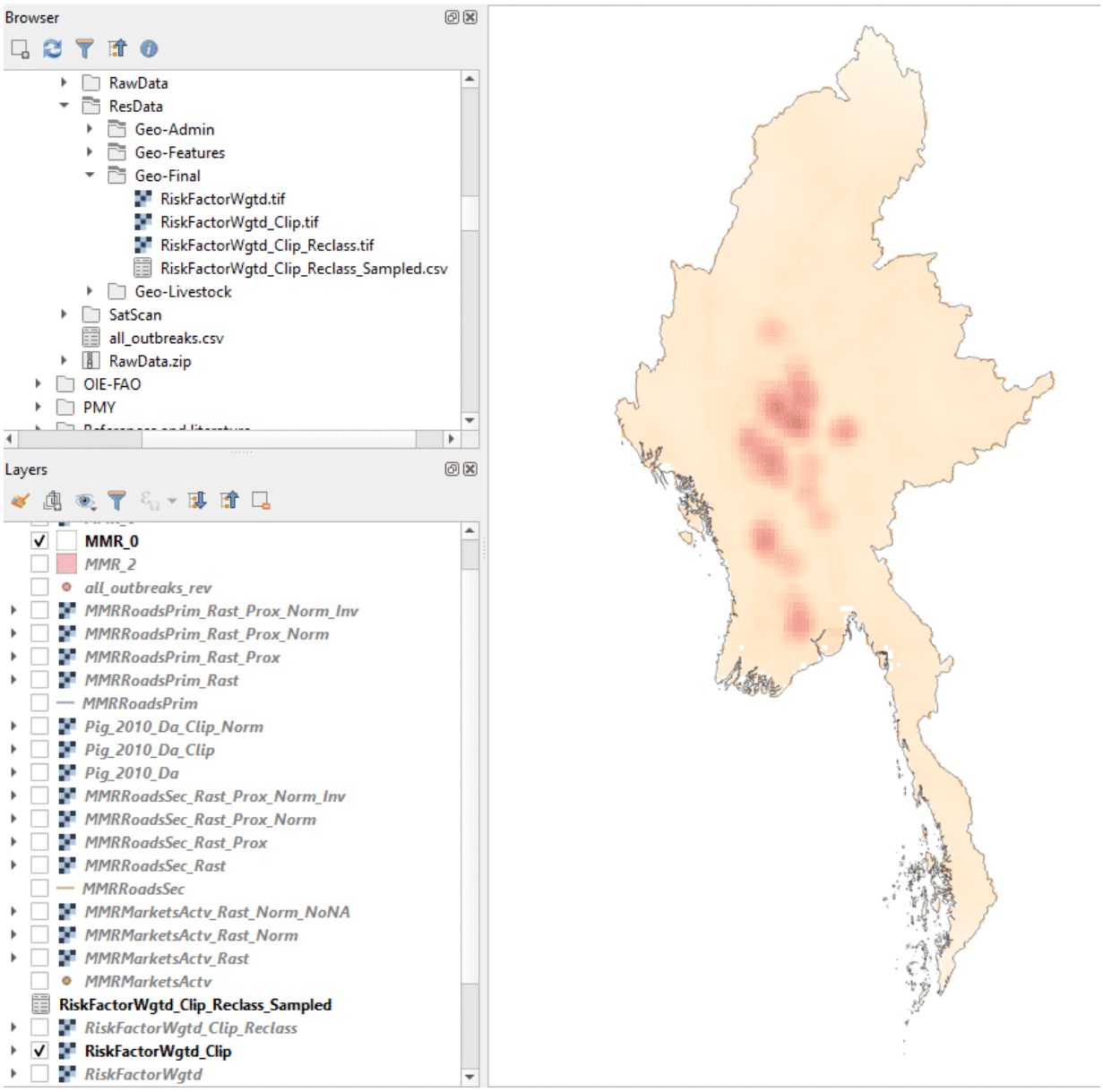
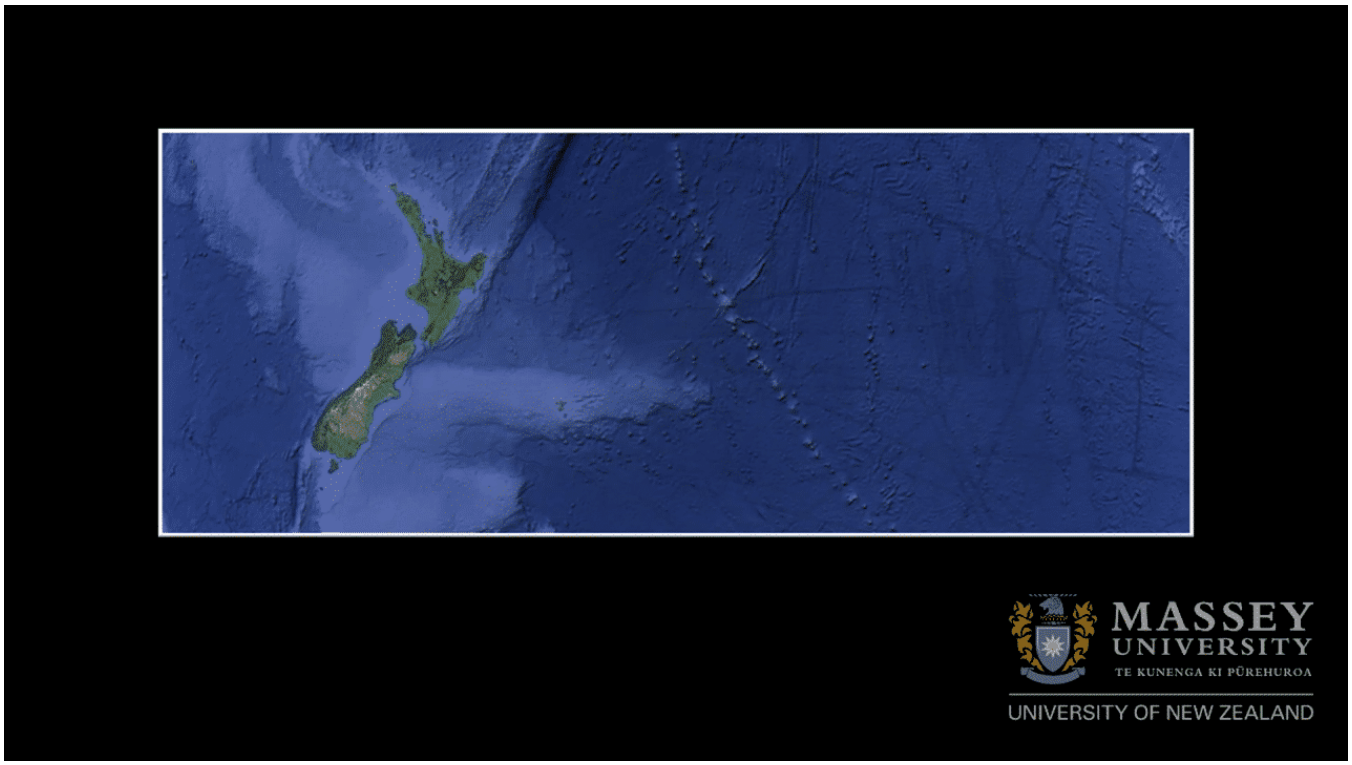


Figure 5.4: Final risk map with areas of increased risk denoted with increased red colouration

CONTINUE

Click ▶ to play the video


MASSEY
UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

CONTINUE

5.2 Evaluate the final spatial risk assessment map

"It is important to evaluate the final SRA map. One way of doing this is to determine the proportion of recorded FMD locations that are located within what might be thought of as "high FMD risk" zones.

To do this we need to first create a new shapefile of FMD case locations to add to the final risk map:"

- Click Open Source Data Manager on Toolbox Menu Bar -> Dialog box (Figure 5.5)
    a. Ensure "Delimited Text" option is highlighted
    b. Select Folder button and then file name
    c. Check default File Format and Record and Field Options are correct
    d. Check Geometry Definition settings are correct for the imported file
    e. Click "Add"

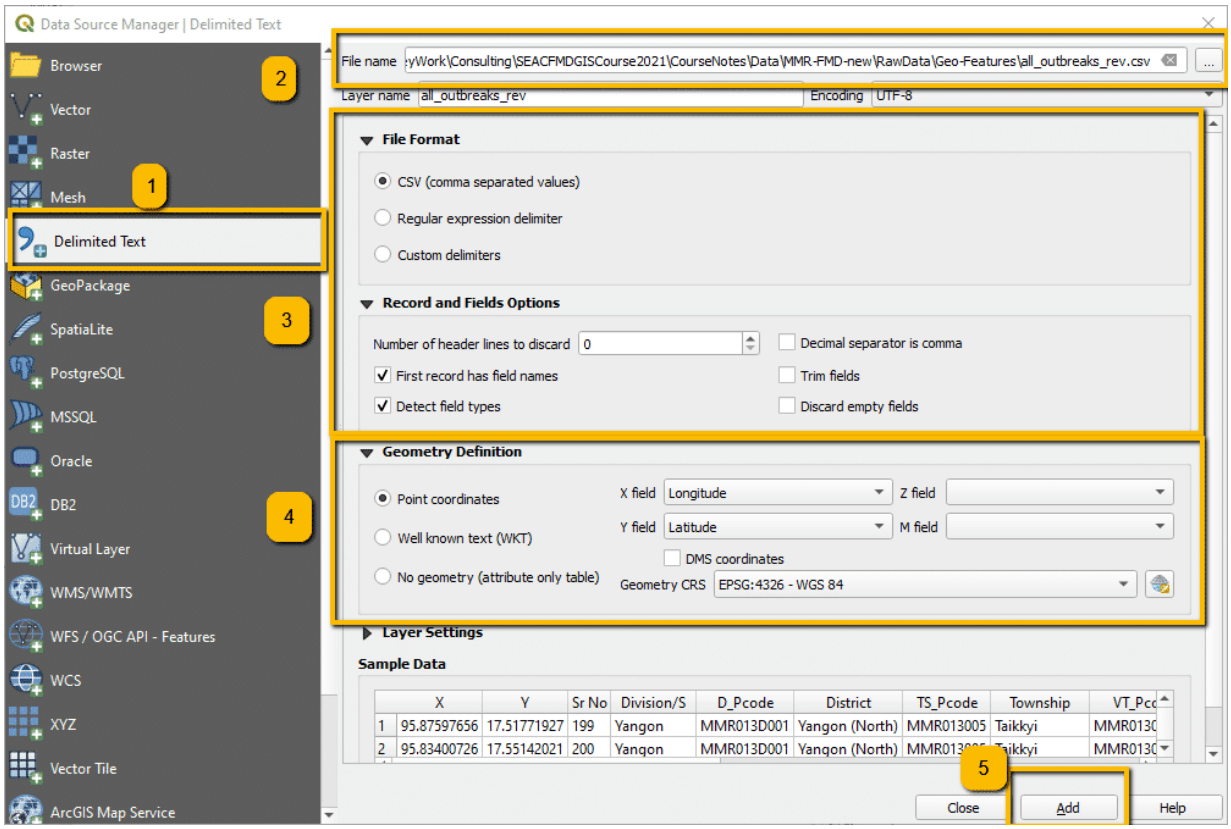


Figure 5.5: Import village outbreak locations and create a shape file

---

"Re-project and save newly-added "all_outbreaks_rev" shape file:

- **In Layers Pane Highlight and right-click "all_outbreaks_rev"**
- **Select Export -> Save Features As … -> Dialog box (Figure 5.6)**

1. **Select "ResData-Features" folder and file name"all_outbreaks_rev"**

2. **CRS: Select Project CRS: EPSG:32646 - WGS 84 /UTM zone 46N**
3. **Click OK**

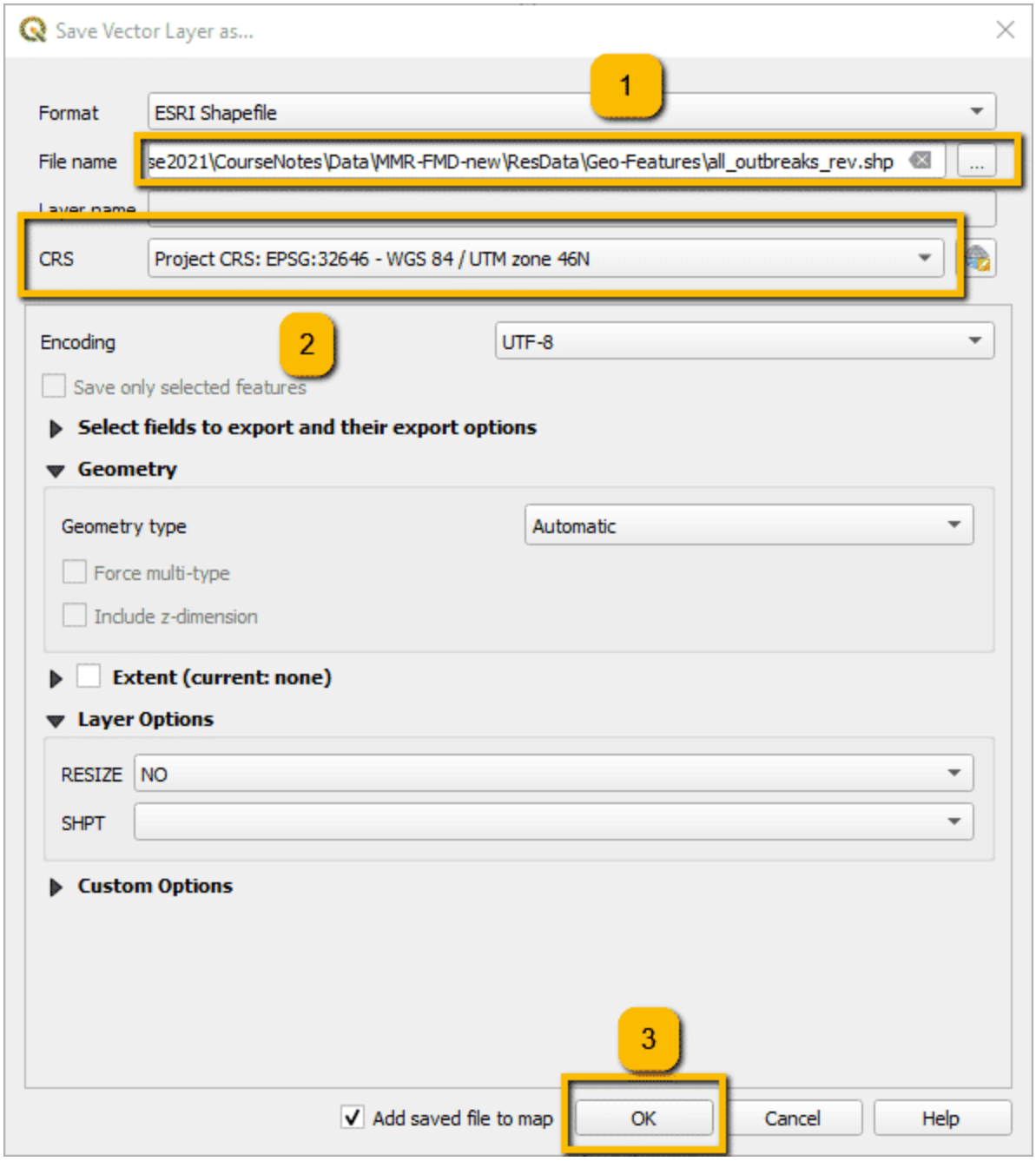


Figure 5.6: Reproject and save village outbreak locations shape file

CONTINUE

"Arrange map layers in Layers pane so that only the final weighted risk map clipped to the country boundary (RiskFactorWgtd_Clip) and the case locations are displayed (Figure 5.7)."

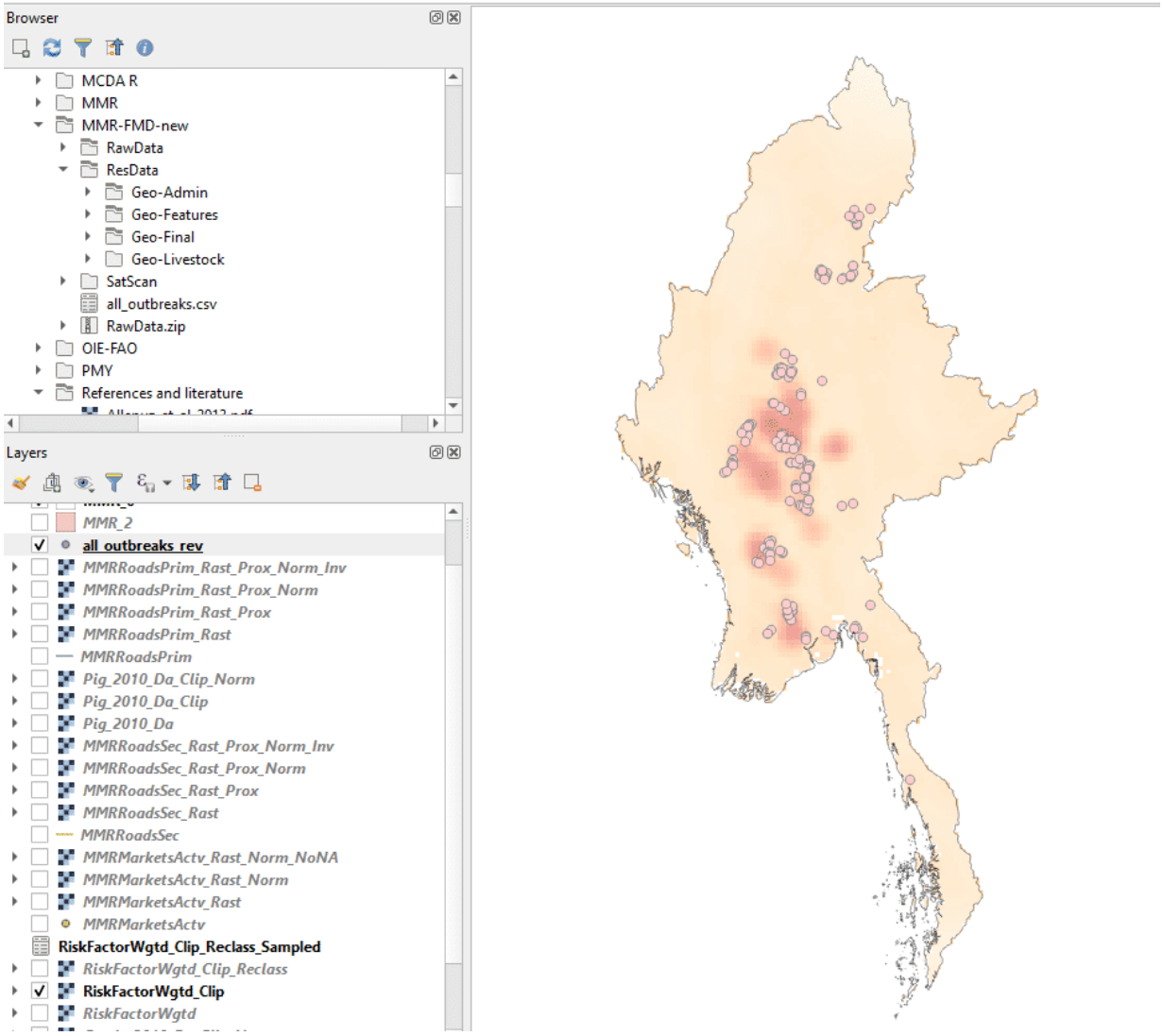


Figure 5.7: Final risk map with areas of increased risk denoted with increased red colouration and village outbreak or case locations identified with points

CONTINUE

"Reclassify the final risk map into high (>0.5) and low (<0.5) risk zones to make interpretation easier for

decision-makers:

- **Processing Toolbox -> Raster analysis -> Reclassify by table (Double click) -> Dialog box (Figure 5.8)**
  - **Raster layer: Select “RiskFactorWgtd_clip”**

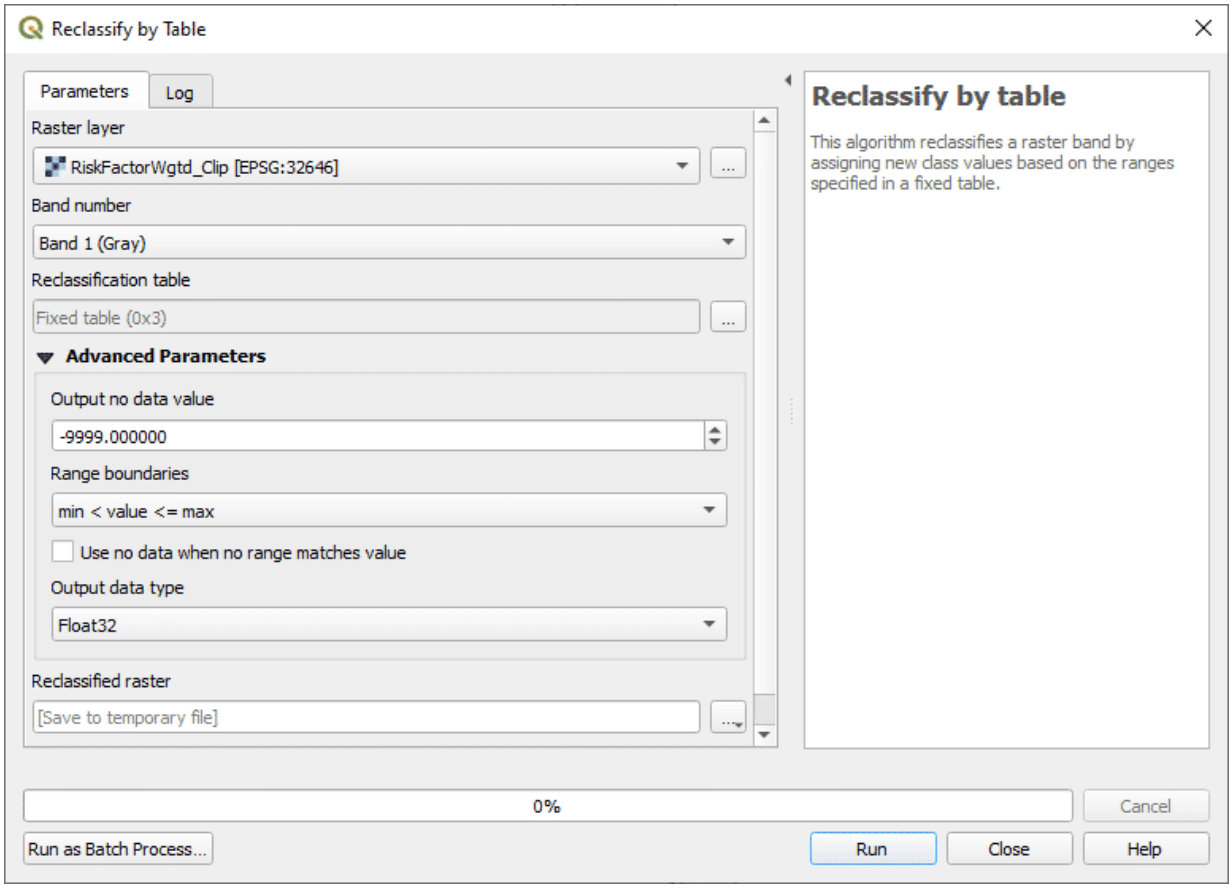


Figure 5.8: Raster reclassification dialog box

CONTINUE

- **Reclassification table: Click "…" button to right and pop-up "Reclassification Table" appears (Figure 5.9)**

1. **Click Add Row and double click in cells Minimum: 0, Maximum: 0.5, Value: 0**
2. **Click Add Row and double click in cells Minimum: 0.5, Maximum: 1, Value: 1**
3. **Click OK"**

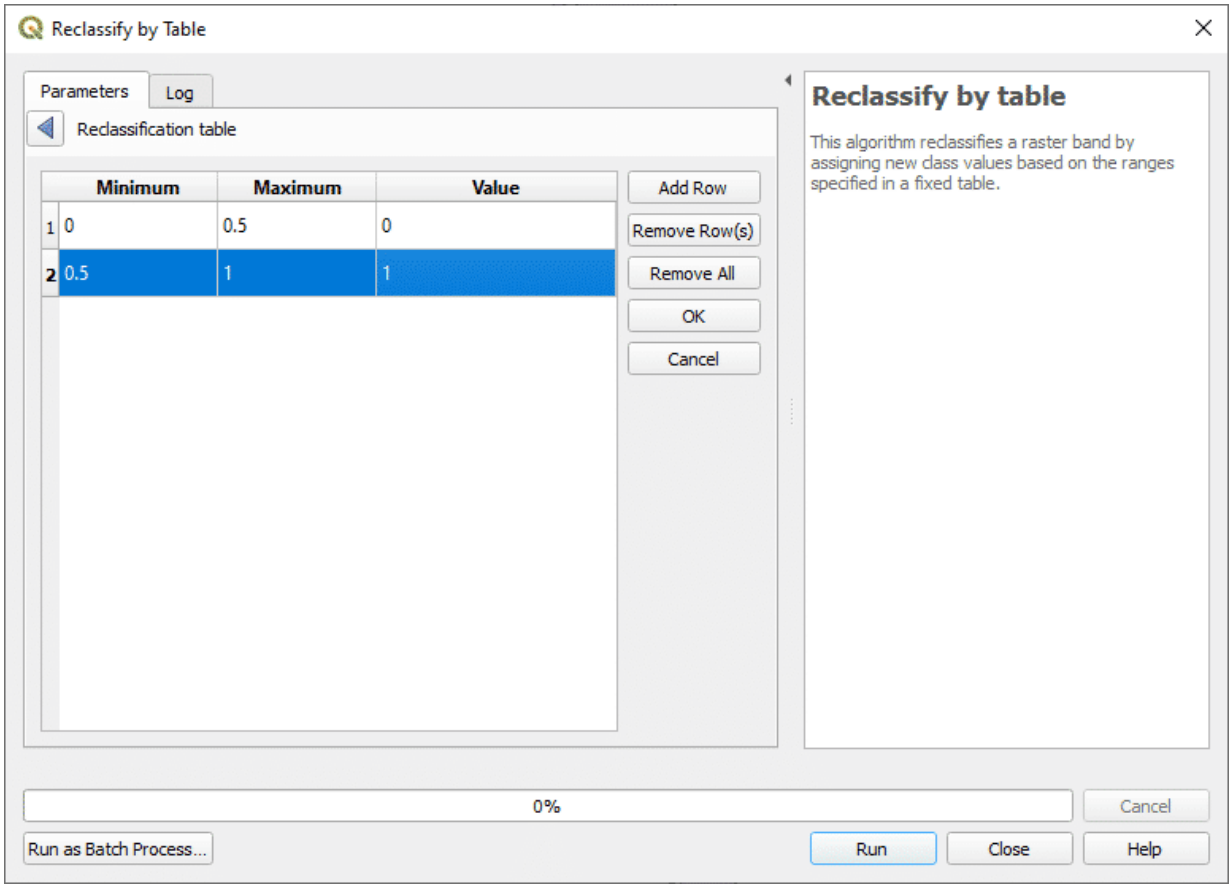


Figure 5.9: Raster reclassification table

CONTINUE

- **Return to dialog box (Figure 5.10)**

1. **Reclassified raster item: Click "…" button to right -> Save to file and rename the output file in the "ResData/Geo-Final/" folder as "RiskFactorWgtd_Clip_Reclass"**
2. **Click Run**
3. **Click Close**

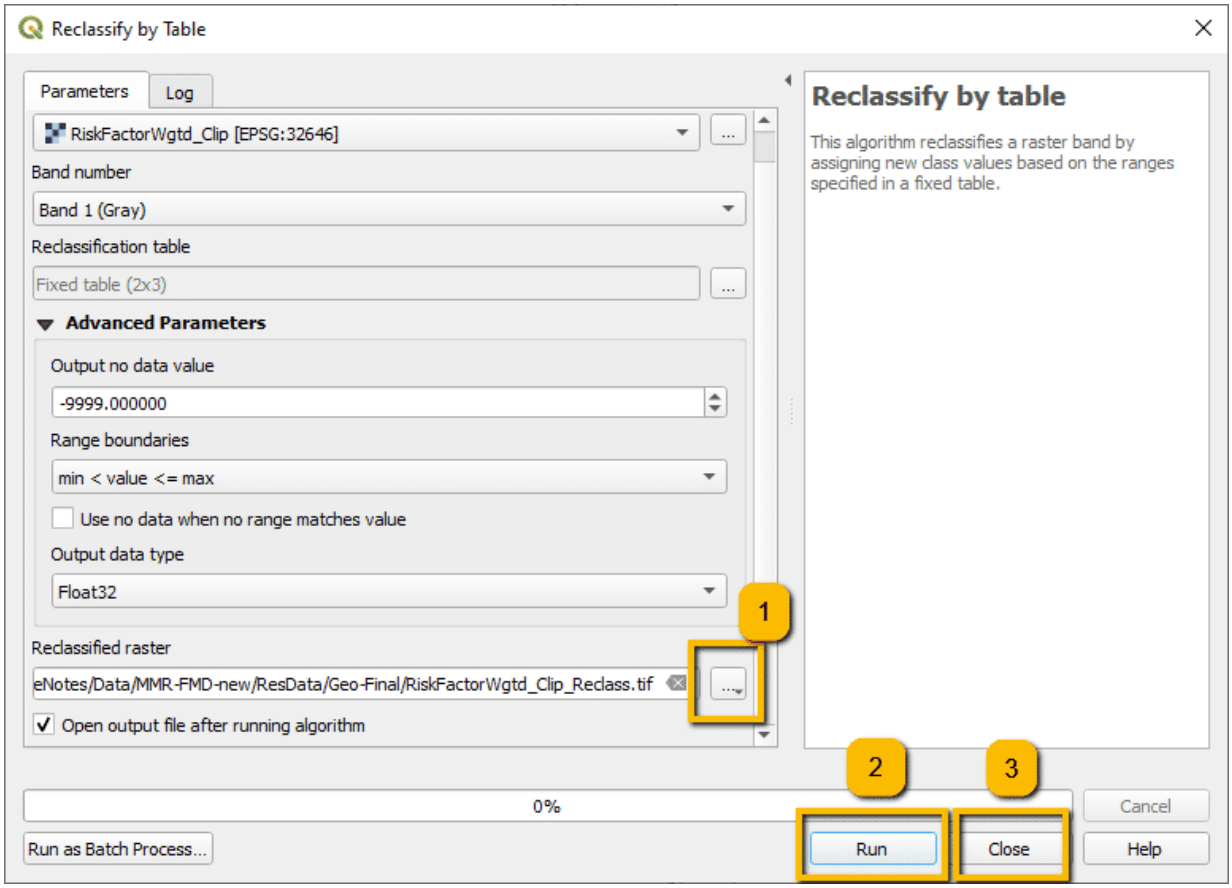


Figure 5.10: Rename and save reclassified spatial risk assessment map

CONTINUE

- **Calculate the proportion of outbreaks/cases in the high risk (risk probability >= 0.5) zone**
- **In Layers pane highlight "RiskFactorWgtd_Clip_Reclass"**

- **Processing Toolbox -> Raster analysis -> Sample Raster Values (double click) -> dialog box: (Figure 5.11)**

1. **Input Layer -> Click "…" button to far right and select the projected vector layer for outbreak locations "all_outbreaks_rev [EPSG:32646]" in the "ResData/Geo-Features/" folder**
2. **Raster layer: "RiskFactorWgtd_Clip_Reclass [EPSG:32646]"**
3. **Sampled: Save to file: Create a new CSV file of the results of this analysis in ResData/Geo-Final: RiskFactorWgtd_Clip_Reclass_Sampled.csv**
4. **Click "Run" and then "Close"**

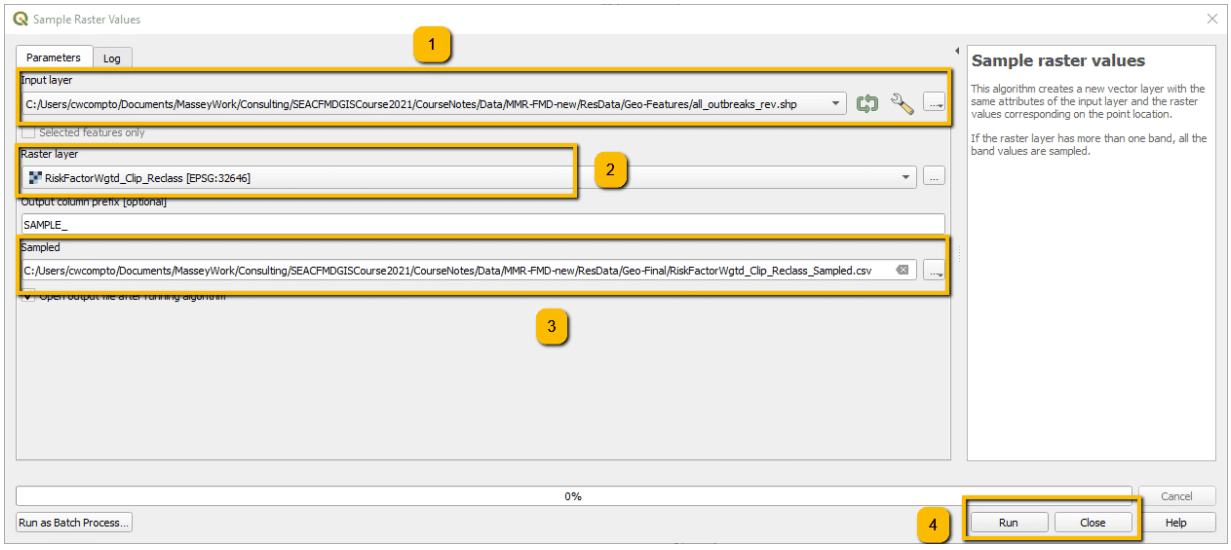


Figure 5.11: Rename and save outbreak location csv file with villages classified as present in high or low risk zones

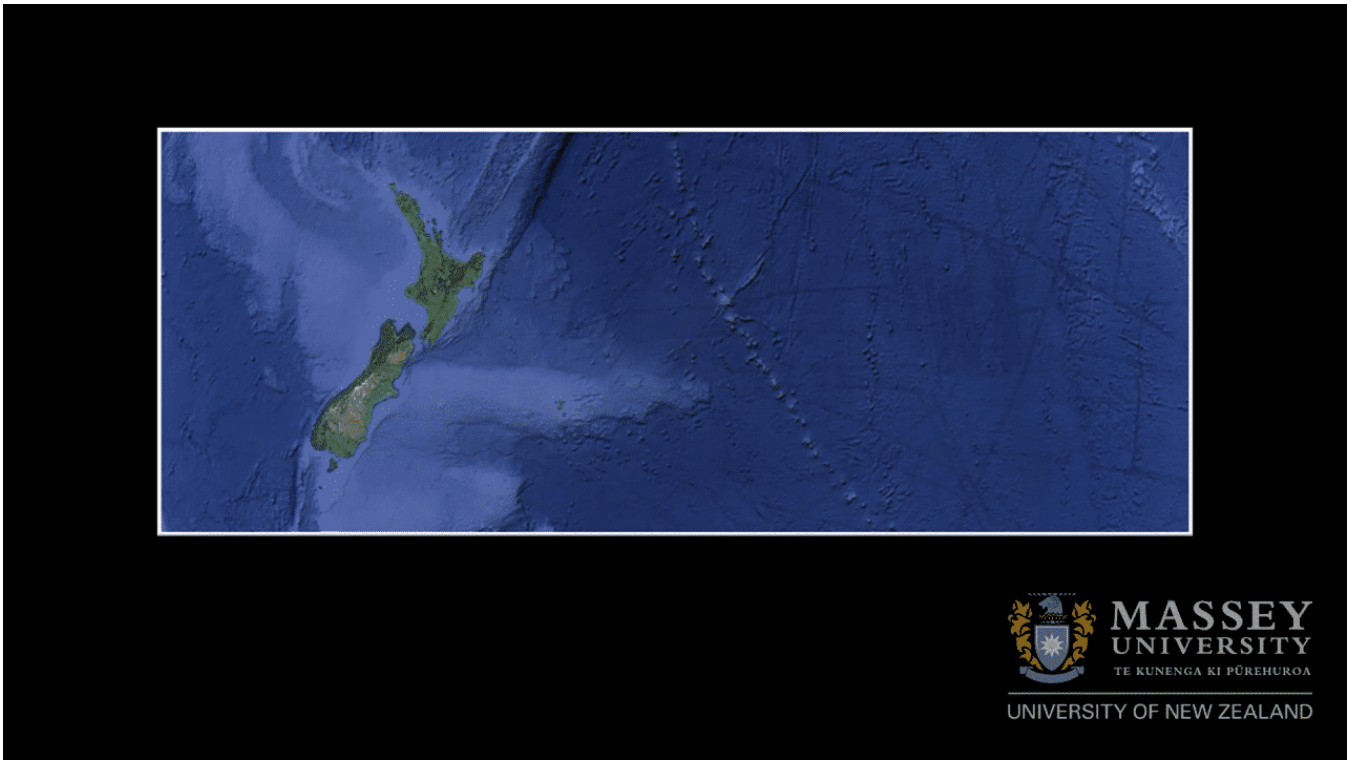
CONTINUE

“Calculate the proportion of outbreaks/cases classified in the SRA high-risk regions:

- **Open “RiskFactorWgtd_Clip_Reclass_Sampled.csv” (will be Read-Only)**
- **Count the number of rows for which there is no Longitude and Latitude value (likely because the coordinates were outside the study region), and therefore no result in the SAMPLE_1 column by filtering for Blanks (n = 10) then Clear Filter**
- **Filter the columns and count the number of cells in the SAMPLE_1 column with value = 1 (n = 68)**
- **Therefore the proportion of outbreaks/cases in the high risk (risk probability > 0.5) zone = 68/178 = 38%**

CONTINUE

Click ▶ to play the video


MASSEY
UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

CONTINUE

Exercise 5.1: Critically evaluate the spatial risk assessment map

"**A final risk assessment map needs to be checked for obvious errors or patterns that don't appear to fit the data used to create it and to be critically evaluated to determine whether it is fit for its intended purpose.**

1. **Discuss how well the most important risk factors for which information is available for are modelled in the final SRA map**
2. **Of the risk factors evaluated, could the parameters be changed to improve the accuracy of the SRA map e.g. diameter of smoothing of heat map of livestock markets density?**
3. **Is there a possibility of information/reporting bias affecting our SRA map?**
4. **What additional data could be gathered to add additional risk factors to improve the prediction of our SRA map?**

CONTINUE

Congratulations - end of lesson reached

NEW ZEALAND
FOREIGN AFFAIRS & TRADE

OIE

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Australian Government
Department of Agriculture, Water and the Environment