SRA_Ch5: Creating and interpreting a final spatial risk map



Introduction

- 5.1 Create final raster risk layer
- 5.2 Evaluate the final spatial risk assessment map
- **Exercise 5.1: Critically evaluate the spatial risk assessment map**

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."



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

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+ ("Pig_2010_Da_Clip_Norm@1" * 0.18) + ("MMRMarketsActv_Rast_Norm_NoNA@1" * 0.40)						
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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

🔇 Clip Raster by Mask Layer			×
Parameters Log			
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RiskFactorWgtd [EPSG:32646]			▼
Mask layer			
MMR_0 [EPSG:32646]		- C) '	≫
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			▼ ③
Target CRS [optional]			
			- 🌚
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Not set			\$
Create an output alpha band			
\checkmark Match the extent of the dipped raster to the extent of the mask layer			
Keep resolution of input raster			
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Run as Batch Process	Run	Close	Help

Figure 5.3: Clipping final raster risk surface to study boundary





["]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

Click \blacktriangleright to play the video





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"

🔇 Data Source Manager Delimited Text	×
Browser	File name 🛛 Work\Consulting\SEACFMDGISCourse2021\Course\lotes\Data\MMR-FMD-new\RawData\Geo-Features\all_outbreaks_rev.csv 🚳 🗌
<u> </u>	Layer name all_outbreaks_rev Encoding UTF-8
• + vector	w File Format
Raster	
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	Regular expression delimiter
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4	Well known text (WKT) Y field Latitude
Virtual Layer	DMS coordinates
🤯 wms/wmts	No geometry (attribute only table) Geometry CRS EPSG:4326 - WGS 84
WFS / OGC API - Features	Layer Settings
↔	Sample Data
₩CS	X Y Sr No Division/S D Pcode District TS Pcode Township VT Pcc
XYZ	1 95.87597656 17.51771927 199 Yangon MMR013D001 Yangon (North) MMR013005 Taikkyi MMR0130
Vector Tile	2 95.83400726 17.55142021 200 Yangon MMR013D001 Yangon (North) MMR013000 Tukkyi MMR01307
Arcuis Map Service	





- "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 8	4
/UTM zone 46N	
3. Click OK	

🔇 Save Vec	tor Layer as	×
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		3
	✓ Add saved file t	to map OK Cancel Help

Figure 5.6: Reproject and save village outbreak locations shape file



["]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"

Parameters Log Raster layer RiskFactorWgtd_Clip [EPSG:32646] Rand number Band number Band 1 (Gray) Reclassification table Fixed table (0x3) Advanced Parameters Output no data value 9999.00000 9999.00000 9999.00000 9999.00000 PRange boundaries min < value <= max Use no data when no range matches value Output data type Float32 Reclassified raster [Save to temporary file]	Reclassify by Table			×
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0% Cancel	0%		Cancel	
Run as Batch Process	Run as Batch Process		Run Close Help	-

Figure 5.8: Raster reclassification dialog box





- 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"

rameters Log				Reclassify by table
Reclassification	table			This algorithm reclassifies a raster band by
Minimum	Maximum	Value	Add Row	assigning new class values based on the ranges specified in a fixed table.
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0.5	1	1	Remove All	
			ОК	
			Cancel	

Figure 5.9: Raster reclassification table



- 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

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Reclassified raster		
eNotes/Data/MMR-FMD-new/ResData/Geo-Final/RiskFactorWotd Clip Reclass.tif		
✓ Open output file after running algorithm		
	2 3	
0%		Cancel
Run as Batch Process	Run Close	Help

Figure 5.10: Rename and save reclassified spatial risk assessment map



- 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)
- 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"

Q Sample Raster Values	×
Parameters Log	Sample raster values
Trput layer C:/Users/oxcompto/Documents/MasseyWork/Consulting/SEACFMDGISCourse2021/CourseNotes/Data/MMR-FMD-new/ResData/Geo-Features/al_outbreaks_rev.shp 💦 🖏 🛶	This algorithm creates a new vector layer with the same attributes of the input layer and the raster values corresponding on the point location.
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З	
0%	Cancel
Run as Batch Process 4	Run Close Help

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



⁶Calculate 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 \blacktriangleright to play the video





Exercise 5.1: Critically evaluate the spatial risk assessment map



⁶A 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?

Congratulations - end of lesson reached

