

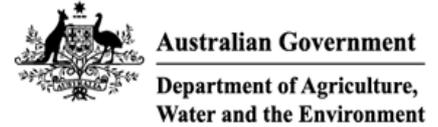
SPATIAL RISK ASSESSMENT FOR FMD RISK FACTORS OF MONGOLIA

TEAM MONGOLIA

Erdenesaikhan Tegshduuren, GAVS

Bayartungalag Bold, GAVS

Khandui Chuluunbaatar, SCVL

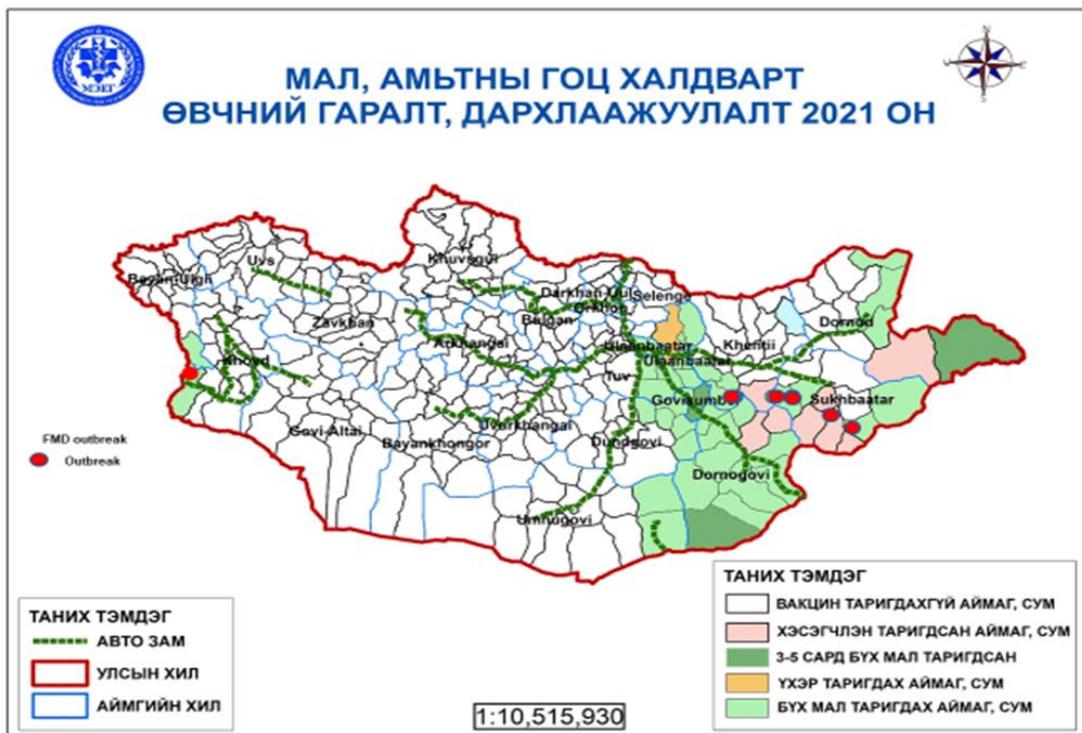


Background and Rational

FMD is one of priority diseases in Mongolia

- Outbreaks (Reoccurrence) of FMD have been reported in this years.
- Due to the high cost of FMD control and surveillance, the risk needs to be assessed and responded to in high-risk areas in the short term.
- In order to increase the economic turnover of Mongolia, we aim to support the export of raw materials and products of animal origin, including meat.

FMD outbreak currents situation in 2021



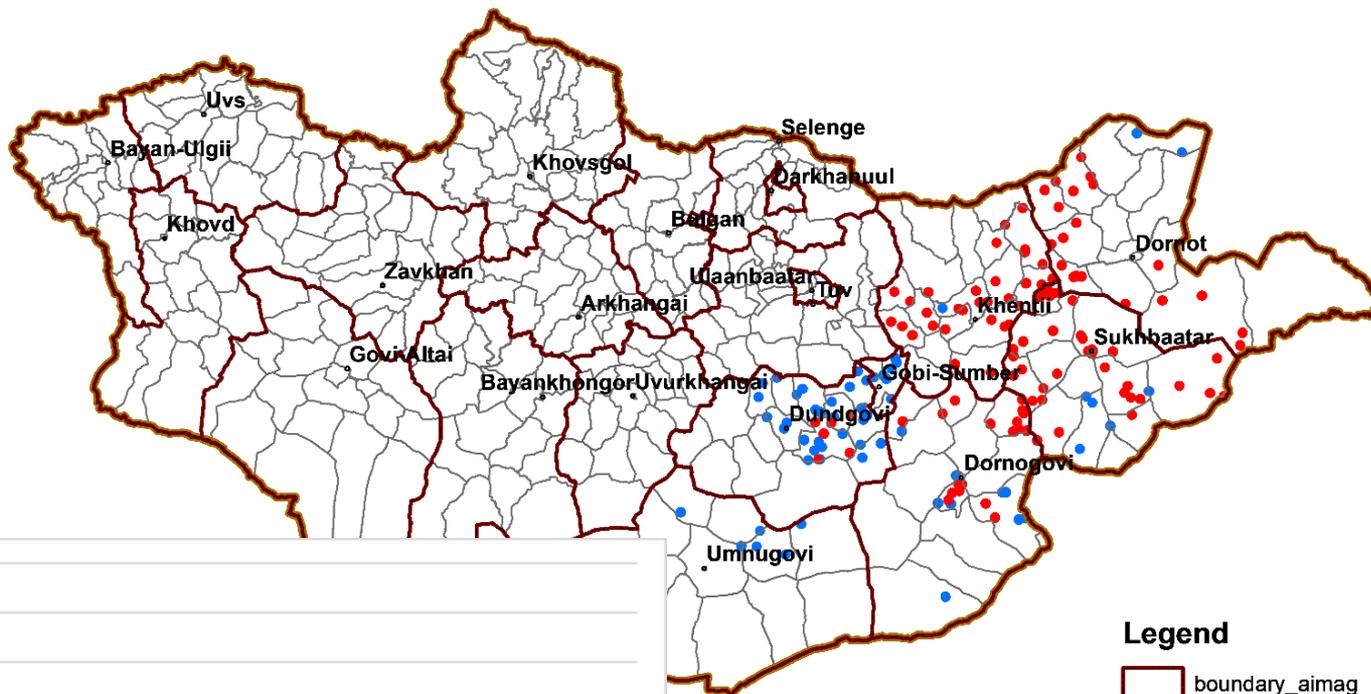
Control measures

- Emergency and routine Vaccination
- Surveillance outside containment and or the protection zone
- Movement control
- Quarantine

No	Province	Soum name	Started on	Cases /Cattle/	Sheep and goats	Status
1	Khovd	Bulgan	2021.06.30	85		on-going
2	Sukhbaatar	Ongon	2021.05.13	16		Resolved
3	Sukhbaatar	Galshar	2021.05.31		141	Resolved
4	Sukhbaatar	Tuvshinshiree	2021.06.08		8	Resolved
5	Dornogovi	lkhkheth	2021.06.17		721	Resolved
6	Khentii	Darkhan	2021.06.18	38		Resolved
Total				139	870	

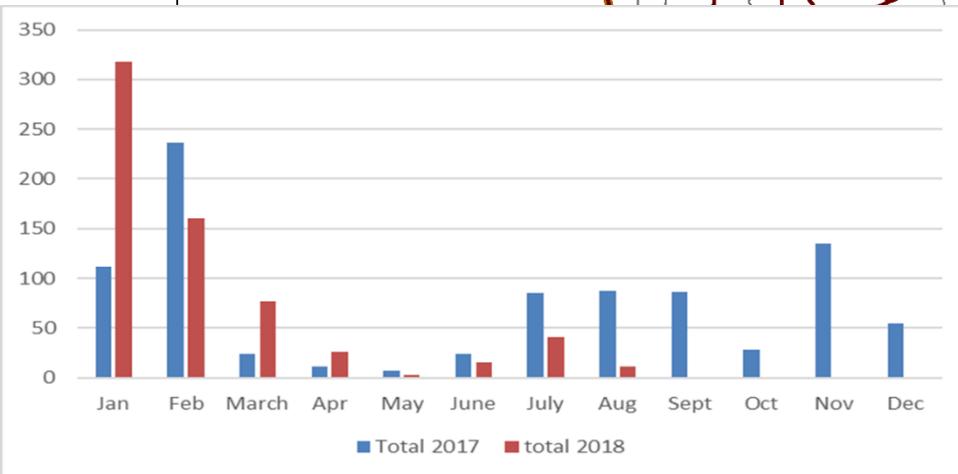
SPATIAL RISK ASSESSMENT ON FMD OUTBREAK IN MONGOLIA -2018

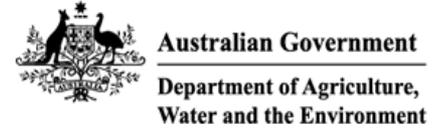
FMD cases in Mongolia from 2017 to 2018



Legend

- boundary_aimag
- boundary_country
- boundary_soums
- 1 Dot = 1
- FMD_2017
- FMD_2018



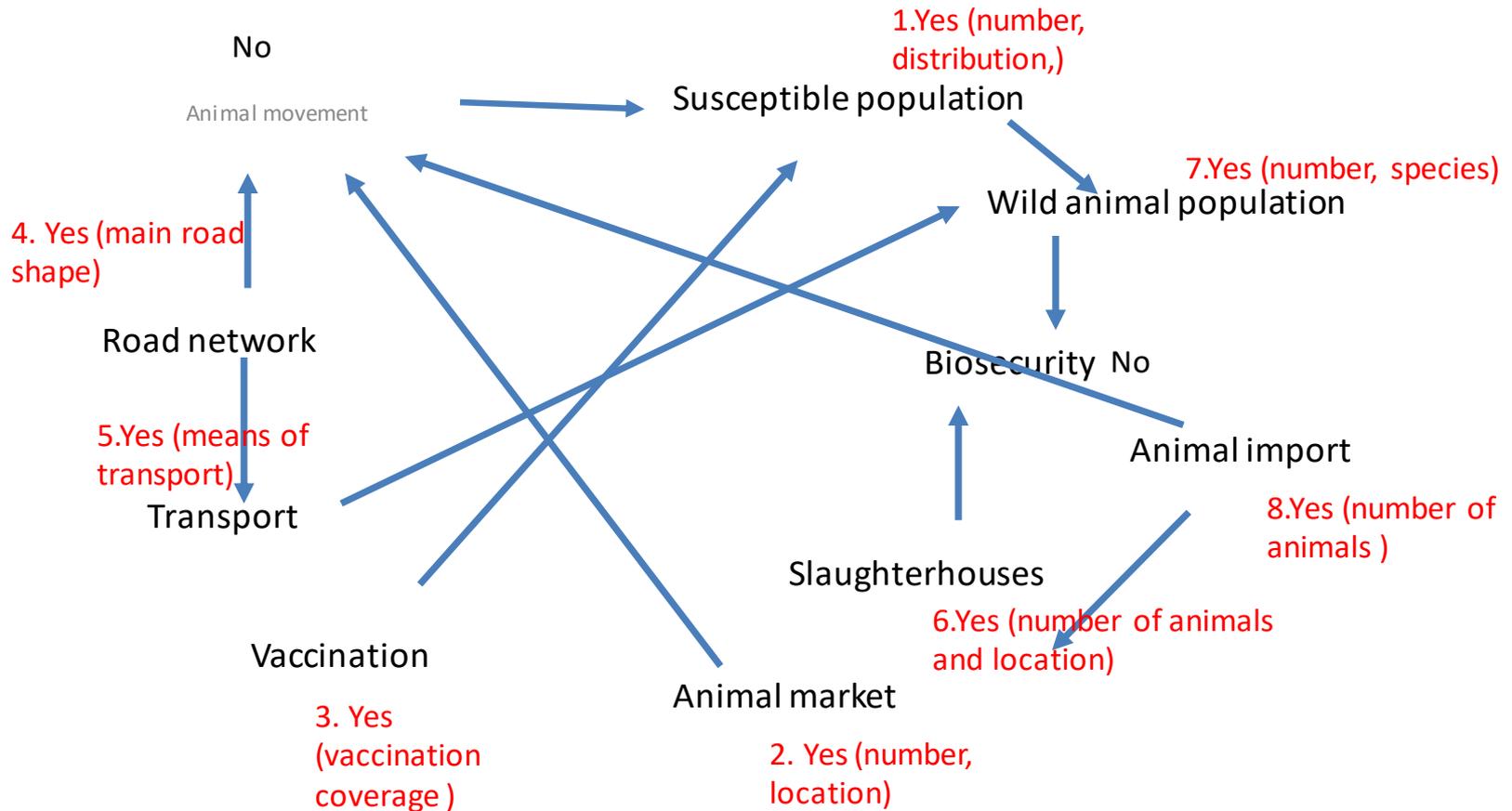


Methodology

CAUSAL PATH DIAGRAM

Risk factors (FMD)

Spatial data availability-8 risk factors



Questionnaire developed and circulated among experts

Collected 10 responses from FMD experts by google form questionnaire regarding to the importance of chosen risk factors

docs.google.com/forms/d/1NqG1JmHwRWmv5o5thGyPbhqfzbD2pmasRf1Qm5Dtjs/edit

YouTube Maps

1. What your name?

Short answer text

1. When comparing Cattle population density with National and local roads for the incursion and spread of FMD, Cattle population density is

a. extremely less important

b. very strongly less important

c. strongly less important

d. moderately less important

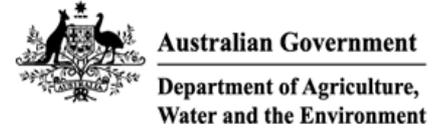
e. equally important

f. moderately more important

g. strongly more important

h. very strongly more important

1. Bolortuya.P, OIE
2. Batchuluun.D, SCVL
3. Chris Bartels, FAO
4. Gerelmaa.U, FAO
5. Amarsanaa.L, FAO
6. Battsetseg.G, FAO
7. Batkhyag.S, MOFA
8. Bodisakhan.Kh, GAVS
9. Erdeneochir.Ts, MULS
10. Chimedtseren.B, MULS



Results and Validation

Identified and selected risk factors

Factor Code	Factor Abbrev	Factor Description
A	WSS	Water sharing springs
B	RDS	National and local roads
C	CTL	Cattle population density
D	SRP	Small ruminants population density

Data sources for the Risk layers

Mongolian shapefile downloaded from *Geofabrik system*.

- Risk factor water sharing springs /Heat map/ *Figure 1*.
- Country boundary, national and local roads /Proximity/ *Figure 2*.

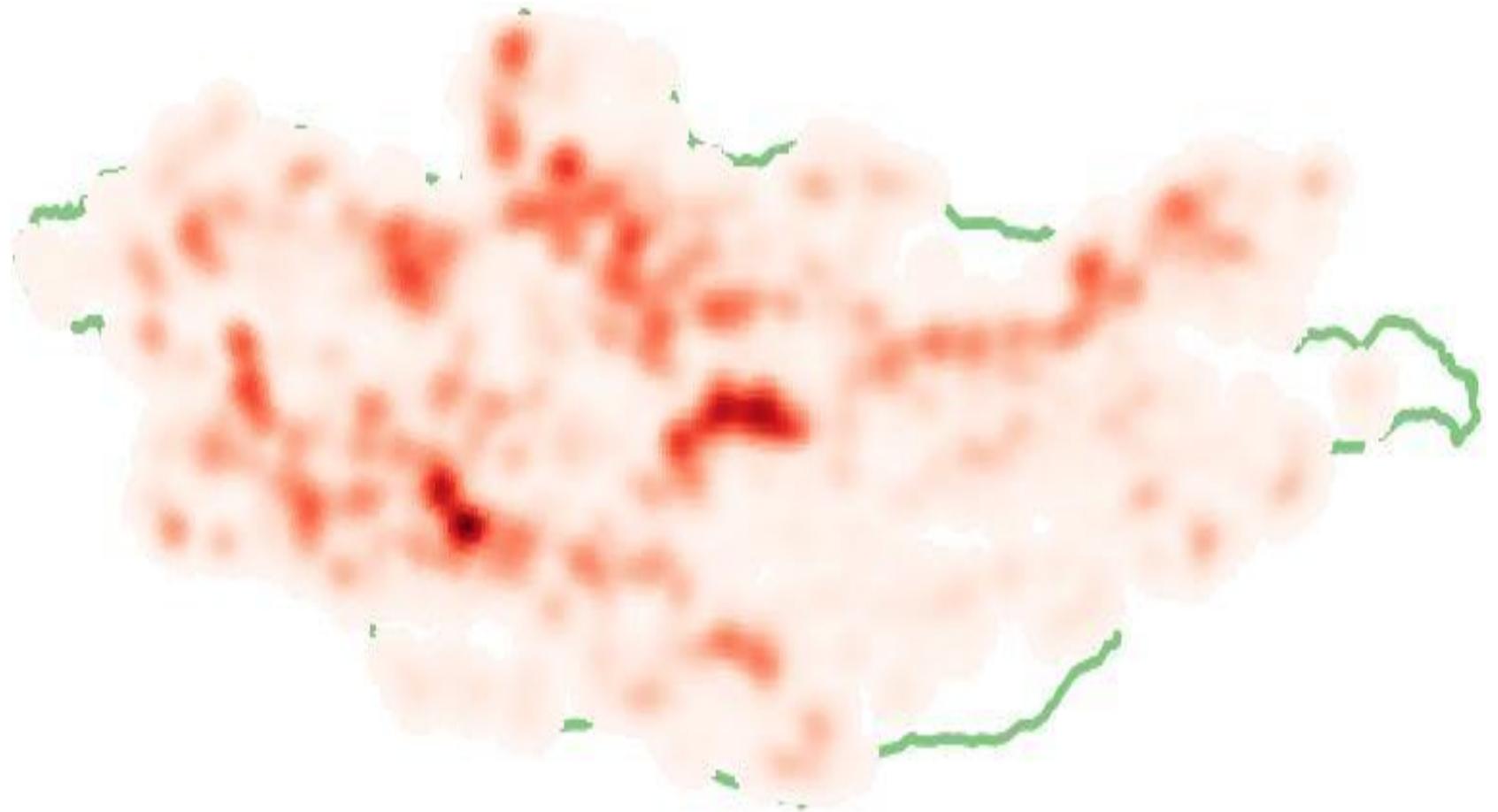
Livestock data collected from *FAO livestock system*

- Cattle and small ruminants population density /Raster/ *Figure 3*.

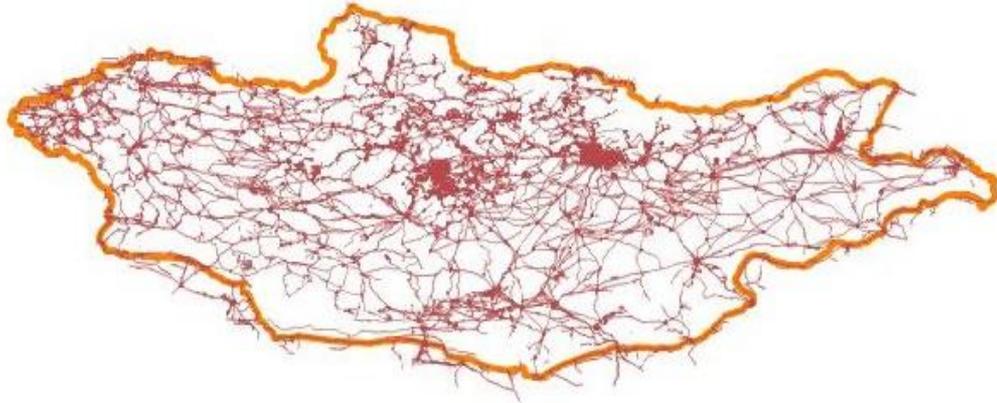
Then...

FMD outbreak locations GPS in Mongolia, 2018

Risk factor water sharing springs /Heat map/



Risk factor national and local roads /Proximity/

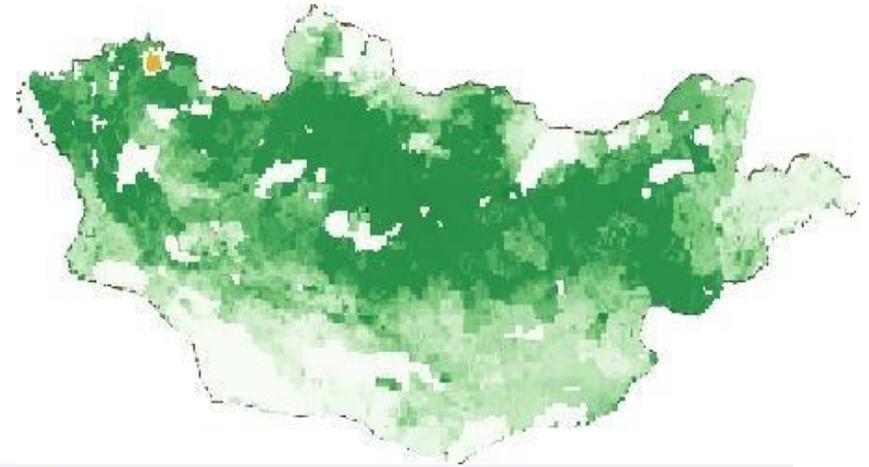
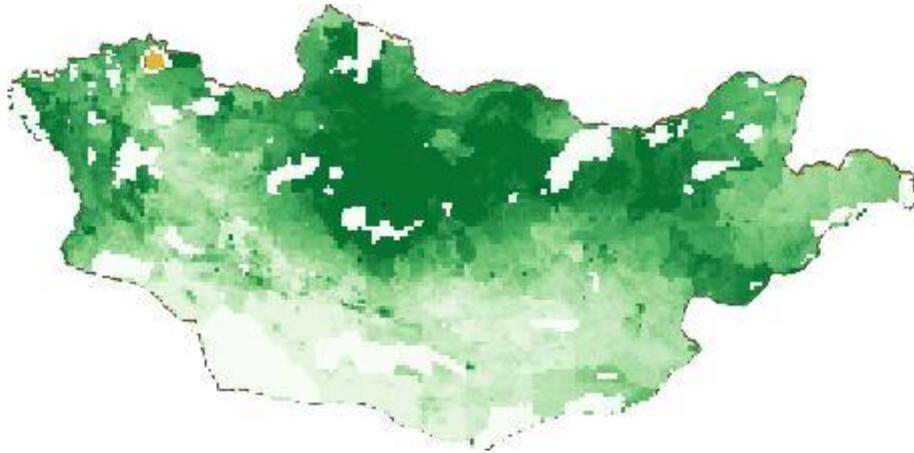


A. Primary and secondary roads



B. Primary and Secondary roads combine and raster calculation

Cattle and small ruminants population density as a raster



Layers

5_Sh_2010_Da
Band 1 (Gray)
344,862.104314

Rum_Clipped (extent)
Band 1 (Gray)
10,356.854495

Ct_Clipped (extent)

Rum_Clipped (mask)
Band 1 (Gray)
10,356.854495

Rum_2010_Da_Clip
Band 1 (Gray)

Layer Exported: Successfully saved raster layer to C:\Users\leba\Desktop\IQ GIS\Khandui\resdata\geo livestock\Rum_2010_D

A raster map showing the population density of cattle and small ruminants, rendered in black. The map shows a complex, irregular shape with several small orange markers scattered across the area.

Combining weighted risk layers

Raster Bands

- CT_2010_Past_Prox_Norm_Inv@1
- MGL_Roads_Past_Prox_Norm_Inv@1
- MGL_Springs_Past_Prox_Norm_Inv@1
- Rumm_2010_Past_Prox_Norm_inv@1

Result Layer

Output layer: ?\ResData\Geo Final\RiskFactorsWgtd

Output format: GeoTIFF

Selected Layer Extent

X min: -761806.95970, X max: 1638962.63120

Y min: 4601779.50450, Y max: 5795645.64420

Columns: 260, Rows: 129

Output CRS: EPSG:32648 - WGS 84 / UTM zone 48N

Add result to project

Operators

+	*	sqrt	cos	sin	tan	log10	(
-	/	^	acos	asin	atan	ln)
<	>	=	!=	<=	>=	AND	OR
abs	min	max					

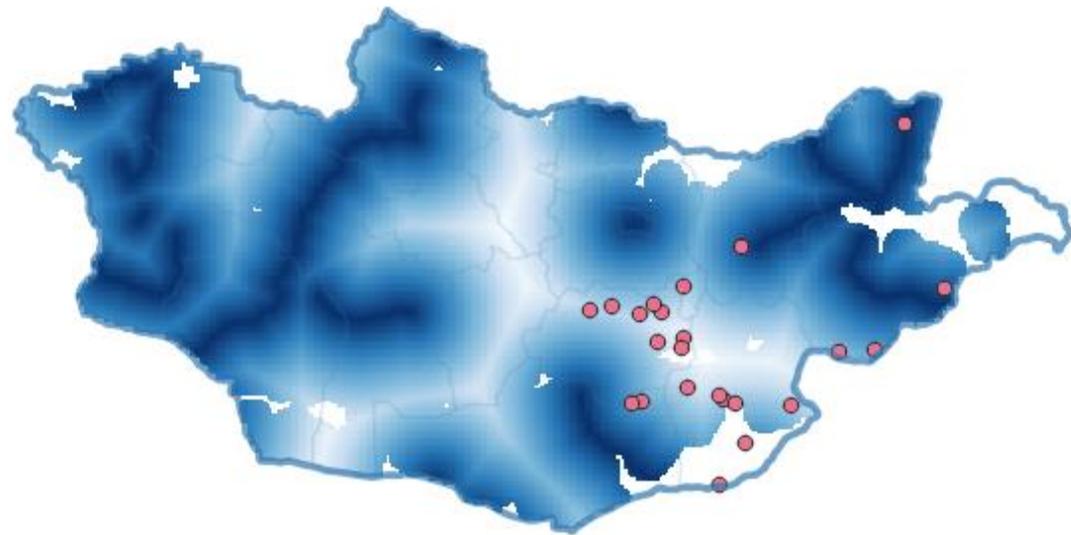
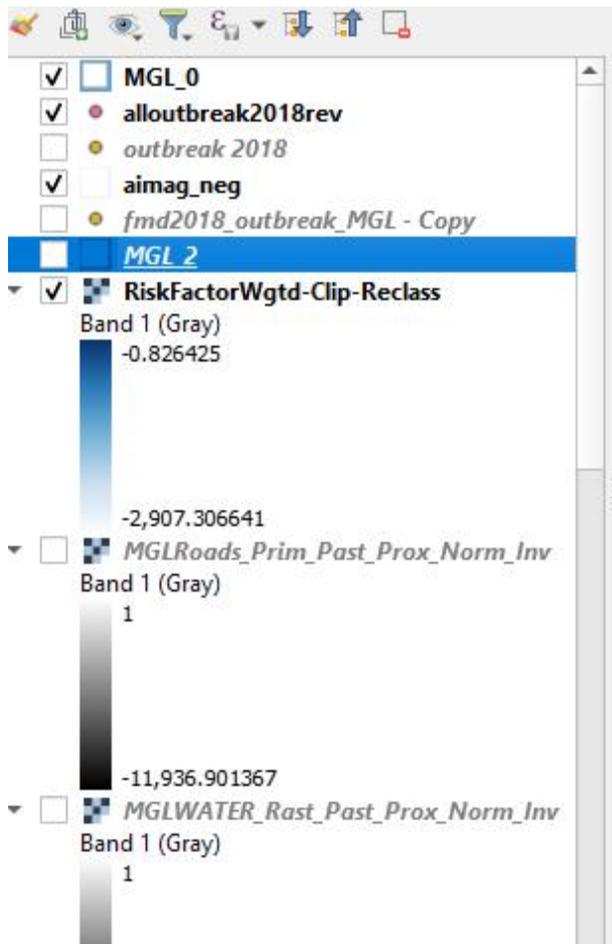
Raster Calculator Expression

```
{"CT_2010_Past_Prox_Norm_Inv@1"*0.35)+("MGL_Roads_Past_Prox_Norm_Inv@1"*0.18)+  
("MGL_Springs_Past_Prox_Norm_Inv@1"*0.16)+("Rumm_2010_Past_Prox_Norm_inv@1"+0.31)}
```

Expression valid

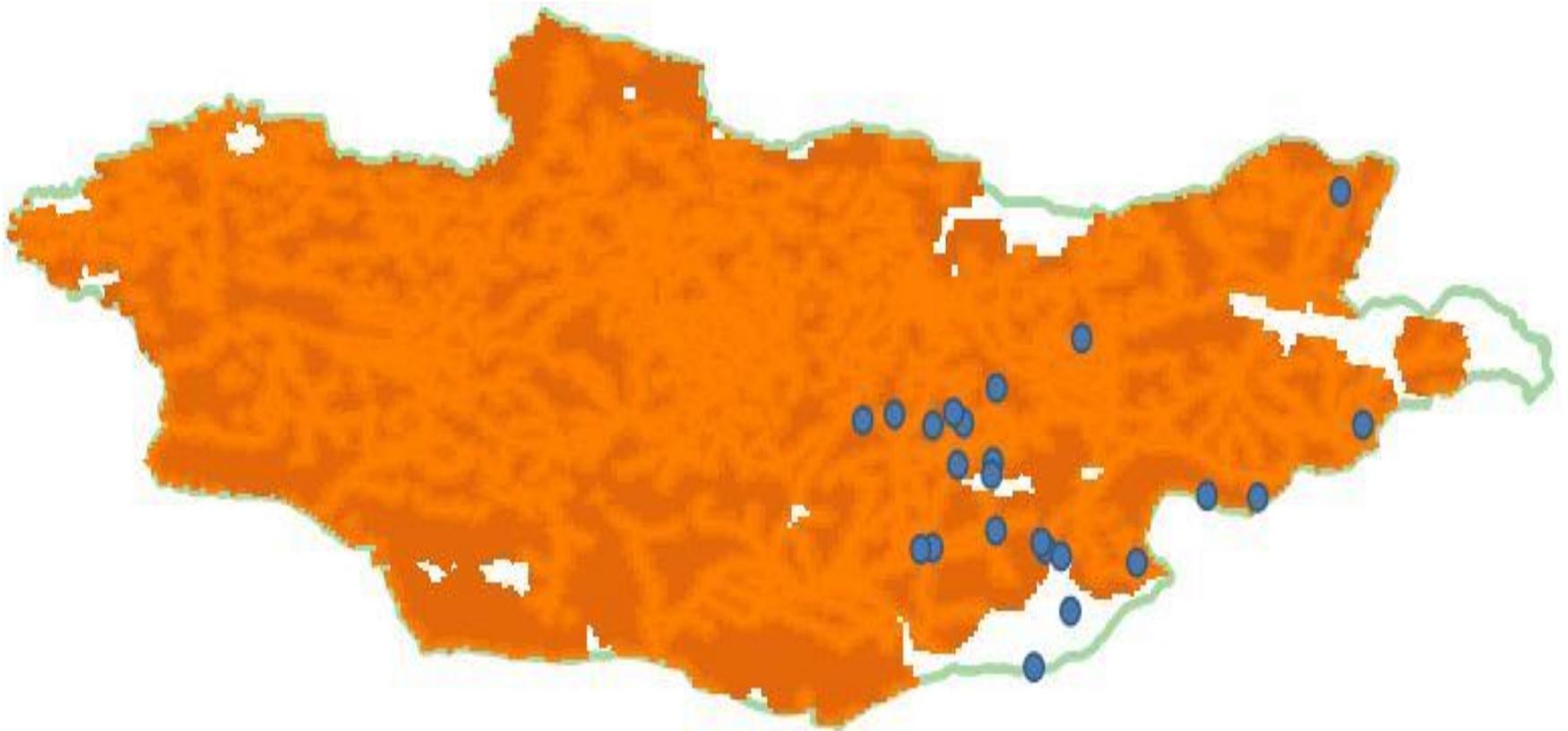
OK Cancel Help

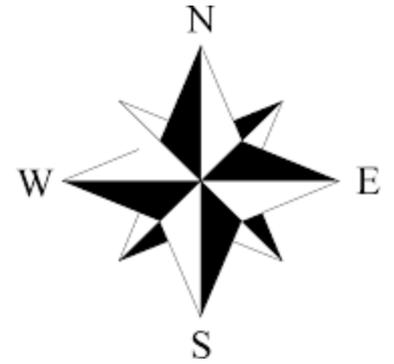
Steps for risk combination



Discussion

- Map shown the result of the Risk combination
- Eastern part of Mongolia matched with the FMD outbreak in 2018
- Some technical errors encountered during the analysis
- Further data validation is needed and replicate the analysis.





**Thank you for your
attention**

