Meteorological alert system in NMS of Mongolia
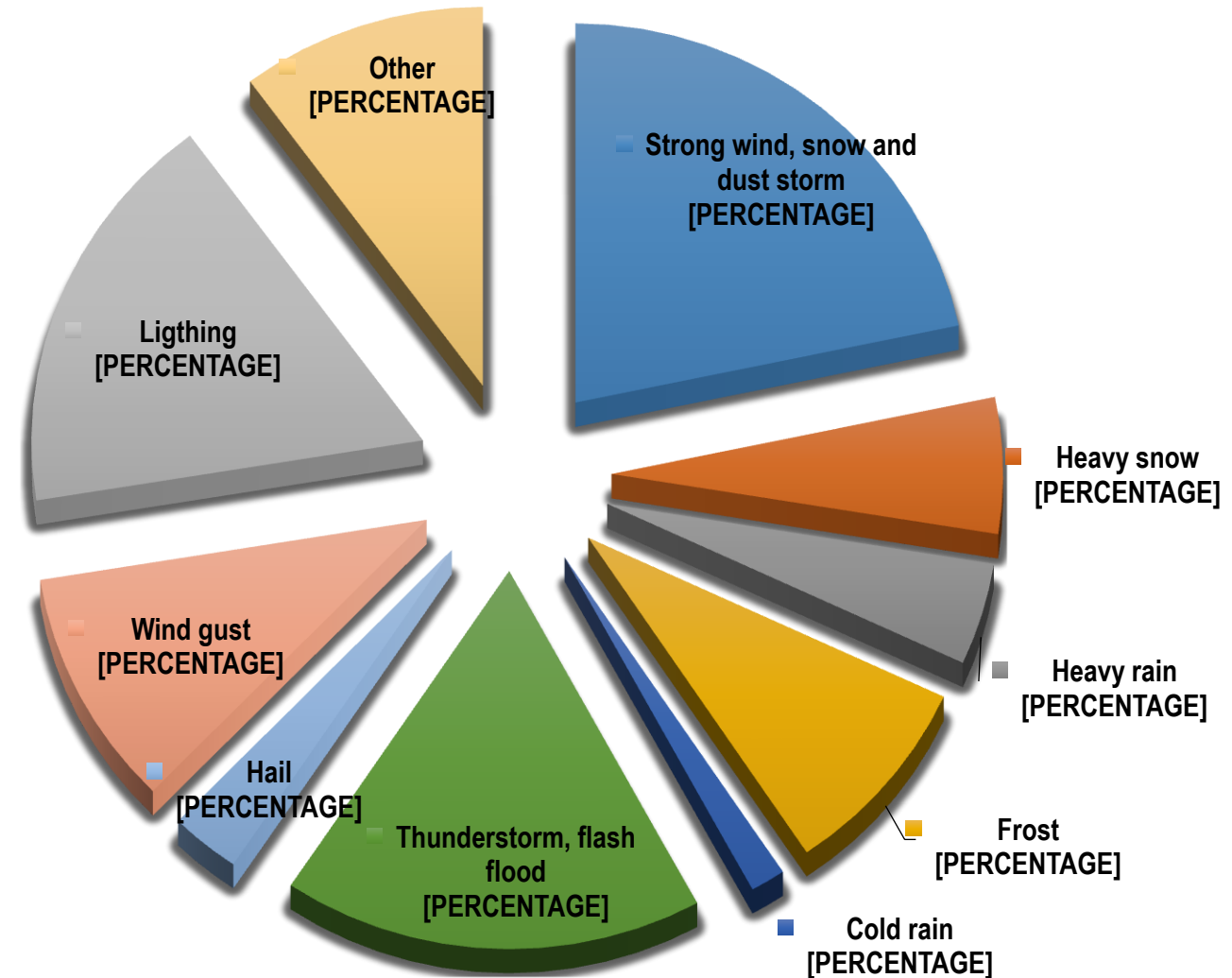
L.Oyunjargal, NAMEM

Regional Workshop on Impact-based Forecasts in Asia

Seoul, Korea, 07-09 NOV 2017

Weather related disasters

1. Strong wind and snow and dust storm
2. Thunderstorm, flash flood
3. Lighting
4. Wind gust
5. Frost
6. Heavy snow
7. Heavy rain
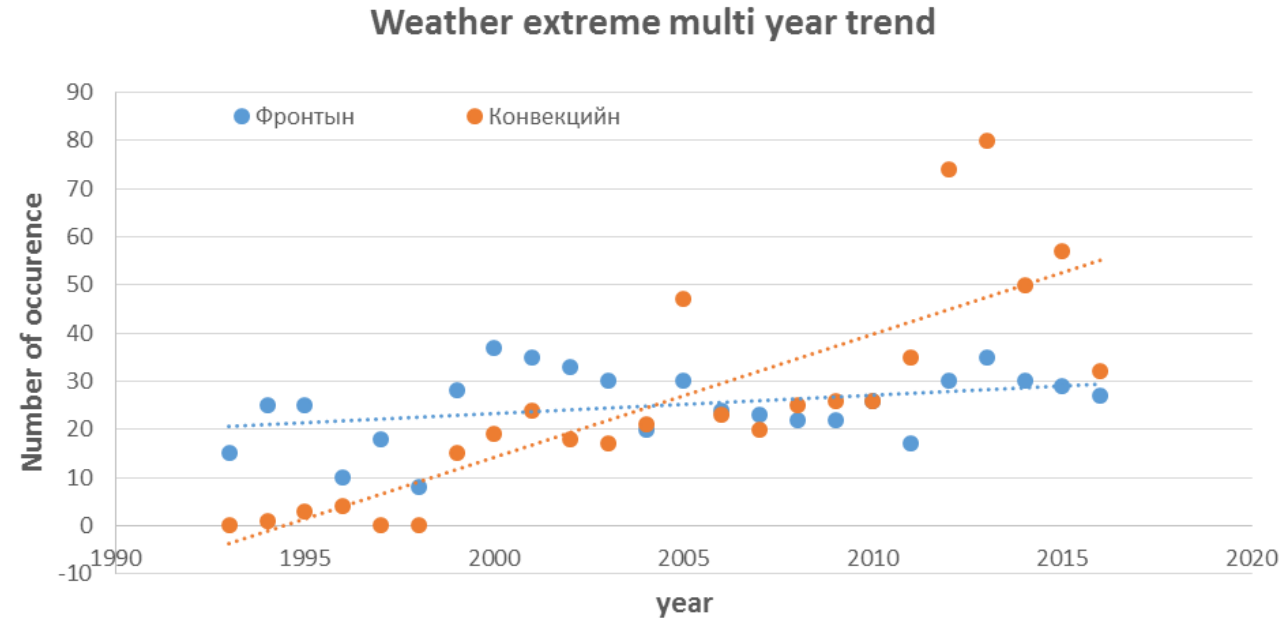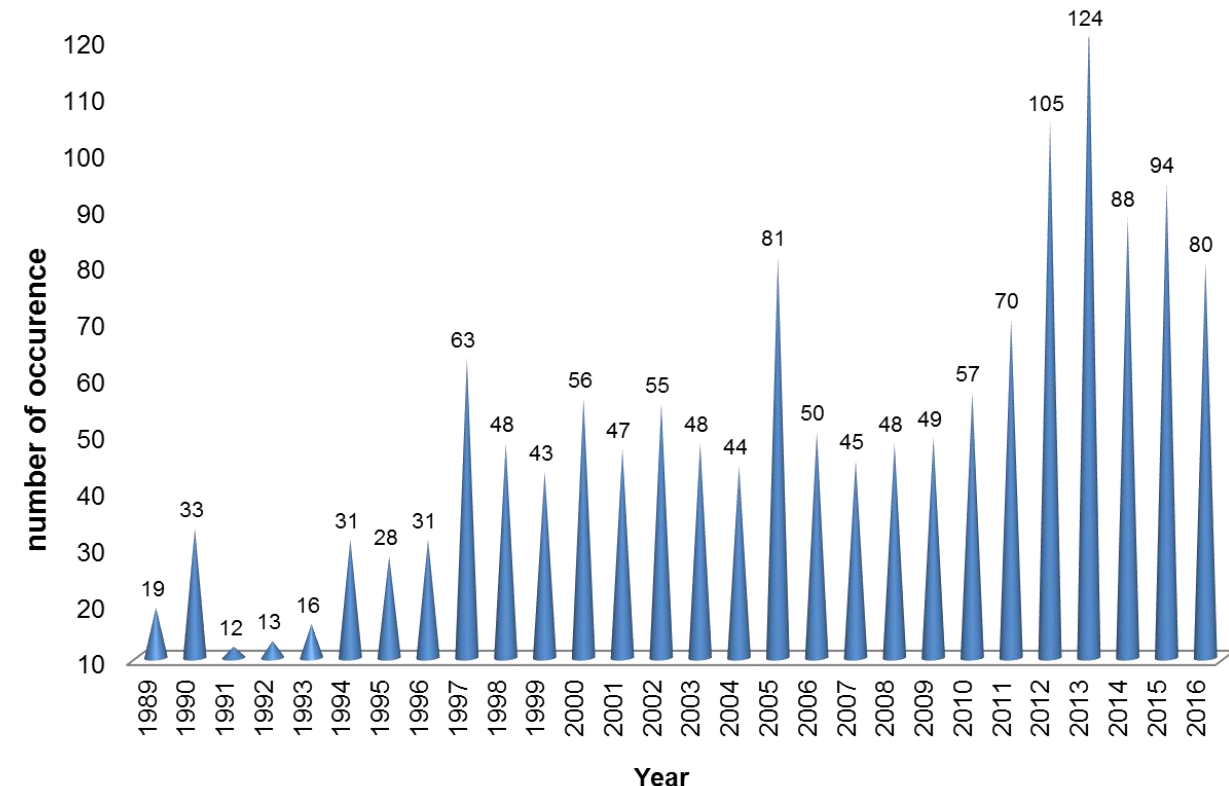8. Cold rain -Rain in low temperature

Weather related disasters

1. Heavy shower and flash flood
2. Heavy snow
3. Strong wind, snow and dust storm
4. Tornado
5. Wind gust
6. Lightning
7. Hail
8. Flood caused by snow melt
9. Ice break

Weather extreme trend
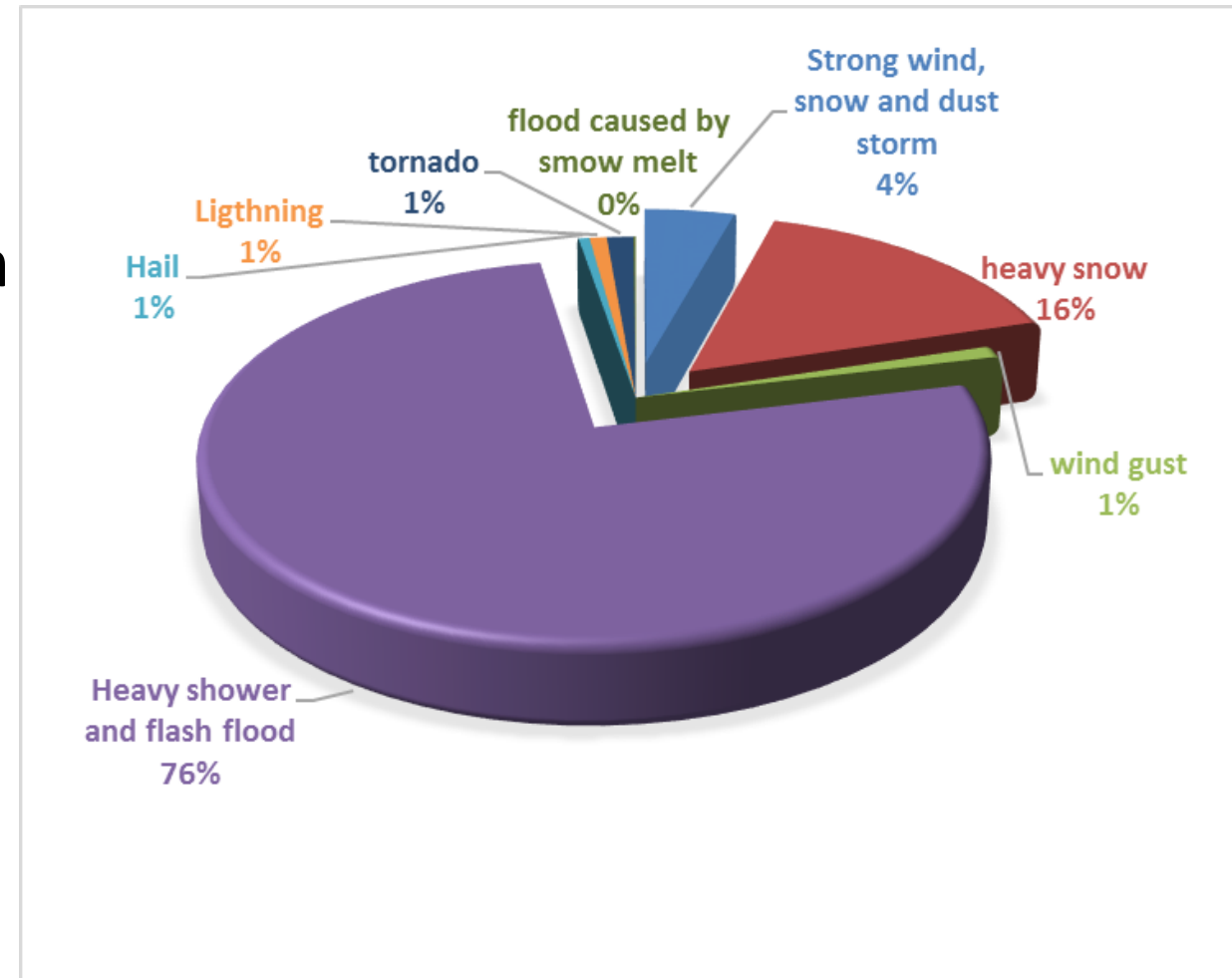
Weather extreme multi year trend
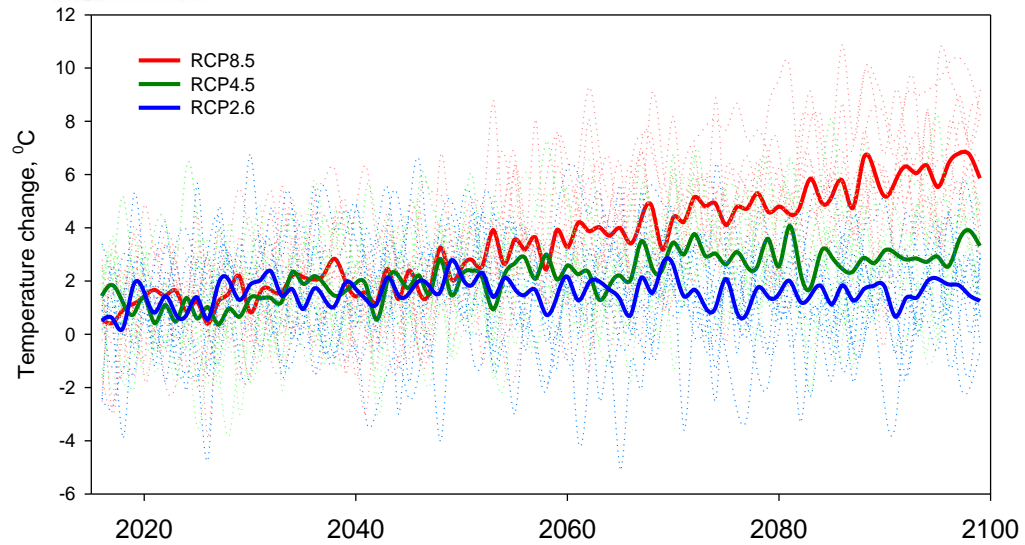
Climate extremes

- # Drought
- # Dzud
  - Dzud (sometimes spelled zud) is a winter disaster in which deep snow, severe cold, or other conditions that render forage unavailable or inaccessible lead to high livestock mortality.
  - At least six types of dzud
    - **White dzud** happens when deep snow covers grass.
    - **Black dzud** refers to freezing temperatures and lack of snow (essential for livestock and human water in the winter) and forage.
    - **A combined dzud** occurs when there are both deep snow and cold temperatures.
    - **A storm dzud** is indicated by high wind and blizzard conditions.
    - **Iron dzud** happens when a layer of ice makes forage inaccessible. Finally, a hoofed dzud occurs when many livestock converge in a location, and the combination of trampling and heavy grazing eliminates forage.
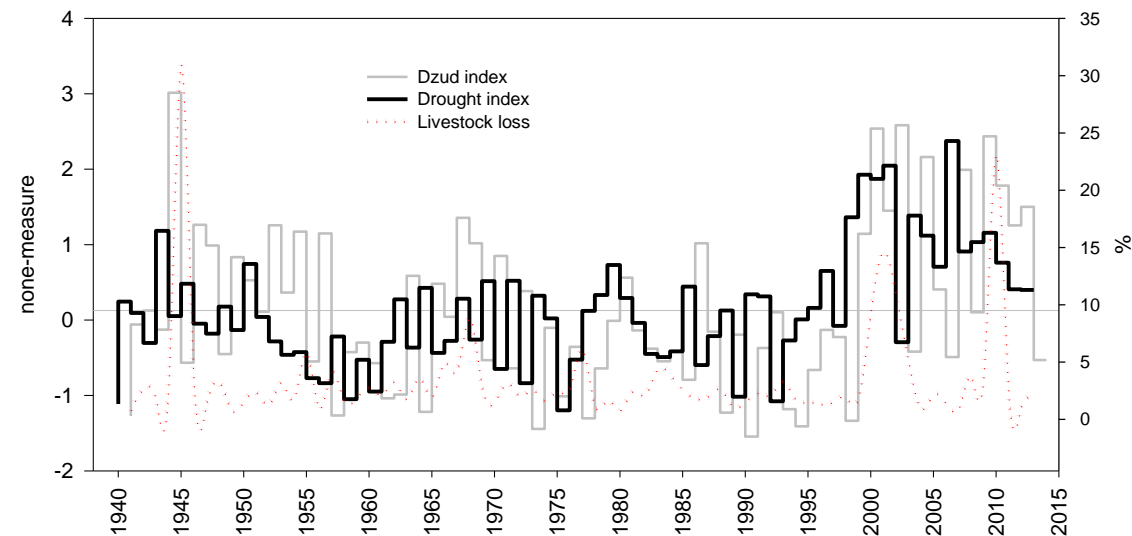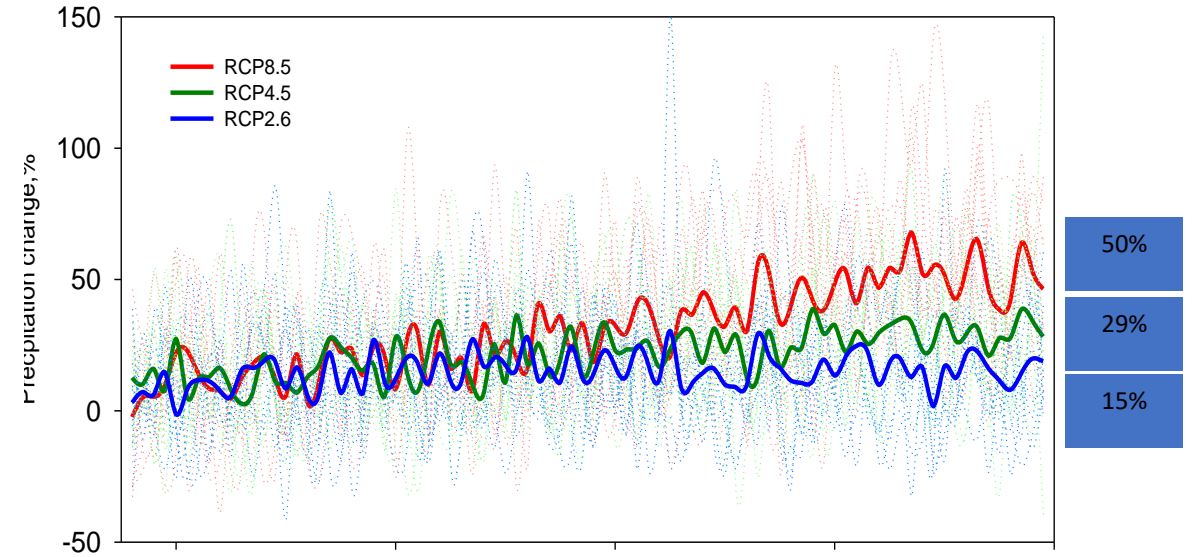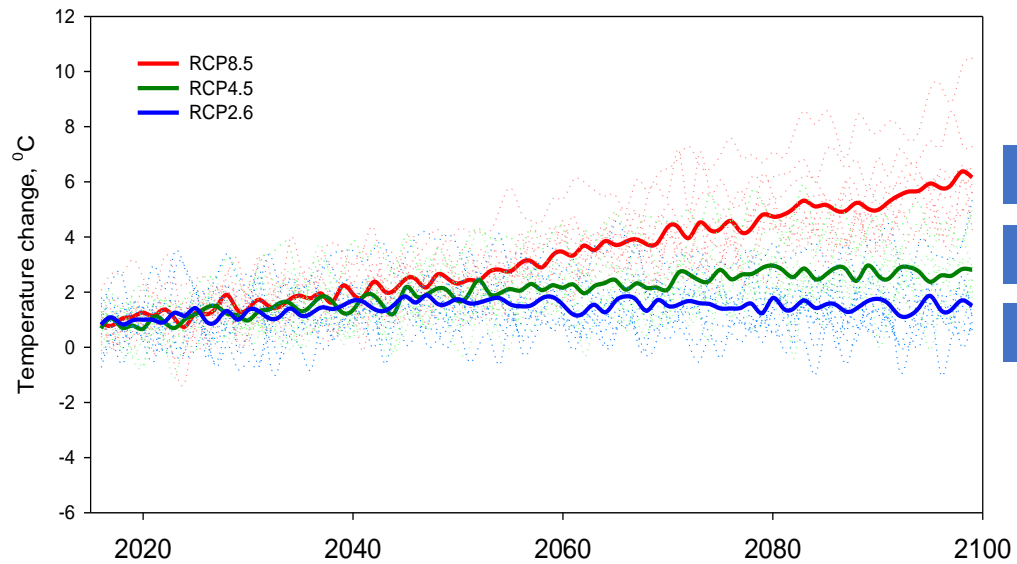
Climate change and climate extreme
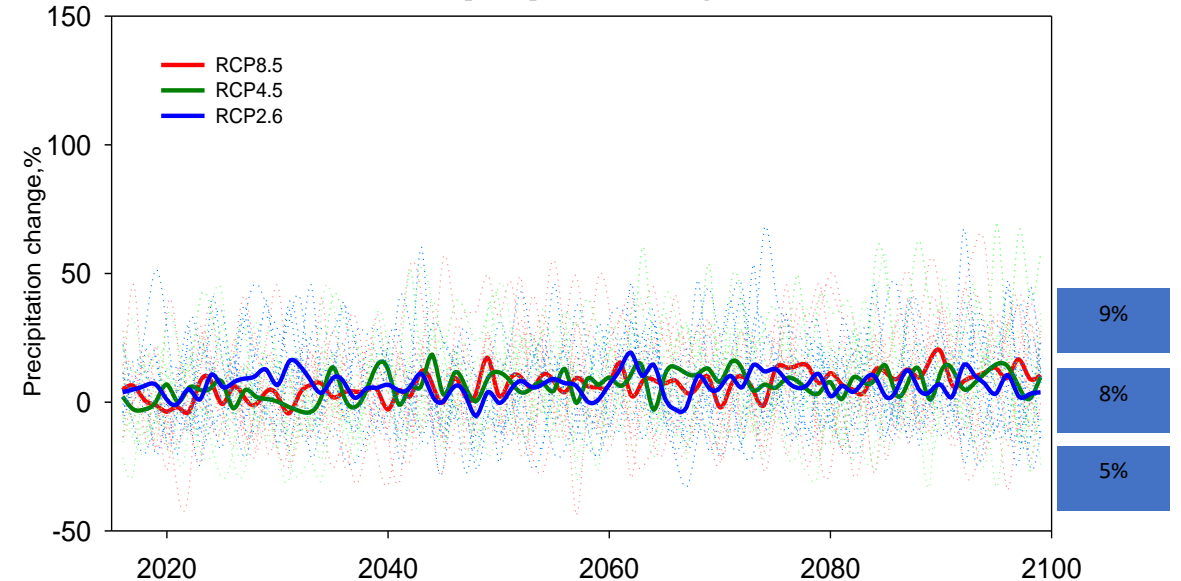

Winter temperature change, 2016-2100

Summer temperature change, 2016-2100

Winter precipitation change, 2016-2100

Summer precipitation change, 2016-2100

Classification of extreme weather

Extreme weather	POTENTIALLY DANGEROUS	DANGEROUS	VERY DANGEROUS
Strong wind	Mean wind speed >=10m/s Wind gust >= 20-23m/s	Mean wind speed >=18m/s Wind gust >= 24m/s Duration: no limit	Mean wind speed >=24m/s in mountainous area Wind speed >= 28m/s in steppe and gobi area Wind gust >= 34m/s in Duration: no limit
Snow storm	Expected to be dangerous	Snowstorm with mean wind speed >=10m/s Visibility =< 2000m Duration: >=3 hours	Snowstorm with mean wind speed >=15m/s Wind gust >= 24m/s Visibility =< 2000m Duration: >=6 hours
Dust storm	Mean wind speed >=10-15m/s Visibility =< 10km by dust	Mean wind speed >=18m/s Visibility =< 1km by dust	-
Snow and wet snow /OCT-MAR/	RR>=2.0mm/12hours Further expected to be dangerous	RR>=5.0mm Duration: =< 12hours	RR>=10.0mm Duration: =< 12hours

Classification of extreme weather /continue/

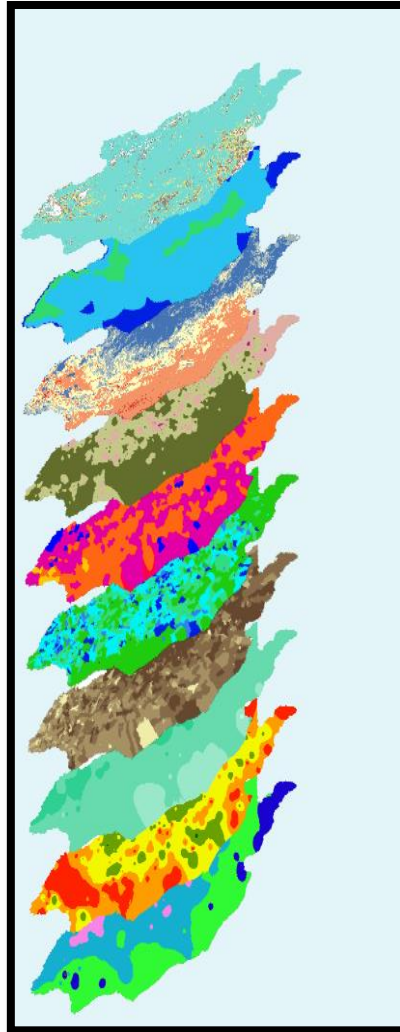| Heavy rain	RR>=.0mm/12hours Further expected to be dangerous	RR>=30.0mm Duration: =< 12hours	RR>=50.0mm Duration: =< 12hours
Heavy shower	RR>=2.0mm/12hours Further expected to be dangerous	RR>=30.0mm Duration: =< 3hours	RR>=10.0mm Duration: =< 1hours
Cold rain /Jun-Jul/	Rain is expected to continue =>12hours	Rain in condition with 9-11°C air mean temperature and >=6m/s wind speed Duration: >=12 hours	RR>=5.0mm rain in condition with =<8°C air mean temperature and >=6m/s wind speed Duration: >=12 hours
Frost /growing season/	Soil surface temperature is expected to be near 0°C	Soil surface temperature: =< 0°C	Soil surface temperature: =< -5°C
River flood	River level is exceeded normal	River is overflowed	River level is reached at flood dangerous level

Classification of extreme weather /continue/

Cold wave	Air temperature is expected to be below -30°C	-	-
Heat wave	Air maximum temperature is expected to be above 30°C in more than 2 days	-	-
Sharp cooling	Air max and min temperature is expected to cool >=15°C in a day or >=10°C in a 3 hours	-	-
Forest and steppe fire	Dry condition is reached at dangerous level	-	-
Pressure decrease	6-12 hours before 5gPa pressure decrease in 3 hours	-	-

Warning information

- Advisory – for Potentially dangerous weather
  - Area, date, type and duration of weather change, expected to be dangerous, and advisory

- Warning information- for dangerous weather
  - Area, date, and type of extreme weather and advisory

- Alert information – for very dangerous weather
  - Area, date, and type of extreme weather and advisory

Dzud risk map-impact based product

id	layer name	Rank	Numerator	Weights	0-100 scale
1	Summer condition	3	9	0.09	9
2	Pasture carrying capacity	2	10	0.10	10
3	Livestock number	3	9	0.09	9
4	biomass/1500 site	2	10	0.10	10
5	Anomal precipitaion	5	7	0.07	7
6	Anomal temperature	5	7	0.07	7
7	Drought index/MODIS	4	8	0.08	8
8	Snow depth	1	11	0.11	11
9	Snow cover/MODIS	3	9	0.09	9
10	Air temperature forecast	2	10	0.10	10
11	Precipitation forecast	1	11	0.11	11
			101	1.00	100

$$Numerator = \sum_{k=1}^{n} (n - r_k + 1)$$

$$W_i \frac{(n - r_k + 1)}{\sum_{k=1}^{n}(n - r_k + 1)} \qquad W_i = 1$$

Overlay

Weighted Overlay

- The risk map is produced on 20 Oct, 20 Nov and 31 Dec. using ground observation data and remote sensing data
- Risk classification: very high, high, medium, low, and very low.

Dzud risk map: final output
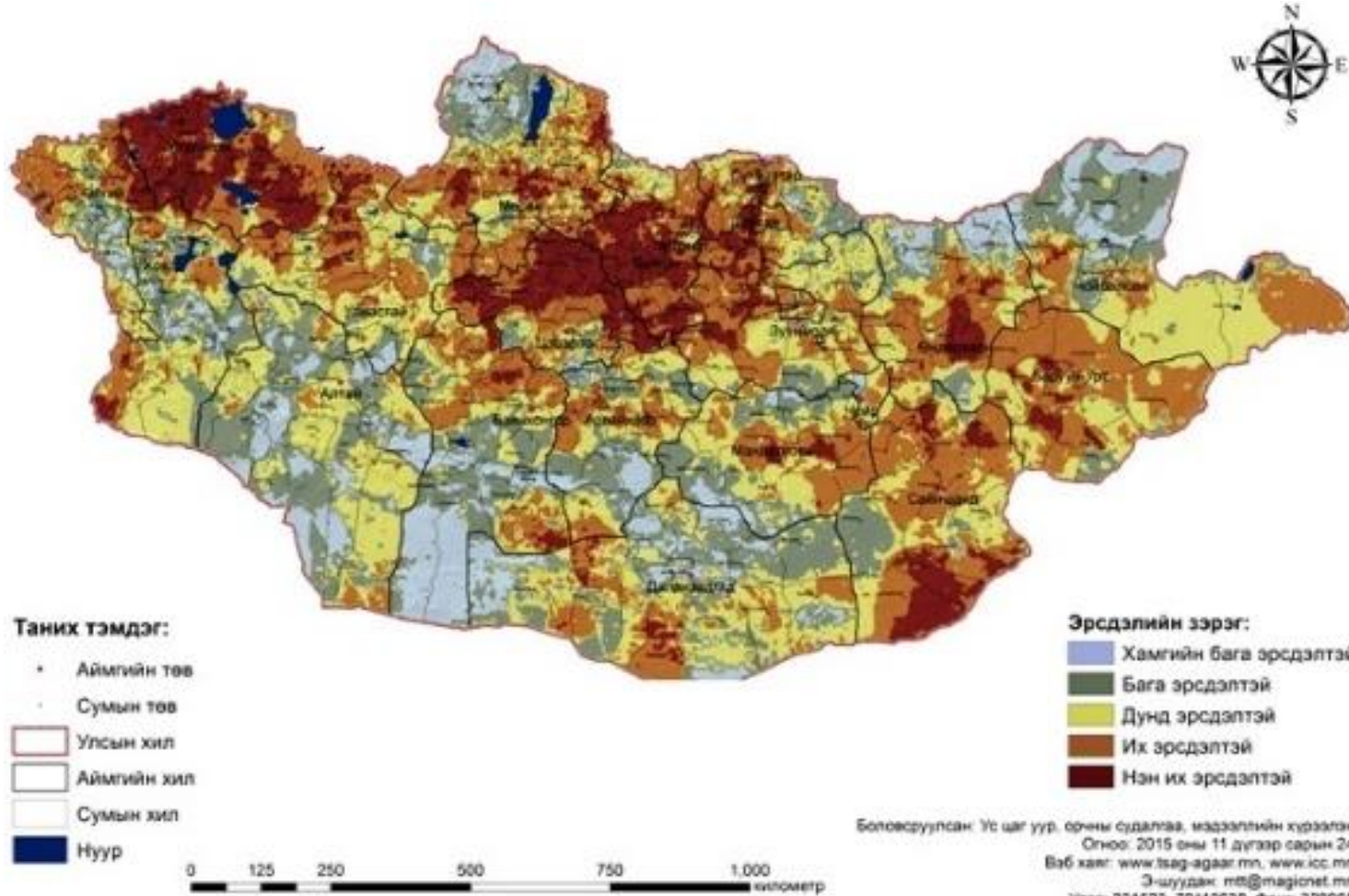
Zud risk map informed to:
-Mongolian Government Meeting,
-Special committee meeting on Emergency Management -
Parliament Standing Committee meeting on Food and Agriculture,
-UNDP meeting in Mongolia
-Ministry Road and Transition

Information distribution

NAMEM

- Ministries Government Agencies
- National Emergency Management Agency
  - To Provinces EMO
  - To Soums
  - To Bags
  - To Herders
- Local Meteorological Offices
  - To Provincial Governmental Agencies
  - To Soum Weather stations and posts
    - To Soum governors
    - To bags commanders
    - To Herders
  - To local televisions and radios
- Mass media
  - To Public Herders
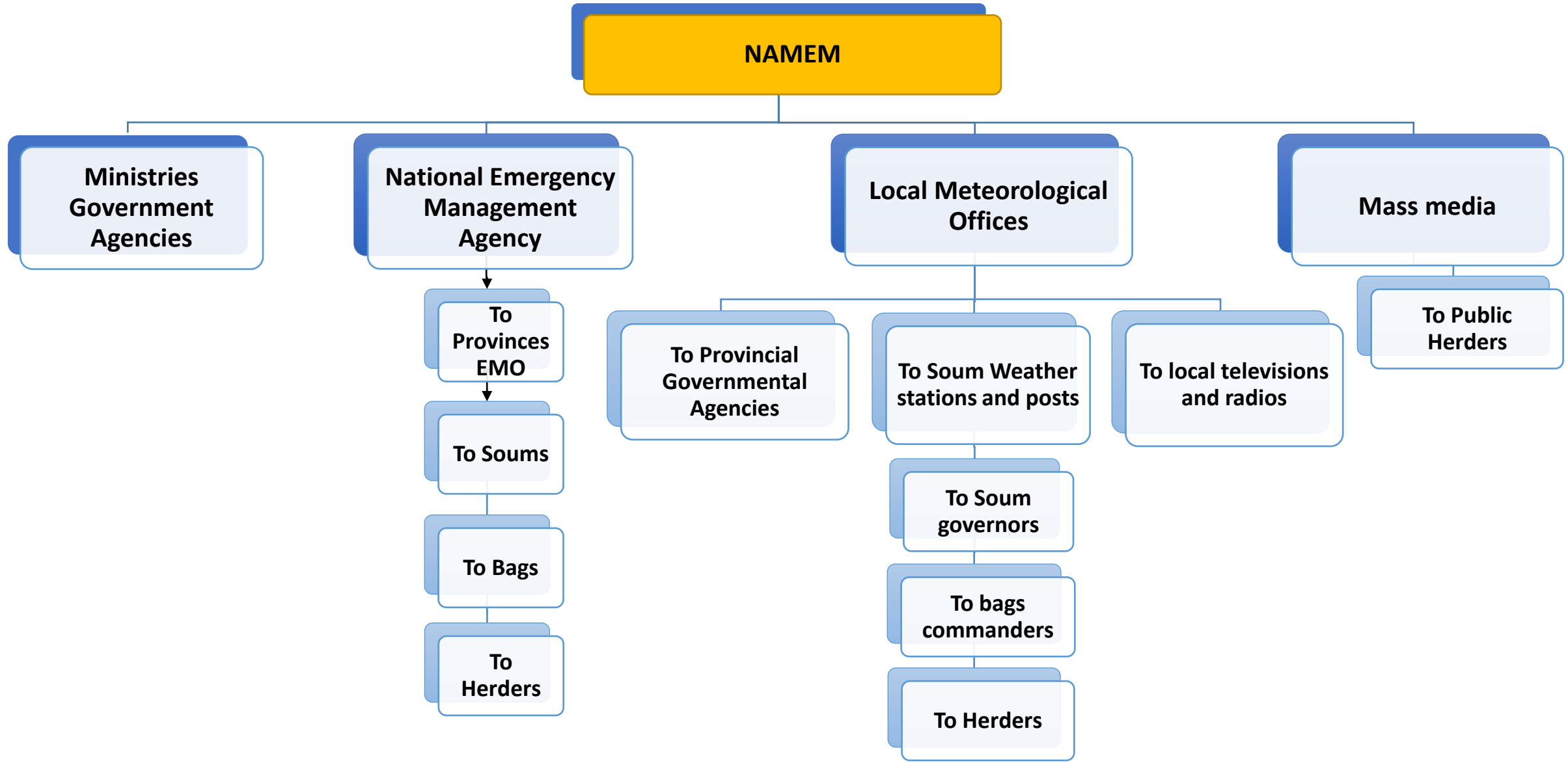
Information distribution

- TV's
- Radio
- Homepage
- Mobile phone-SMS
- Mail
- Fax
- Social media
- Special connection to emergency organizations

Good practice

THANK YOU FOR YOUR ATTENTION