

2.2 Action Plan for Seasonal prediction and livestock early warning system

2.2.1 About SPLEWS

SPLEWS is a system that provides precise and timely information through key institutions allowing herders and government officials to prepare effective responses to slow onset disasters including drought and *zud*. Due to the large economic losses, the primary focus of SPLEWS is mitigating the disaster risk from drought and *zud* (slow onset disasters- caused by extreme climate). However, rapid onset disasters such as flood, storms and others (extreme weather) are considered as well.

The current livestock sector is based on the traditional nomadic pasture system, and herder family livelihood is highly dependent on and influenced by weather and climate. Herder families need to make preparations for winter and spring to reduce their livestock loss. For winter preparation, the conditions of the previous summer (in terms of vegetation growth, coming winter weather and climate outlook) are essential information for planning migration of herders families, preparing hay and fodder as well as other measures from decision makers at *soum*, *aimag* and country level. Annual economic losses caused by extreme weather and climate related natural disasters have increased in Mongolia. The tendency for increased frequency of climate extremes is expected to continue in the future. As a result, drought and harsh winter is highly likely to occur more frequently, bringing risks for agriculture and livestock. Also, there is clear evidence of drought intensification in Mongolia under global climate change (MARCC, 2009).

SPLEWS has four main components:

- **Risk Knowledge:** Risk assessment provides essential information to set priorities for mitigation and prevention strategies and designing early warning systems. Research on future climate change, its potential impacts, and associated risks is important.

- **Monitoring and predicting:** Systems with monitoring and predicting capabilities provide timely estimates of the risks faced by herding communities, economies and the environment. This component allows for a three to six months weather forecast and provides important information for planning and preparations. Seasonal forecasts are based on existing climate data, in particular on sea surface temperatures, which are then used in ocean-atmosphere dynamic models, coupled with a synthesis of physically plausible national and international models.
- **Disseminating Information:** Communication systems are needed for delivering warning messages to the potentially affected locations to alert local and regional governmental agencies. The messages need to be reliable, accurate and simple so they can be understood by authorities and public.
- **Response:** Coordination, good governance and appropriate action plans are a key point in effective early warning systems. Likewise, public awareness and education are critical aspects of disaster mitigation.

The main idea behind SPLEWS is that the earlier and more accurately we are able to predict short and long-term potential risks associated with natural and human-induced hazards, the more likely we will be able to manage and mitigate disasters' impact on society, economies, and environment.

The situation in Mongolia: National Agency of Meteorology, Hydrology and Environment Monitoring (NAMHEM) produce weather forecast and seasonal prediction and conduct research on weather related disasters. The mandate for development of all hazards Early Warning System is the responsibility of the National Emergency Management Agency (NEMA).

Seasonal outlook for winter and winter pasture capacity is estimated and mapped by Institute of Meteorology and Hydrology (IMH) based on weather and pasture monitoring at the end of summer. The Ministry of Food, Agriculture and Industry finalize livestock migration scheme six months ahead. Local governments and local emergency departments are responsible for coordinating and implementing the livestock migration scheme with herders. It is also important to note that agencies in Mongolia are organized according to the specialized tasks for different hazards (National Emergency Management Agency, National Agency of Meteorology, Hydrology and Environment Monitoring, Institute of Meteorology and Hydrology, Ministry of Industry and Agriculture), without much information sharing or partnership with other agencies. It is these gaps that have to be addressed by bringing together all concerned agencies.

Another key issue is accuracy of prediction pasture condition and migration scheme at the smallest level of *soum*. The issue in Mongolia is not the establishment of a new early warning system, but converting the existing early warning system to an effective one. For this purpose the agencies responsible shall fulfill the four components (above) according to their functions and responsibilities to make the early warning system reliable, timely, cost-effective, sustainable, and a user friendly tool.

2.2.2 Target for SPLEWS

Precise seasonal prediction and proper preparation for *zud* would result in saving about 80 % of animals which usually die every winter. This technology belongs to non-market goods and its targeted beneficiary groups are the whole society, including herding and farming communities and other citizens. In terms of geographical targets, people and communities of all areas will benefit from the technology diffusion which is expected to be completed by 2018.

2.2.3 Barriers to SPLEWS

Barriers to the diffusion of the SPLEWS technology were initially gathered through a survey using a questionnaire. Then constructive discussions were facilitated during a stakeholder workshop and the barriers were then categorized, ranked, and decomposed to identify their root causes and enabling environments.

Overall six categories of barriers have been identified. Among these, three main types of barriers (economic and financial, institutional and organizational capacities, and information awareness barriers) are prioritized and their root causes defined by problem trees.

Table 43: Key barriers identified for SPLEWS

Barrier sub/ category	Key barrier	Brief description of barrier
Economic and financial	Inadequate financial resources to intensify the technology	The prime objective of SPLEWS is to provide timely, accurate, unambiguous and credible information to the population and decision makers at risk of a disaster. Quality and reliability of information (specifically predictions) is an issue for drought and <i>zud</i> . Mongolia's territory is relatively large compared to its population. The existing networks are not sufficient to cover the whole country with high density of observation and monitoring stations. There are nearly 130 meteorological stations and the distance between them is 150-300km. Such low resolution affects the accuracy of monthly and seasonal climate forecast. There is a lack of financial resource to increase the resolution and number of meteorological stations, especially to purchase monitoring equipment and to build communication infrastructure.
Non-financial		
Institutional, organizational capacity	Insufficient research and development of a comprehensive scientific approach to produce timely and user oriented information	Existing institutions, especially the research community, need to carry out more research to develop and introduce new seasonal prediction, satellite processing and pasture yield modeling techniques. There is a lack of experts and skilled personnel for operating the systems, lack of computing resource to run models and to process satellite images, and lack of a high density observation and monitoring network. Monthly and seasonal prediction accuracy is currently less than 60% and sometimes the skill level is very diverse and especially weak in seasonal forecasting.
Information and awareness	Inadequate awareness and understanding	Nowadays, information technology application is spreading in the country, but herders and farmers have limited access to information disseminated through mass media due to high cost of service and inadequate communication structure. Even in cases they receive the information, they are often unable to understand and interpret the information and make use of it.
Network failure	Poor coordination between organizations in the current early warning system	Currently, some components of the SPLEWS technology already exist in institutional structures, even though they produce and use information regarding the early warning system. As mentioned above, many institutions and agencies including NAMHEM, IMH, Satellite Data Centre, NEMA, MIA and Pasture Management Association NGO are involved in gathering, processing, mapping, analysis, planning and decision making. However, there lacks a coordinating mechanism and a harmonization of different data to generate an integrated point of view in the system in order to take timely action. During disaster response, emergency operations by different national and international organizations are not well planned and coordinated.

2.2.4 Proposed action plans for SPLEWS

Measures to overcome main barriers are carefully designed on the basis of root cause analysis and identified through stakeholder

meeting and consultations. Then, enabling environment were discussed and determined.

Table 44: Key measures identified for SPLEWS and aggregation for strategy formulation

No	Key measure	Priority (1- high, 2- med, 3-low)	Accelerating RD&D	Accelerating deployment	Accelerating diffusion
	Financial incentives				
1	Allocation of required amount of funds by the government and exploration for alternative funding sources	1	Long	Long	Long
2	Set up low tariff communication system for the disaster information	2		Medium	
	Skill training and education				
3	Systematic training for different stakeholders of SPLEWS	2	Short	Short	
4	Develop message packages and train users through media and press	2		Short	Short
	Mechanism and institutional arrangement				
5	Facilitate consultative periodical meetings at decision making and implementation levels	1	Short	Short	Short
6	Establish post disaster feedback mechanism	2	Short	Short	Short
	Support R&D				
7	Support research and development on components of SPLEWS	1	Medium	Medium	
	International cooperation				
8	Strengthen international collaboration and experience sharing activities	2	Short	Short	

Comment: *Time scale (short – 1-5 years, medium –up to 10 years and long up to 15-20 years)

Prioritization and characterization of the technology acceleration measures are presented in Table 2.6.

Table 45: Detailed action plan of key measures for technology Seasonal prediction and livestock early warning system

Sector : Animal husbandry / Agriculture							
Technology:		SPLEWS - large scales and long term					
Innovation Stage:		Deployment - Diffusion					
No	Key measure/ category	Priority (1- high, 2- med, 3-low)	Why is it needed?	Who?	When (0-5 years, 5-10 years, 10-20 years)	How much will it cost?	Risks and indicators of success
	Financial incentives						
1	Allocation of required amount of funds by the government and exploration for alternative funding sources	1	The government has to allocate sufficient financial budget for strengthening SPLEWS including improving computer resource and monitoring equipment in the national hydro meteorological service and the need to consider investments in a midterm strategic plan. In order to fill the financial gaps in investments and research support, the government needs to submit project proposals to donors based on results of a feasibility study and R&D study. For this purpose, bottom-up information flow among institutions is needed to develop and submit project proposal with strong justification to donors.	Ministry of Finance; Ministry of Environment and Green Development; National Meteorological Agency; National Emergency Management Agency;	10-20 years	Present budget is about 2 million US\$ including operational and research expense. Additional 500thousand US\$ per year for 5-6 years is required from the Government and international donors.	Success: Improved SPLEWS components including risk assessment, monitoring and prediction, information dissemination and response. Risk: The system covers many organizations so it might affect efficiency. Better coordination is required.
2	Set up low tariff communication system for the disaster information	2	Currently rural people and herder/farmer families use mobile phones in their daily life. However, it is relatively expensive to obtain information through mobile phone use. The government needs to set special low tariff for disaster information transmission.	Ministry of Finance; Ministry of Environment and Green Development; National Emergency Management Agency; IT and Communication Agency; Public and private communication companies	8-10 years	Special contract with related communication organizations should coordinate. Difficult to estimate.	Success: Increased information dissemination to users and organizations
	Skill training and education						
3	Systematic training for different stakeholders of SPLEWS	2	Training of skilled personnel, researchers and other related officials need to be trained on SPLEWS and disaster risk management.	Ministry of Finance; Ministry of Environment and Green Development; National Meteorological Agency; Ministry of National Emergency Management Agency;	5-8 years	Training will cost about 30000 US\$ per year from the government and international agency.	Success: Increased number of personnel with knowledge and skills of SPLEWS technology

4	Develop message packages and train users through media and press	2	To provide information, it is necessary to translate the scientific results into simple word. Special manual or guidance should be developed for the public.	Ministry of Finance; Ministry of Environment and Green Development; National Meteorological Agency; National Emergency Management Agency; Public and private training organizations, Media and press	2-4 years	Development of package will cost about 10,000 USD once. Training would cost about 20,000 US\$ per year. Funding can be done from the government and international donors.	Success: Ready message packages for audiences and periodical media and press spots and events
Mechanism and institutional arrangement							
5	Facilitate consultative periodical meetings at decision making and implementation levels	1	Frequent periodical meeting of different agencies and organizations in after disaster period help to improve preparedness planning and learn from lessons. Roles of different organizations should be defined thoroughly. Review of organizational strategy and planning and intentional inclusion of related components of SPLEWS should be done.	Ministry of Finance; Ministry of Environment and Green Development; National Meteorological Agency; Ministry of Industry and Agriculture; National Emergency Management Agency;	7-8 years	No additional cost.	Success: Improved coordination of stakeholders;
6	Establish post disaster feedback mechanism	2	During and after disaster response, feedback from different stakeholders, including the general public, should be gathered and analyzed. Lessons learnt and recommendations should be considered in short and long term planning of different roles and responsibilities of organizations. Advanced and available communication means such as internet, mobile phone and others can be used in the process.	Ministry of Finance; Ministry of Environment and Green Development; National Meteorological Agency; Ministry of Industry and Agriculture; National Emergency Management Agency; public and private institutions, NGOs	7-8 years	System development cost is 10-15 thousand US\$.	Success: Improved citizen's participation in planning and implementation and evaluation process of SPLEWS.
Support R&D							
7	Support research and development on components of SPLEWS	1	Researchers and personnel should be supported to study and conduct related research in institutions in Mongolia and other countries. To increase capacity, research institutions need to collaborate with international climate centres and research institutions to learn about new seasonal forecasting techniques.	Ministry of Finance; Ministry of Environment and Green Development; NAMHEM; Ministry of Industry and Agriculture; National Emergency Management Agency; public and private research institutions, NGOs; researchers	4-5 years	R&D requires about 500 thousand US\$ per year for 5-6 years.	Success: Strong scientific background of SPLEWS improved accuracy of seasonal prediction;
International cooperation							
8	Strengthen international collaboration and experience sharing activities	2	Learning from other countries' research and experiences will allow accelerating SPLEWS technology transfer and diffusion.	Ministry of Finance; Ministry of Environment and Green Development; National Meteorological Agency; National Emergency Management Agency; public and private educational institutions, researchers	2-3 years	Cost will be about 30,000 US\$ for 3 years for exposure trips and short and long term studies	Success: Increased number of specialists who gained more knowledge and skills to utilize in SPLEWS related jobs