Study on Early Warning Systems in Uganda

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I.   Introduction

a)   Background and Context

Uganda has experienced a number of disasters in the recent past caused by hazards such as floods and drought, landslides, human and livestock epidemics, pests, forest fires and conflicts. This has necessitated the need to build public awareness of the threats of hazards to mitigate their impact. To this effect, the Government of Uganda (GoU) is refocusing its disaster risk management strategy to proactive preparedness and prevention. Early warning system (EW) is an important element of this strategy. An Early warning system (EWS) would generate information that would allow individuals and communities exposed to a hazard to take action in a timely manner to avoid or reduce their risk (UNISDR, 2010; Rogers and Tsirkunov 2011).

With support from United Nations Development Programme (UNDP), Uganda has established and operationalized the National Emergency Coordination and Operations Centre (NECOC) whose primary function is the generation of EW information products and their dissemination by appropriate media to members of the National Platform for Disaster Risk Management, District Disaster Management Committees, and communities.

There are several organisations and agencies implementing EWS in Uganda, with varying temporal and spatial dimensions. These include Ministry of Agriculture Animal Industries Fisheries (MAAIF), Agency for Technical Cooperation and Development (ACTED), Famine Early Warning Systems Network (FEWS NET), Uganda National Meteorological Authority (UNMA), Ministry of Health, and NECOC. There is, therefore, a need to coordinate and harmonise approaches and bring efficiency, coherence and synergy to this diversity of EWS in the country and build a sustainable comprehensive system. Furthermore, the analysis and integration of data and information from multiple sources is most effective when it is coordinated under a single authority. This would aid in use of standardized protocols for warning communication and dissemination, effective coordination and data exchange among the actors in the EW process (UNEP 2012). It is also important that the EW information is timely, reliable, accurate, and issued by a respected national agency with the requisite political authority (UNISDR 2006, United Nations 2006). These are essential for public confidence if recipients are to act on the information and as more decision-makers trust an EWS, the more effective it is likely to be (Bailey 2013). The OPM is best placed to take on this role and it would promote the extension of its capacity to manage the national early warning system (NEWS) and provide early warnings with greater hazard coverage and better focused warnings in terms of stakeholder needs and locations. The NEWS would thus build on existing EWS in the country.

b)   Purpose and Scope of the Study

The main objective of this study is to map existing early warning systems in Uganda to specific hazards, economic and social sectors, and geographic locations and areas, and to propose how the NECOC could integrate or redistribute these EWS channels.

Specific objectives

Catalogue existing sources of hazard early warnings in Uganda, and regional and global sources with relevance to Uganda;

- Characterize the early warning sources in terms of usefulness to the NECOC, considering their hazard scope, geographic range, kinds of recipients, frequency, credibility, lead times and sustainability, etc;
- Gather global best practices on early warning systems and distil lessons that are applicable to Uganda;
- Propose modalities and tools with which these system can be integrated/linked and how the NECOC can receive, integrate and disseminate the sources' early warning information.

II.   Methodology

a) The consultant conducted acomprehensiveliterature review of existing EWS in Uganda then consulted with the following EWS agencies using an interview guide (Annex III):
- The Uganda National Meteorological Authority
- USAID/Famine Early Warning Systems Network (FEWS NET)
- The Ministry of Agriculture, Animal Industries and Fisheries (MAAIF)
- ACTED – Drought Early Warning System in the Karamoja
- Conflict early warning system by Ministry of Internal Affairs
- NECOC – flood early warning system in Butaleja district
- Ministry of Health – human epidemics
- Ministry of Water and Environment Lake Kyoga water level stabilisation project.
- Atomic Energy Council for radiological hazards
- Geological Survey and Mines for earthquake monitoring

c) Thereafter, the consultant proposes how the existing EWS can be linked to the comprehensive NEWSunder a single EWS authority.

d) Finally, the consultant recommends indicators and the corresponding data sources to use for data collection for the NEWS.

III. Major Findings and Analysis

A. EWS in Uganda

Early warning is defined by the United Nations' International Strategy for Disaster Reduction (UNISDR) as "the set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss" (UN 2009). This implies that EW goes beyond the production of technically accurate warnings to understanding of risk and the link between producers and consumers of warning messages with the ultimate goal of triggering action to prevent or mitigate a disaster. EWS encompasses four separate but interlinked elements: knowledge

Box 1: Components of EWS

Source: UNISDR, 2006
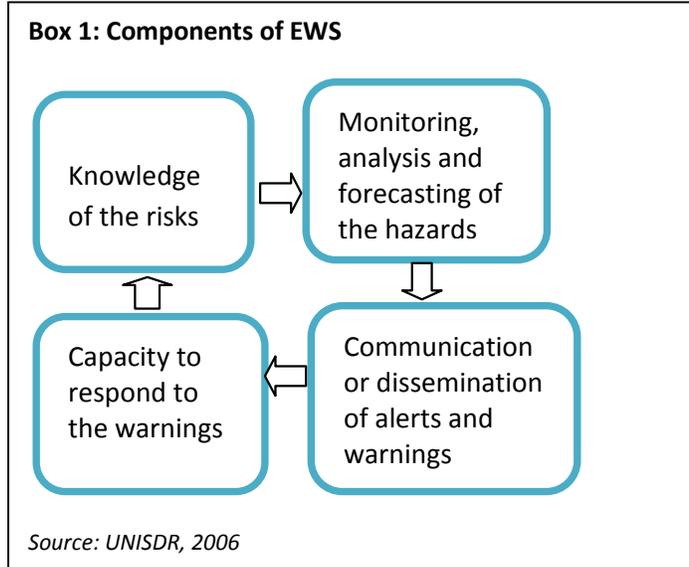
of the risks; monitoring, analysis and forecasting of the hazards; communication or dissemination of alerts and warnings; and local capabilities to respond to the warnings received. The expression "end-to-end warning system" is also used to emphasize that warning systems need to span all steps from hazard detection through to community response. EWS are an integral component of disaster preparedness and involve a broad spectrum of actors. They are combinations of tools and processes embedded within institutional structures composed of knowledge of the risk, a technical monitoring and warning service, dissemination of meaningful warnings to population at-risk and public awareness and preparedness to act (Box 1). An effective EWS therefore requires essential infrastructure and capabilities for detecting, modelling and predicting natural hazards. It should be capable of integrating information and data from various sources and sectors and providing warnings.

Uganda does not have a NEWS. This has resulted in proliferation EWS each monitoring different hazards and issuing their own warnings targeted at various audiences. Some of these EWS are standalone and are not linked to any other. Existing EWS and the agencies are identified below:

1. Uganda National Meteorological Authority (UNMA)

a) General Information
This is a specialised government agency responsible for the provision of meteorological services in the country. The offices are located on 10th floor of Postel Building, Clement Hill Road, while the operation centre is at the National Meteorological Centre in Entebbe. UNMA was created in 2014 when the Department of Meteorology (DoM), in the Ministry of Water and Environment (MoWE), was transformed into a government Authority. Previously, the DoM was established in 1977 as a specialised government department after the collapse of the East African Community when the East African Meteorological Department (EAMD), created in 1948, was dissolved.

b) Data management

UNMA monitors weather and climate across the whole country. It collects weather data on 32 indicators such as rainfall, temperature, humidity, sunlight hours, etc. This data is collected using a network of stations which include: include 11 synoptic stations feeding Global Telecommunication System, 20 agro-meteorological stations, 18 Hydro-meteorological stations, 300 rainfall stations, one Upper air station at Entebbe airport, and several automatic weather stations. There is a division within UNMA responsible for the design, implementation and monitoring of its station network.

The periodicity of data collection depends on the parameter and varies from 15 minute to 24 hour intervals. Collation, processing and archiving of all weather data observed in Ugandais the responsibility of the division of Data Processing and Applied Meteorology. It also produces regular ten-day (dekadal) and monthly bulletins in addition to receiving, archiving, transmitting weather data, and production of seasonal forecasts. The forecasting division is responsible for the collection and distribution of real-time data and producing daily public and aviation forecasts. This is done at the National Meteorological Centre in Entebbe and Soroti Forecast Office.

The management of data quality is done to international standards set by the World Meteorological Organisation (WMO).

c) Information reporting and dissemination

UNMA produces products ranging from daily weather updates, monthly updates to seasonal forecasts. Three seasonal forecasts are issued in a year; March to May (MAM), June to August (JJA) and September to December (SOND). The forecasts give advisories on likely weather conditions and impacton various sectors such as wildlife, energy and agriculture. The information products vary in content depending on the type (Table 1). The thresholds used in data analysis are based on national historical data and are referenced for Uganda.

UNMA has data sharing policy that is aligned to GoU and East African Community meteorological data sharing policy. Access to data has to be requested in writing, stating the data required and intended use. However, a small fee may be charged as cost recovery.

UNMA, with partners, is piloting a project called Mobile Weather Alert serviceto provide localised weather alert service on Lake Victoria using mobile technology. This service is aimed at fishermen and fish traders to make informed decisions on when and where to fish in Lake Victoria depending on the weather, thus helping to save lives and preserve livelihoods. Previously, many lives were lost on the lake because fishermen were unprepared for bad weather conditions on the lake. Fishermen community representatives are trained in basic understanding of weather forecasts and how to respond to various alerts. Equipped with mobile phones, the community representatives then pass on their knowledge to fishermen and traders and encourage them to sign up to the Mobile Weather Alert service.

d) Funding and partnership

UNMA largely relies on GoU for funding but receives occasional support from partners for some activities. It enjoys support from some partners in weather and climate sectors, including:

- Continuous support from IGAD Climate Prediction and Application Centre (ICPAC) in preparation of seasonal forecasts during pre-climate outlook forums when forecast models are run at ICPAC and presentation at climate outlook forum. ICPAC is also a regional hub for access to climate products and data from international forecast centres.

- Support from NOAA climate Centre for training two staff in Numerical Weather Prediction and a work station for running the models for short range forecasting.
- WMO from the regional hub in Kenya.
- WMO, MTN Uganda, Ericsson, National Lake Rescue Institute and the Kalangala Fishing Community for the weather alert on Lake Victoria.
- Stakeholders using weather data e.g. DEWS, FEWS NET, MAAIF

Table 1: Information products by UNMA

Product	Content	Audience	Dissemination channels
Daily public forecasts	- Weather for the current day - Weather for the next 24 hours - Daily readings for rainfall, temperatures, humidity, wind and sunshine	- General public	- Radios (mainly FM radio stations broadcasting in local language); - Television; - Print media
Aviation forecasts	Air route and terminal airdrome forecasts	Flight operators	Control tower
10-day (dekadal) and Monthly agro-meteorological bulletins	- Weather summary and highlights for the last 10 days - Weather reviewers at monthly and seasonal basis - 10, 20 and 30 days rainfall and temperature analysis - Advisories to agricultural sector - Seasonal rainfall accumulated from the beginning of year to most current dekad	- Agricultural community - Feeds into various EWS - Agricultural policy makers	Internet, stakeholder meetings, mailing list
Monthly Weather bulletin	Climatological statistics including comparison of current month and long term averages	- Planners - Climatologists - Agricultural community - Feeds into various EWS - Agricultural policy makers	stakeholder meetings, mailing list
Special forecasts	- Seasonal forecast circulars - Press releases on unpredicted weather events of concern to the public	- Policy makers - Insurance companies - General public - Agricultural community - Feeds into various EWS	Press release, media

Source: UNMA

e) Strengths
- Major funding source is the GoU which is sustainable
- Expertise in weather and climate analysis
- Has the historical weather information important to inform EWS
- Partnerships at regional and international level provide necessary technical support and access to international weather centres.
- Through the use of FM radio stations and Uganda Red Cross volunteer network in communities,UNMA is able to communicate weather information quickly and more clearly.

f)   Weaknesses/challenges
- It is understaffed and operating at only 50 percent staffing. Limited skilled human resources impacts on UNMA's ability to offer services.
- Chronic under-funding has resulted in deterioration of the field observing station network. For instance, most of the important equipments are inadequate, grounded or non-existent yet they are capital intensive e.g. Radar, the Upper Air System, wind profiler, forecasters system, etc.
- Obsolete and inadequate weathermonitoring infrastructure as resulted in low density of equipment which limits data collection, analysis and provision of meteorological services.

2.   Flood Early Warning System in Butaleja District

a)   General information
This sensorflood monitoring system is a pilot project of Uganda Communications Commission (UCC), International Telecommunication Union (ITU), OPM, the Ministry of Water and Environment, and District Local government of Butaleja with technical support from ANS Service. It was set up in 2013 and is due to be commissioned in the last quarter of 2014. The system is placed on River Manafwa between Himutu and Mazimasa sub-counties in Butaleja district.

b)   Data management
This community based flood warning system is not collecting any data yet or relaying any information to NECOC. However, the system is linked to the district headquarters by solar powered radio which enables the district authorities to also monitor the flood levels.

c)   Information reporting and dissemination
The sensor has two warning levels; alert and alarm. The first sounding of a siren indicated that communities should prepare, while a second one meant that they should evacuate.The warning reaches to the community within a 5 km radius. However, simulations exercises have not been carried out to assess its effectiveness or population capacity to understand the warnings and take action.

d)   Funding and partnerships
This system is funded by ITU and UCC to demonstrate how Information and Communication Technology can be used in disaster preparedness and early warning. Installation and operation is a collaborative effort of the community, the local government, MoWE and OPM.

e)   Strengths
- The siren is easily understood and warns many people in the quickest possible time.
- It is linked to the district for external support.
- Community can operate the sirens to send out warnings.

f)   Weaknesses/challenges
- Siren has a limited range and covers only a small part of the area that is prone to flooding.
- The system is not automated and therefore cannot be remotely monitored
- As sirens only transmit so far, communities must establish relay systemsto pass on warnings received.

3. Famine Early Warning Systems Network (FEWS NET)

a) General information
FEWS NET is a project of the United States Agency for International Development (USAID) which monitors and reports on food security conditions and issues early warning to decision makers for response to emerging humanitarian crises. It is located on plot 32 Kanjokya Street, Kamwokya in Kampala. FEWS NET analyses food security in the whole country.

b) Data management
FEWS NET monitors hazards like drought, floods, price shock, livestock epidemics that may have an impact on food security. This is integrated with information and data onmarkets and trade, nutrition, livestock and crop production,and livelihoods to evaluate current and future food security conditions.The indicators used include, terms of trade, satellite rainfall estimates, normalized vegetation index (vegetation condition), informal cross-border price data, GAM rates, monthly price data of staple foods, livestock and livelihood commodities such as firewood, charcoal and wage labour.

FEWS NET has one technical manager who does the analysis and reporting of food security conditions. It has access to technical support from FEWS NET regional office in Nairobi, Kenya. ArcGIS (Version 10.1) and MS Excel are used for mapping and data analysis respectively.

FEWS NET collects very limited primary data, mainly prices and volumes of informal cross-border trade at Mpondwe and Suam. This is collected on monthly basis and sent to the regional centre in Nairobi. FEWS NET therefore relies on network of partners to access the data needed to conduct livelihood analysis. It has access to up to date data on parameters it monitors, including; market price of staples,wage labour, firewood and livestock from selected markets from Farmgain and WFP; rainfall forecasts from UNMA, rainfall estimates from publicly available satellite data from United States government agencies like National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA) and US Geological Survey (USGS) which provide data on current conditions, historical trends, and future forecasts; seasonal livelihood activities from district production offices and NGOs working at community level.

FEWS NET monitors Abim, Amudat, Arua, Gulu, Kaabong, Kabale, Kampala, Kotido, Masindi, Mbale, Moroto, Nakapiripit and Napak markets. Historical data on these markets is available. FEWS NET has livelihood zone baselines and profiles that are used to contextualise analysis.

c) Information reporting and dissemination
FEWS NET produces quarterly food security outlook with a six month lead period, monthly food security outlook updates, and monthly market reports. Occasionally, an alert is issued to highlight areas of food security concern. The content of the quarterly report describes the overall current and food security situation and projected food security conditions. It includes the information on weather, markets, health and nutrition, livestock health and pasture conditions, household food deficits with qualitative description of livelihoods and coping strategies. It also provides judgement on the severity of the situation using the Integrated Food Security Classification (IPC) framework. The protocols and analysis thresholds used to indicate levels of risk are based on the Acute Scale of the IPC system used for decision making in emergency situations. These standards are nationally and internationally recognized.

All these products sent to USAID, government ministries, donor organisations, humanitarian agencies, local governments and NGOs via email distribution and internet. FEWS NET also presents this information to stakeholders at the disaster risk reduction platform and food security and agriculture sector meetings. These forums, in addition to email exchange, are used to give feedback for corrective measures to be taken and continued improvement of the system.

d) Financing and partnerships

FEWS NET is wholly funded by USAID based on five-year funding cycle. It's reliance on donor funding jeopardizes its long-term sustainability as any change in donor funding priorities may result in downscaling or termination of the EW activities.

FEWS NET Uganda collaborates informally with other EWS agencies such as MAAIF, ACTED and UNMA. At regional and global levels FEWS NET works in partnership with Global Information and Early Warning System on Food and Agriculture (GIEWS) and Integrated Food Security Phase Classification (IPC). As a USAID project, it works with four United States government agencies—NASA, NOAA, US Department of Agriculture (USDA), and USGSwhich provide data on current conditions, historical trends, and future forecasts. NASA and NOAA collect and process satellite data; USGS and regional scientist based in Kenya analyses remote sensing and geospatial data on vegetation, rainfall, and water use to produce country and region specific depictions related to the growing season.

In partnership with FAO and WFP, FEWS NET produces a quarterly markets and trade bulletin at the regional level to monitor cross-border of food commodities and livestock to quantify the contribution of informal cross-border trade to food security in eastern Africa.

Information is freely shared with other EW agencies on request. However, since FEWS NET is not the primary source of the market data in its archives, such data has to be obtained from the primary provider.

FEWS NET is willing to collaborate with NEWS especially in areas of expert analysis in vulnerability assessment, information and data sharing and capacity building.

e) Strengths
- It has a robust system of analysis based on the livelihoods approach.
- It gives a warning lead time of six months with monthly updates
- Has a network of experts in the region.

f) Weakness/challenges
- Reliance on single donor for funding puts its long-term sustainability in jeopardy.

4. Conflict Early Warning System (CEWARN)

a) General information
Conflict Early Warning and Response Mechanism (CEWARN) was launched in 2002 as a co-operative initiative of the Inter-governmental Authority on Development (IGAD) member states. It is implemented by the Conflict Early Warning and Early Response Unit (CEWERU) located in the Community Service Centre in Ministry of Internal Affairs on Jinja Road. Its basic mission is to assess situations that could potentially lead to conflicts or violence and prevent their escalation. It covers the Ugandan side of the Karamoja

cluster. In 2012 this was expanded to include Lamwo, Adjumani, Yumbe and Koboko because of conflict in S. Sudan; Bulambuli and Abim due to the spill-over effects of the conflicts in Karamoja.

b)   Data management

CEWARN principally monitors conflict in pastoral areas and related conflict such as cattle rustling. Data is collected on incidents of conflict and the context situation using indicators shown in Table 2.

Table 2: CEWARN Indicators

Incident Indicators	
Armed Clashes	• Military Battle • Other Armed Clashes
Raids	• Raids with Abductions • Organized Raids • Livestock
Protest Demonstrations	• Peaceful Protests • Violent Turmoil or Riots
Other Crime	• Assaults • Banditry
Situation Report Indicators	
Alliance Formation	• Inter-ethnic group alliance, • Ethnic group – government alliance
Armed intervention	• Internal armed support, • External armed support
Aggravating Behaviour	• Interrupt other activities • Influx of IDPs • Pastoral migration • Separation of groups • Bullets as commodities • New Markets • Development aid problems • Security escorts • Harmful migration policy • Livestock prices drop • Protest • Negative media coverage • Media controls • Small arms availability • Harmful livestock policy • Post-raid blessing • Student attendance interrupted • Livestock sales increase • Migrant labourers
Environmental Pressure	• Natural disaster • More livestock in secure • Land competition areas grazing areas • Livestock disease abandoned
Exchange Behaviour	• Celebration • Cross-border trade • Inter-group marriage • Inter-group sharing • Gift offering
Mitigating Behaviour	• Access to health care • Bride price stable • Relief distributions • Access to education • Law enforcement • Positive media coverage • Small arms disclosure • Negotiations taking place • Markets remain open
Peace Initiatives	• Women peace messengers • Religious peace building • Weapons reduction program • NGO peace initiatives • Local peace initiatives
Provocative Behaviour	• All-male migration • Pre-raid blessing

• Traditional forecasting

CEWARN has field monitors in each district in the Karamoja cluster who gather data and information on situations and events from communities using a network of peace committees, community based organizations, police, etc. The field monitors forward the data and information on a weekly basis or whenever a serious event occurs to the country coordinator based at Centre for Basic Research for analysis and report compilation. The Coordinator is also responsible for archiving all data.

c)   Information reporting and dissemination
CEWARN produces monthly reports highlighting:
- Thesecurity situation such as nature and number of violent incidents, livestock and human lives lost, number of stolen livestock recovered,
- Measures taken by district and local leadership to address the current security challenges such as cross-border security meetings and community peace initiatives by leaders from the two countries and the local communities, respectively.
- Interventions undertaken to reduce occurrence of conflict e.g. restocking, increasing livestock access to water, livestock vaccinations, etc.
- Potential causes of conflict such as antagonistic alliance may be formed for aggression against another community or group
- Recommended response.

The reports from the Coordinator are forwarded to CEWERU which determines which line ministries should receive the reports for immediate response. The reports are also sent to the district leadership, NGOs, CBOs and communities.

d)   Funding and partnerships
CEWARN funded is by GoU and IGAD. Whilst GoU funds the operational costs, IGAD provides funds the field monitors and the Country Coordinator. CEWARN is not linked to other EWS in the country but works in partnership with CEWARN in the Kenya and South Sudan side of the Karamoja cluster.

e)   Strengths
- CEWARN is the only EWS with expertise in monitoring conflict.
- It has cross-border collaboration mechanisms which facilitates access to information across borders and helping to understand events with regional or cross-border implications.

f)   Weakness/challenges
- It is not linked to other EWS and therefore not benefiting from information that could enrich it.

5.   Ministry of Agriculture, Animal Industries and Fisheries (MAAIF)

a)   General information
MAAIF has managed thenational food security EWS since around 2000. It monitors crop, livestockand fisheries production and performance. It also manages the IPC for Karamoja region. The EWS is based in the early warning unit (EWU) at the ministry headquarters in Entebbe.

b) Data management

The early warning unit does not collect data or information directly but has access to data and information collected by other departments and units within the ministry. Informationand data is collected on mainly crop and livestock production indicators like yield, level/extent of pest and disease damage, and food and livestock prices. This information is sent as hard copies to the ministry by all district production offices twice a year.The EWU has no clearly defined data entry, analysis, verification and reporting systems. Also, data used in IPC analysis in Karamoja is retained in the templates and not transferred to a database. It is therefore difficult to see how the data is analyzed to inform EW. However, the unit has access to ArcView for mapping and MS Excel for data analysis.

c) Information reporting and dissemination

The main products produced by the EWU are advisories issuedtwice a year to coincidewiththe beginning of each cropping season after UNMA issues the seasonal forecast.Theadvisories are designed to advise the farming community on the likely impact of the seasonal rains on their activities and the appropriate crops to plant during the season. These are mainly issued as press releases and disseminated through newspapers, radios and local governmentstructures to the farmers.Occasionally, with support from partners and the local governments, the EWU conducts an IPC analysis in Karamoja and produces maps showing current and projected food security conditions in the region.

The EWS does not have a feedback mechanism to improve or correct the system.

d) Financing and partnerships

The EWU is funded by GoU. It collaborates with other EWS in Uganda such as UNMA, FEWS NET and DEWS. Regionally it works with ICPAC, GIEWS, among others.

Data and information is easily shared with other EWS. Linking with NEWS would enable it improve and strengthen its data gathering system and analysis.

e) Strengths
- It has disaggregated production data which is useful for trend analysis at district and national level.
- The vertical communication structure between the ministry and districts can be built on to collect routine data.

f) Weakness/challenges
- The EWS is under-resourced and working well below capacity.
- Its national footprint is very light and offers only qualitative information and issues only 2-3 advisories in a year and are mainly based on likely rainfall performance on agriculture.
- Very limited data entry, analysis, verification mechanisms.
- The EW message is based on likely impact of only one indicator on crop and livestock production
- The information collected is limited in scope and barely used for EW
- It lacks database and digital archive of the information and data collected.
- Data collection is still analogue.

6. Drought Early Warning Systems (DEWS)

a) General information

The DEWS is implemented in Karamoja sub-region largely by the district local governments with support from ACTED. It started in 2008 as a pilot project in Nakapiripirit district and expanded to all districts in Karamoja in 2009. It was set up purposely to provide communities, districts leadership and development partners with timely warning of increased risk of drought and therefore initiate implementation of drought preparedness measures. The DEWS is located in the seven districts of Karamoja run by technical staff from each district. ACTED provides support by providing data entry software, data backup, facilitating data and information field verification exercises, and community dissemination of EW messages.

b) Data management

The DEWS monitors drought and analyses its likely impact on livelihoods. On a monthly basis, data is systematically collected from sentinel sites comprising of 10 households in 10 parishes representing the main livelihood zones in each district. The data is collected from households, kraals and markets using both printed forms and mobile phone technology (Nokia Data Gathering) by parish chiefs on 21 indicators in four main sectors; livestock, crops, water and livelihoods (Table 3). However, because of change in technology whereby the Nokia data gathering system is being rendered obsolete, ACTED is in the process of changing to Android platform.

Table 3: DEWS indicators
Source: ACTED

S/N	Indicator	Source
1	NDVI	Internet
2	Rainfall Amount	Internet/Community
3	Temperature	Community
4	Weather forecast	Departmentof Met.
5	Livestock Body Condition	Kraals
6	Livestock Migration	District
7	Livestock disease incidence	District
8	Accessibility of grazing areas	Kraals
9	Type of crop planted	Household
10	Crop condition (germination, pest/disease, color)	Household
11	Crop Yield	District
12	Quantity of water fetched daily at HH level	Household
13	Time spent to fetch water	Household
14	Type of water sources	Household
15	Market prices: charcoal, firewood, casual labor, sorghum, mature bull	Market
16	Terms of trade (bull/charcoal/labour/sorghum)	Market
17	Type and number of livestock available in the market	Market
18	Incidence of malnutrition	District
19	Out migration of people	LCI
20	Freedom of movement	Household
21	Type and source of food eaten	Household

Additional data and information is obtained from other partners such as rainfall estimates from FEWS NET, livestock disease surveillance from C&D and weather forecasts from UNMA. The data is uploaded from the mobile phone modules into the DEWS software at the district which automatically analyses the data and generates a draft report. The district early warning team, comprising of technical personnel from agriculture, water, natural resources, security, livestock, health, and commerce sectors, reviews the draft and validates the final report before it is disseminated. The DEWS in Uganda is largely implemented by the district local government with oversight by ACTED. All activities from data collection to analysis and production of drought bulletin are undertaken by the district officials.

There are several measures taken to ensure data quality. i) Data quality control tools are inbuilt in the DEWS software, ii) GPS coordinates are logged for each household interviewed, allowing for crosschecking of data collected, iii) district technocrats and ACTED staff conduct field visits to verify the data and information. Each district has an archive of all data collected but ACTED office in Kampala keeps a backup. Data in all the seven districts of Karamoja is up to date.

Periodically, DEWS is assessed by ACTED Appraisal Monitoring and Evaluation unit for reliability of data collected, end-user awareness of products and messages and where actions are taken after messages are communicated. This allows for continued improvement of the DEWS.

c) Information reporting and dissemination
The DEWS issues a monthly drought bulletin. These bulletins report on the current situation, advisories on mitigation measures to take to alleviate impact of any events, and forecasts the duration of an event. The four drought risk classification levels (normal, alert, alarm and emergency) are based on thresholds for Karamoja.

The EW messages are disseminated as monthly early warning bulletins (full report and 2-page summaries) by electronic mail to decision makers. Radios are used to relay messages to communities. To enhance listening to radios, ACTED provided the 10 selected households in each parish with a radio, with the hope that they would listen to the spot messages and inform their neighbors. Community drama groups, with support from ACTED, also present skits at community meetings on salient messages that need to be communicated to communities.

d) Funding and partnership
The DEWS is partly funded by UK Department for International Development through FAO for supportive activities mentioned in section 6 (a). Because it is set in the local government structure, the parish chiefs, DEWS focal person and other technocrats are paid by the government.

DEWS works in partnership with other EWS such as MAAIF, FEWS NET and UNMA. It is willing to collaborate with NEWS as a member of an EW sub-committee.

e) Strengths of DEWS
- The use of mobile phone technology to collect data and send to the DEWS district focal person speeded up the process the time for analysis, interpretation and production of a Drought Bulletin. ACTED is in the process of moving their data collection platform from Nokia to Android.
- The DEWS, especially the monthly analysis and issuance of DEWS bulletin, is embedded within the local government structure, ensuring ownership and sustainability without ACTED.
- The local government is empowered to carry out their own EW which allows them to approve their information products faster and plan for timely response.

- GPS coding of sentinel sites allows for easy verification of data.
- The set up of the system is replicable in other districts in the country.

f) Weaknesses/challenges
Information dissemination channels to the community, especially using drama groups and giving out radio sets, are dependent on external funding and not efficient or sustainable.

7.   Integrated Disease Surveillance and Response System (IDSR)

a)   General information
This disease EWS is implemented by the Public Health Emergency Operations Centre (EOC), a specialised agency of the Ministry of Health (MoH). The EOC is located on the fourth floor of Lourdel Towers, Plot 1 Lourdel Road in Wandegeya, Kampala. Established in 2013, it is charged with streamlining and coordinating human disease surveillance activities such as detection, reporting, analysis, interpretation, feedback, and response. The centre also keeps surveillance on events at the intersection of public health and domestic animals and wildlife.

b)   Data management
The hazard monitored by EOC is human epidemics. Data is collected from all public health facilities, not-for-profit hospitals and laboratories using a web based District Health Information System (DHIS-II) which has been integrated with mTRAC (an SMS system) for direct sending of aggregated data from Health facilities to District Health office and Servers at EOC. The DHIS-II is a web-based open-source communications system for reporting national health data. Data is collected on priority diseases in Table 4 using indicators in Table 5. The EOC receives, evaluates, and distributes the information and serves as the centre of communication and coordination of emergency response operations in the health sector.

Table 4: Priority diseases, conditions and events for IDSR

Category	Examples	Periodicity
Epidemic prone diseases/ conditions	Cholera, Bacterial Meningitis Diarrhea with blood (Shigella), Acute hemorrhagic Fever Syndrome (e.g. Ebola, Marburg, Rift Valley, Lassa, Crimean Congo, West Nile Fever), Malaria, Typhoid fever, Yellow fever, Chikungunya, Dengue, Measles, Influenza-like illness, Severe Acute Respiratory Infection (SARI), Plague, Human Rabies, Anthrax (human), Acute viral hepatitis, Maternal deaths, Peri-natal deaths.	Weekly or as it occurs
Diseases/ conditions targeted for eradication or elimination	Dracunculiasis, Leprosy, Neonatal tetanus Poliomyelitis, Onchocerciasis, Buruli ulcer, Lymphatic Filariasis, Noma	Monthly
Other major diseases/ conditions of public health importance	Diarrhoea with dehydration less than 5 years of age, Severe pneumonia less than 5 years of age, New Advanced HIV/AIDS, Tuberculosis, sexually transmitted infections (STIs), Human African Trypanosomiasis (HAT), Trachoma, Schistosomiasis, Diphtheria, Pertussis (Whooping cough), Brucellosis, Kala azar, Nodding Syndrome, Injuries (Road traffic Accidents), Hypertension, Diabetes mellitus, Adverse Drug Reactions (ADR), Adverse events following immunization (AEFI).	
Diseases or events of international concern	Human influenza, Severe Acute Respiratory Syndrome (SARS), yellow fever, Smallpox, Acute Hemorrhagic Fever Syndrome,	As it occurs

(In addition to some noted in rows above)	Any public health event that is infectious, zoonotic, foodborne, chemical, radio nuclear, or due to unknown condition.	

Source: IDSR Strategy, 2011

The EOC has a feedback mechanism at all levels from point of reporting disease outbreak to response efforts, allowing for routine evaluation of system. Also, the surveillance and response systems are periodically assessed for effectiveness in terms of timeliness, quality of information issued, level of preparedness, case management and overall performance. Thereafter, corrective measures are taken to address any challenges and improve the system.

Table 5: List of ISDR indicators

	Indicator	Source of information
1.	Proportion of monthly IDSR reports submitted from the districts to the national level on time in the last 3 months	Monitoring chart Routine summary reports
2.	Proportion of health facilities submitting surveillance reports on time to the district.	Summary reporting forms
3.	Proportion of cases of diseases targeted for elimination, eradication and any diseases selected for case-based surveillance reported with case-based forms or line lists.	Routine summary reports and case-based or line listing reports
4.	Proportion of suspected outbreaks of epidemic prone disease notified to the national level within 2 days of surpassing the alert threshold	Log of suspected outbreaks and rumors Routine summary reports
5.	Proportion of districts in which a current line graph is available for selected priority diseases	Supervisory reports District analysis book
6.	Proportion of reports of investigated outbreaks that includes analyzed case-based data	Investigation reports Routine summary reports
7.	Proportion of investigated outbreaks with laboratory results	Outbreak investigation reports Laboratory reports Routine summary reports Log of outbreaks and rumors
8.	Proportion of confirmed outbreaks with a nationally recommended public health response	Log of suspected outbreaks and rumors Outbreak investigation reports Supervisory visit reports
9.	Case fatality rate for selected epidemic prone disease reported (cholera and meningitis)	Routine reports and outbreak investigation reports
10.	Attack rate for each outbreak of a priority disease	Demographic data about the district Outbreak investigation report with line lists or case-based forms
11.	The number of epidemics detected at the national level and that were missed by the district level	District summary reporting forms District analysis book Supervisory reports Standard surveillance reports
12.	Proportion of districts that report laboratory data for diseases under surveillance	National log book of reports received
13.	Proportion of district laboratories that received at least one supervisory visit with written feedback by provincial/national level	Reports of the District Lab Focal Person - this may require field visits
14.	Proportion of regional laboratories reporting analyzed lab data to the national lab (Central Public Health Laboratories)	Central Public Health Laboratories

Source: IDSR Strategy

c) Information reporting and dissemination

The EOC issues weekly bulletin by email and on the website and theytargeted at health workers frontline of management of health events, general public, OPM, district leadership and health development partners like World Health Organisation, United Nations Children's Fund, US Centre for Disease Control and Prevention.

Information for general public is also provided through radio talk shows, press releases, policy statements and media interviews.

d) Funding and partnership

EOC is funded by GoU in partnership with health development partners such WHO, UNICEF.

e) Strengths
- Specialised in disease surveillance

f) Weakness/challenges
- Limited integration with other EWS.

8.	Monitoring water levels in Lake Kyoga Basin

This is a pilot project of the MoWE to stabilise water levels in Lake Kyoga basin which is notorious for recurrent flood episodes. It is still in infancy and the ministry is still installing equipment (telemeters) in Lake Kyoga at Bugondo and the mouth of 13 riversfeeding into the lake, including; River Manafwa, River Malaba, River Namatala, River Sironko, River Awoja and River Sipi catchments.

The project will use telemetry, an automated communications process by which measurements are made and other data collected at remote or inaccessible points and transmitted to receiving equipment for monitoring located at Water Resources Management department in Entebbe. Measurements will be taken on water levels and river flow in order to monitor fluctuation. When alert levels are reached the department will send warning messages to the community leaders and regional Water offices to inform the communities in affected areas. However, the department is still establishing alert thresholds.
The project is funded by GiZ, American Red Cross and GoU.

9.	Vulnerability Analysis and Monitoring (World Food Programme--WFP)

a) General information

The WFP EWS is located at the country office at 17-19 Clement hill Road, Kampala. It started in 1962 and it monitors food security across the whole country, including refugee areas.

b) Data management

WFP monitors droughts, floods and price shocks. Data is collected on crop performance, food availability and access and market prices. WFP monitors indicators associated with crop performance, food consumption, coping strategies, market prices, among others. Food security, market assessments and trader surveys are used to collect data on a weekly, monthly or bi-annual basis. Ad hoc rapid assessments are conducted whenever needed.Food security and nutrition assessments are conducted twice a year for

Karamoja and once for refugee areas. Data and information is routinely collected by WFP staff in the field level while some is obtained from partners. To ensure data quality, data collectors are trained and data is crosschecked before being cleared for use. WFP data is up to date and is archived in an online database systemand is available to partners on request.Assessment reports and bulletins are freely accessible from the WFP website.

c) Information reporting and dissemination
Information products produced by WFP include food security and nutrition assessment reports, monthly market bulletins andquarterly food security updates.The reporting thresholds for levels of risk are based on international standards such as GAM and food consumption score.

Information products are targeted at decision makers at national or district level. These products are shared with the partners who include central and district local governments, food security and agricultural livelihoods cluster members and donors. These recipients give feedback to WFP through emails, discussion at dissemination workshops on usefulness of the products, clarification of issues and suggestions for improvement as it continues to continue collecting, generating and disseminating food security and market information regularly.

d) Financing and partnerships
The EWS is funded by donors through the country office plans. However, some activities such as assessments are co-funded by other UN agencies such as UNHCR and UNICEF.

WFP collaborates with UNMA, NECOC, and FEWS NET in early warning. Through partnership, WFP has supported UNMA (whilst it was the Department of Meteorology) to set up 26 Automatic Weather Stations. WFP is willing to be linked to the NEWS.

e) Strengths
- Has staff at sub-offices to collect information and data at district level
- Availability of historical data which is useful for trend analysis.

e) Weaknesses/challenges
- It is dependent on donor funding

10.   Real-time Disaster Reporting System (UNICEF)

This is a planned project by United Nations Children's Fund (UNICEF) aimed at supporting the Department of Disaster Preparedness and Management to establish a disaster risk management volunteer scheme and real-time Disaster Reporting System at the NECOC. This will use the existing UNICEF U-Reporter interface by enabling it to transfer all disaster related messages directly to NECOC. The system will enable communities to report hazard events and disasters when they occur through disaster risk management volunteers who will use interactive mobile-based rapid survey platform to send alerts to a dashboard at the NECOC in real-time. The rapid survey will be structured to match the DisInventar. The NECOC would validate the information by deploying a fairly detailed rapid survey to District Disaster Management Committees (DDMCs) via mobile. The DDMC and volunteers would also receive instruction messages and materials to guide response.

11. Flood early warning – Uganda Red Cross Society

Uganda Red Cross Society (URCS) is collaborating with MoWE to establish monitor flooding system in Manafwa River Basin. So far, Makerere University in partnership with Massachusetts Institute of Technology has completed modeling the flood characteristics. MoWE is currently installing and calibrating river gauges. URCS plans to provide six community radios to assist communities to broadcast flood warnings. URCS plans to engage with NECOC to merge this system with the community flood warning system setup in the same flood basin by OPM and partners.

Since 2011, URCS has collaborated with UNMA to broadcast seasonal weather forecasts to communities in selected areas using community radios and their network of URCS volunteers. The weather information is obtained from regional meteorological offices in Lira and Soroti for communities in Apac and Katakwi,respectively. The community radios were set up by URCS but are managed by the communities.

12. Indigenous EWS

a) General information
The indigenous EWS in Uganda largely depends on traditional knowledge to predict some weather events such as the start of the dry and rainy seasons.

b) Data management
This EWS is based on the observation of the behavior of specific birds, plants, insects and animals which may be response to changes in meteorological conditions. Okonya and Kroschel (2013) identified some indicators used by smallholder farmers to predict seasonal rainfall in Gulu, Kabale, Kasese, Masindi, Soroti and Wakiso districts (Table 6). However, these indicators are not consistent or frequently used in all the regions of Uganda.While indigenous EWS are of value its dissemination remains a challenge.

c) Information reporting and dissemination
Information is usually relayed informally by word of mouth in the communities.

d) Funding and partnerships
These EWS generally have no associated costs. The indigenous system are generally standalone and do not work in partnership with other EWS.

e) Strengths
- Where people are familiar with the EWS, it is trusted by the communities.

f) Weakness
- The system depends on experience, knowledge, and culture of the people in a specific region. Therefore, not all people may be familiar with use of traditional indicators to predict seasons.
- The system is not dynamic enough to predict seasons in the context of climate variability.
- The indicators are relevant in only areas with similar birds, plants, insects, and animals because they are unique or specific to a certain locality.

Table 6: Indicators for Indigenous EWS in Uganda

	Indicators for the onset of the dry season		Indicators for the onset of the rainy season
1	Appearance and movement of insects (butterflies, red caterpillars, western honeybees, *Apismellifera* Linnaeus (Hymenoptera: Apidae), bush crickets, *Ruspoliabaileyi* Otte (Orthoptera: Tettigoniidae), *nsenene* in Luganda	1	Winds blowing from west to east
2	Winds blowing from the east to the west	2	Appearance of nimbus clouds in the morning and evening/night
3	Appearance of birds (blackeagle, African pied wag tail *Motacillaaguimp* Dumont, *osukusukuorokwir* in Ateso	3	Birds like cuckoos, ducks, *tutu* or *tongufu* in Acholi, *ekirikint* in Ateso and the grey crowned crane (*Balearicaregulorum*) start to call
4	Appearance of migratory birds (cattle egrets *Bubulcusibis* Linnaeus, *bisege* in Runyoro, *ichule-dekaorariaabong* in Ateso)	4	Termites warms also known as African flying white ants (*Coptotermes formosanus* Shiraki) leave their nests; Uphill movement of African army ants
5	Singing/calling of birds (Bateleureagle, *Terathopius ecaudatus*, *koga* in Acholi)	5	Appearance of migratory birds (*ichule-deka* in Ateso)
6	Winds blowing from the west to the east	6	Frogs in swampy areas start croaking at night
7	A clear sky	7	Winds blowing from the east to the west
8	Treesshedtheirleaves	8	Moon appears white/grey/bright with visible ring and one side of the moon is black
9	Coldness during the day and night	9	A feeling of excess heat during the night and day
10	A lot of coldness in the morning and evening	10	Movementofcloudsfromtheeastto thewest
11	New moon appears red without a lining	11	Occurrence of thunderstorms
12	Appearance of the rain bow frequently	12	Presence of cool winds
13	Presence of red clouds at sunset	13	Winds blowing from the south to the north
14	Winds blowing from the north to the south	14	Occurrence of whirl winds
15	Movement of cumulus clouds from the east to the west	15	New leaves of trees sprout
16	Strong winds coming with rain in a storm	16	Cattlea re restless and start jumping
17	Warm winds blowing	17	Movement of clouds from the west to the east
18	Moon appears black in color	18	Algae swell, dampen and become more visible
19	Moon appears bright	19	Ice cap on Mount Rwenzori is visible
20	Strong winds in the morning and evening	20	When a group of small stars is in the east
21	Appearance of fog in the morning	21	Appearance of millipedes (*kamwaka* in Luganda)
		22	Presence of dew on plants in the morning
Indicators of rain or no rain in 1 – 3 days			
1	Body feels increased/excessive heat during the night and day	4	Appearance of many nimbus clouds
2	Presence of red clouds in the morning	5	Appearance of fog in the morning for no rain
3	A feeling of body pain (headache, flu, and aches)		

Source: Okonya and Kroschel (2013)

13.   Earthquake Monitoring

a)   General information
The Department of Geological Survey and Mines (GSM) in the Ministry of Energy and Mineral Development, located on Plot 21-29 Johnstone Street in Entebbe, is responsible for monitoring earthquake events in the country. Earthquake monitoring was initially under the department of Meteorology but was transferred to GSM in 1960s.

b)   Data management
Earthquakes are caused by processes, such as tectonic plate movements, that originate below the earth's surfacewhich cannot be predicted. This implies that there is no forecast system for earthquakes so their occurrence is monitored as they can trigger landslides, floods or man-made hazards. Data is collected on seismic activities (tremors) using seismometers stationed mainly in earthquake prone areas. There are four digital seismometers located at Kasese (Kilembe mines), Hoima, Mbarara and at department headquarters in Entebbe. Data from these stations is collected in two ways; on a compact disc at the station and automated live streaming of encrypted data to a server at Entebbe where it is downloaded and analysed. Mbarara is an international station that feeds into the Global Seismographic Network. This is a permanent digital network of state-of-the-art seismological and geophysical sensors connected by a telecommunications network, serving as a multi-use scientific facility and societal resource for monitoring, research, and education. Plans are underway to locate other seismic stations at Ntoroko, Soroti and Zombo.

c)   Information reporting and dissemination
The general public is not the main consumer of information on earthquakes. This information is generally availed on request to stakeholders engaged in activities that must take into account seismic events such as drilling for oil and construction in earthquake prone areas.Information is also available in departmental annual reports.

d)   Financing and partnerships
The seismic monitoring system is largely funded by GoU. The department receives some support from partners such as USGS, UN Office of Project Services (UNOPS).

e)   Strengths
This is the only specialised government agency responsible for earthquake monitoring.

f)   Weakness/challenges
- The department suffers from chronic understaffing and underfunding.
- The seismometer density in the country is very low and insufficient to adequately monitor seismic activities throughout the country.

14.   Monitoring of radiological hazards

a)   General information
The Atomic Energy Council (AEC), created in 2008, is mandated to monitor and register facilities with radiation sources in the country and to ensure radiation safety and security conditions. Located on the third floor of Amber House, AEC is a specialised government agency under the Ministry of Energy and Mineral Development.

b) Data management

AEC inspects facilities with radiation sources periodically to ascertain the functionality of the machines, safety precautions in place, knowledge of the machine operator, radiation doses on the workers and in the facility, access control to the radiation area, presence of a standard radiation symbol in the radiation area to alert the public, and if the facility is licensed to have a radiation source.

Depending on the risk associated with a radiation source, facilities are inspected once or twice a year. Facilities with computed tomography (CT scan) and nuclear medicine are inspected every six months while those with lower risk such as dental facilities, x-rays and mammography are inspected once a year.

c) Information reporting and dissemination

The reports generated are used to advise the facilities with radiation sources. These are also reports available only on request. AEC also conducts workshops and radio talk shows to sensitize the public on radiation exposure and safety.

d) Financing and partnerships

AEC is government funded. It works in partnership with other national radiation protection bodies in the eastern and southern Africa regions e.g. Botswana and Mauritius and with the International Atomic Energy Agency.In Uganda, AEC cooperates with other regulatory bodies such as National Environment Management Authority and Uganda Bureau of Standards.

e) Strengths

This is the only specialised government agency responsible for radiation monitoring.

f) Weakness/challenges

Staffing levels are insufficient to monitor all the facilities with radiation sources.

B. Analysis of findings

The existing EWS in Uganda have some factors in common and peculiarities as highlighted below.

<u>Similarities</u>

- DEWS, WFP,MAAIF and FEWS NET both monitor hazards that are likely to have an impact on livelihoods and food security. They use a livelihoods based approach to analysis. They all have special emphasis on Karamoja sub-region because it is prone to drought and vulnerable to food insecurity.

- MAAIF, FEWS NET and WFP all monitor food security conditions across the country

- EWS monitoring drought depend on UNMA for rainfall data and seasonal forecasts.

- The real time disaster management system, EOC and DEWS use (or plan to) efficient Android platform for data and information collection.

- With the exception of EWS established in national institutions (DEWS to some extent) and are government funded, the other EWS are dependent on donor funding which doesn't augur well for their sustainability if they exist independent of the national system.

- The DEWS, URCS and UNMA are able to directly reach the communities with warnings.

- The majority of EWS have partnerships with regional EWS organisations.

- URCS and ITU/UCC are planning to monitor flooding in Manafwa River basin in the same communities.These two initiatives can be merged synergy

Peculiarities

- It is only DEWS that is fully integrated in the local district structure and the processes used in the operation of the system are similar to those to be used by NECOC. These include using community leaders to collect information and data, sending data on Andriod platform, using a district EW team comprising of representatives of main sectors to analyse the data and information and produce an EW bulletin. EOC also used a similar method for data collection but analysis is done at national level.
- UNMA early warning system reaches to all levels of the general public to decision makers and all sectors across the country.
- EOC, GSM, AEC and UNMA are specialised agencies in their respective areas of expertise.
- UNICEF will report disasters in real-time to NECOC but is not an EWS. But it is only planned to report disasters in real-time directly linked to NECOC using a network of volunteers.

Gaps

- A system for monitoring lightening hazard is lacking.

These EWS can also add value to the development of the NEWS as shown in Table 7.

Table 7: Contributions of existing EWS to NEWS

EWS	Contribution to NECOC
UNMA	Weather data and weather forecasts;
EOC	Disease surveillance data; Already using USSD based Android platforms to collect data at both district and national level. Can share experience with NECOC in setting up system.
DEWS	This system is well integrated in the district structures in Karamoja region, from data collection and reporting to publication of bulletins. The model used is similar to that of the NECOC and offers opportunity for lessons in setting up EWS at district levels. Bulletin is currently being shared by mailing list but plans are underway to have a website portal and recipients will only be sent the link on a monthly basis.
FEWS NET	Information and data on livelihoods; Expertise in livelihoods based analysis of likely impact of hazard events on populations; Expertise in assessing timeline of hazard event against seasonal calendars to inform response planningas it would enable response agencies to tie such plans to the timeline to identify the window of opportunity concerning appropriate interventions, timing of interventions and the potential of confounding factors to escalate a crisis; Expertise in satellite imagery analysis for rainfall and vegetation conditions.

URCS	Network of community volunteers who can be trained to collect data and information in real time or on routine basis. They can also be used to relay warnings to communities quickly; The community radios can be used to broadcast a broad range of warnings; Has modelled flooding characteristics of River Manafwa that can be linked with community based flood monitoring system set up UCC/OPM/MoWE in Butaleja. This would enable monitoring a larger area, real time and remote monitoring of flooding at NECOC which could translate into improved emergency response by authorities and communities.
UNICEF	Network of community volunteers who can be trained to collect data and information in real time (disaster events) or on routine basis (indicator based); Volunteers can also be used to relay warnings to communities quickly; Resources to set up real time hazard monitoring system which is useful for sudden onset hazards
CEWARN	Expertise in conflict analysis; Has field monitors skilled in collecting and reporting conflict related data. They can be integrated in among the community data and information agents.
MoWE(water resource monitoring)	Provide data and information and data on water levels in various rivers and lakes being monitored; Expertise in flood modelling; Flood monitoring in a number of river catchments and Lake Kyoga
MAAIF	National data and information on agriculture sector
WFP	Data and informationon food security and nutrition Expertise in food security and nutrition analysis.
AEC and GSM	Data and information and expertise in their respective fields

C. Linking existing EWS to the NEWS

Many reasons have been advanced for the integration of EWS existing in a country into the NEWS (Bailey 2013, Chaudhry 2006, WMO 2006, Zomers 2012, Pulwarty and Sivakumar 2014):

1. For effectiveness, EWS need a clear chain of command that ensures that only one official warning is given to each affected community and that stakeholders know the official source of the warning to avoid confusion and panic. This would also ensure that the warnings are authoritative, trusted and accepted by stakeholders.

2. Strong integration of response and EWs is an important characteristic of a holistic and successful EWS. It would also harmonise approaches to disaster risk management across the country.

3. It would allow for scaling up of localised EWS for hazards that affect other geographical areas of the country to ensure that such areas benefit too. For instance, DEWS managed by ACTED has funding for only Karamoja sub-region whereas there are other areas in Uganda that are prone to drought.

4. The scope of EWS needs to cover multiple but common hazards in the country to adequately contribute to disaster risk reduction.

5. Regional cooperation is crucial for the development and sustainability of EWS because some hazards have implications beyond national boundaries e.g. weather, epidemics, conflict. Also events beyond national boundaries may have an impact in the country. The NEWS can engage with regional and international institutions to exchange information and data.

6. EW decision making is an integrative process since impact of hazard events are inherently contextual, therefore partnership is important.

7. The NEWS can leverage resources to build institutional capacity to provide effective warning services.

Government leadership is essential for development of successful NEWS (Box 2). However, government cannot go it alone and multi-sectoral, interdisciplinary and multi-agency collaboration is crucial. For this reason, the existing EWS should be integrated into the NEWS and bring efficiency, coherence, harmony and synergy to the diversity of EWS and warnings in the country. It would also ensure that EWS operate within the established institutional arrangement which is vital for sustainability of the system and that NECOC's capacity to provide early warnings with greater hazard coverage and better focused warnings in terms of stakeholder needs and locations is enhanced.

The integration can occur at points where they can increase access to and efficiency in collection of important information and data and contribute to consensus building in risk assessment. Thus, EWS can be integrated into the NEWS in the following areas:

- Data and information collation – There is no substitute for local monitoring and local communities must be supported in data and surveillance gathering. This can be done at community level by data collection agents of existing EWS using harmonized tools. This would improve reliability of data and information received.

- Participation in multi-sectoral and stakeholder risk analysis of the situation at district national level as part of the EW teams. The various EWS have expertise and can contribute to risk analysis where expert opinion in various sectors and consensus building is required to estimate the risk of hazard events to individuals, populations, property or the environment. This is necessary for building technical capacity to issue warnings and confidence in the EW information.

- Local communities are the first to take actions to respond to an event and therefore must be able to receive early warning information quickly. It is therefore important to strengthen the link between the technical teams issuing warnings and the communities to ensure that they receive the information in a timely manner. This can be done through the network of community agents who can serve as channels of communication of early warning messages to communities.

- The progress of a hazard event determines the kind of response needed. Participation of response agencies in the NEWS (or at district level) would not only foster coherence in response, but also ensure that it is timely, appropriate and avoids overlap.

Box2: Global best practices in establishing effective NEWS

1. Governments must lead the EWS processes. It is also usually the responsibility of the national authority to take the decision on how to react to information received from international sources.
2. Strengthening coordination, partnerships, linkages and synergies among the implementing agencies, national and local institutions and donors is critical for the common goal of establishing effective NEWS.
3. The capacity for early warning and dissemination as well as the in-country partnership among relevant institutions should be enhanced. There is need for developing and promoting national and regional human and institutional capacity, transfer of know-how, technology and scientific knowledge through international cooperation and partnership.
4. It is cost effective to build on the existing systems in an integrated framework when establishing an EWS.
5. Providing overall organizational assistance to specialized technical institutions can result in the effectiveness of inputs and resources. This can be maximized by providing strategic direction for the implementation and monitoring of the activities which avoids overlaps between the implementing agencies.

IV. Integration of Existing EWS into NEWS

The proposed NEWS will not replace the existing EWS but enhance their collaboration by integrating them into the national system as shown in Figure 1.

At the district level, sector heads or their appointees, will be provided with Smart phones with mobile applications to use for collecting and sending data to the NEWS dashboard at NECOC. Data will be collected using two tools; the standard DesInvetar form (Annex II) and a tool based on identified EW indicators in Table 8. The DesInvetar form will be used to collect data on disaster losses to generate historical data useful for making projections of likely impact of disasters and to inform decision making for better emergency preparedness. The other EW indicator based tool will capture routine data that will be used for analysis and monitoring of hazards to provide advisories to the communities on impending disasters. The sector heads will also be responsible for validating the data collected in their respective sectors. The District Disaster Management Committee (DDMC) comprising of departmental heads will analyze data, produce and disseminate an approved district EW bulletin. This bulletin will also be posted on the NECOC website by the national EW focal person.

At the community level, the community will give information on household indicators to community information agents comprised of local government staff and NECOC volunteers. The Community Agents and the community will receive the early warning advisories from the district through various communication channels such as radios, TV, megaphones, during barazas (community meetings), etc. The community agents will also further relay the advisories in their communities.

Figure 1: Proposed integration of existing EWS into NEWS
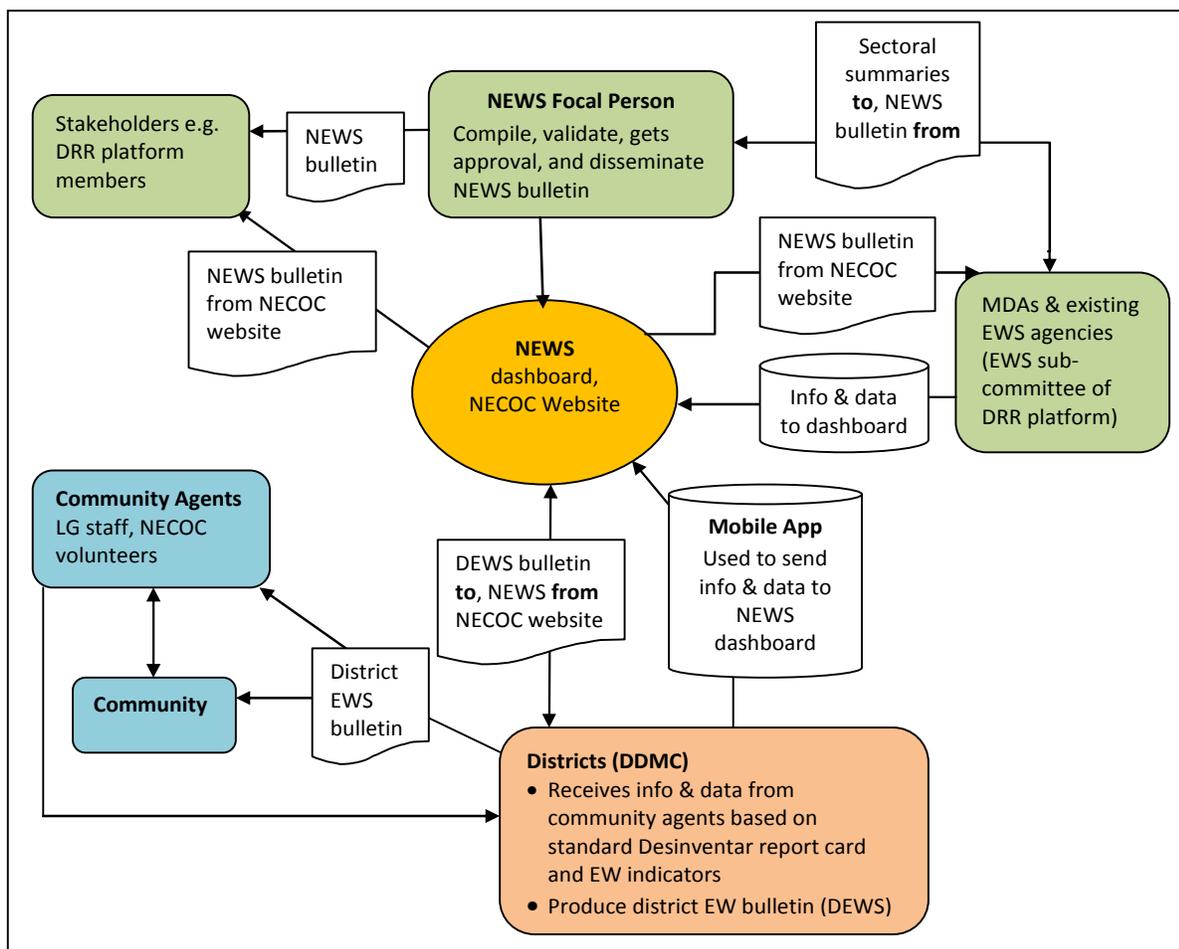
At the national level, EW focal persons in MDAs and agencies with EWS will use the same tools as districts to collect and send data to the NEWS dashboard. They will also be able to access data and information from districts on the server to conduct analysis and produce national sectorial summaries. The NEWS focal person based at OPM will then use these summaries to compile the NEWS bulletin and present to the EWS subcommittee of the DRR for review. The EWS subcommittee comprises of members from the line ministries and coordinated by the OPM EWS focal person. The NEWS focal person will incorporate any comments and submit the final report to OPM for approval and thereafter, disseminate to all stakeholders using a mailing list or web link to the NECOC website where a copy of the bulletin will be posted.

Table 8: Indicators for the NEWS

	Category	Indicator	Data source
1	Weather	Rainfall (point data, rainfall estimates, weather forecasts)	UNMA, FEWS NET, internet (e.g. http://earlywarning.usgs.gov/adds/), GEONET Cast
2		Temperature	UNMA

3		Seasonal rainfall performance (very poor, poor, average, good, very good)	DPO/ Sub-county/Parish Chief
4	Crops	Crops planted	DPO/ sub-county/Parish Chief
5		Crop condition at different growth stages (very poor/crop failure, poor, average, good, very good)	Community data collection agents/districts
6		Crop production at harvest (per crop/season)	DPO (MAAIF for historical)
7	Livestock	No. of ribs exposed (livestock body condition)	DPO/sub-county/Parish Chief/selected kraals
8		Incidence/outbreak of trade restrictive diseases e.g. foot and mouth disease	DPO/Livestock Resources at MAAIF
9		Distance to grazing areas (Access to pasture)	DPO/sub-county/Parish Chief/selected kraals
10		Distance to water source (Access to water)	DPO/sub-county/Parish Chief/selected kraals
11		Normalized Difference of Vegetation Index (NDVI) --Pasture condition	FEWS NET, Satellite/internet e.g. http://earlywarning.usgs.gov/adds/
12		Occurrence of livestock migration	District production office
13	Markets	Prices of staple food commodities	Districts,Infotrade, Farm Gain, WFP, ACTED, UBOS
14		Livestock prices (per head of mature bull/shoat)	WFP, districts commercial office (DCO), DPO
15		Price of livelihood commodities e.g. firewood, charcoal, wage labour	WFP (for Karamoja), DPO, DCO
16		Terms of Trade	Calculated ratio
17		Milk prices (mainly pastoral areas)	DPO, DCO
18	Health & nutrition	Crude Mortality Rate (CMR)	MoH/Dept of Health at district and UNICEF,WHO
19		GlobalAcute Malnutrition (GAM) rates	UNICEF, MoH/Dept of Health at district
20		Mid-Upper Arm Circumference (MUAC)	UNICEF, MoH/Dept of Health at district
21		Under five mortality rate (U5MR)	IDSR/ Dept of Health at district
22		Case fatalities from epidemics	IDSR/ Dept of Health at district
23	Water	Type of water source	Community data collection agents
24		Distance to water source	Community data collection agents/district data summaries
25	Conflict	No. of incidences of armed/violent livestock theft (rustling)	CEWERU/district security office
26		No. of incidences of armed clashes	CEWERU/district security office
27		No. of incidences of inward pastoralist migration (aggravating factor),	CEWERU/district security office
28		No. of refugeescrossing border into country(refugee influx)	OPM/CEWERU/district security office/Red Cross
29		No. of IDPs entering the district (IDP influx)	OPM/district security office/Red Cross
30		No. of incidences of post raid blessing (aggravating behaviour in pastoral areas)	CEWERU/district security office

31		No. of incidences of pre-raid blessing (provocative behaviour)	CEWERU/district security office
32		No. of incidences of all-male migration (provocative behaviour)	CEWERU/district security office
33	Others	Coping strategies index	Household/DPO
34		Food consumption index/dietary diversity index	Household/DPO

V   Recommendations

1. NECOC needs to establish a framework for collaboration with existing EWS at district and national levels to harmonize data collection and reporting and analysis.

2. As is the accepted international practice, a single national authority should issue warnings when the NEWS becomes functional. This would avoid causing confusion among stakeholders.

3. The frequency of routine data collection needs to be agreed upon with agencies and districts.

VI   Conclusion

There are several EWS in Uganda depending on mainly donors for funding which is not sustainable in the long-term. Establishing the NEWS under OPM would build a sustainable system.

Annex I: References

1. ACTED Uganda (2013). *Karamoja Drought Early Warning System (DEWS): An Assessment of Data Reliability, End-User Awareness and Early Action*. ACTED, Kampala.

2. Bailey, Rob (2013). *Managing Famine Risk Linking Early Warning to Early Action*. A Chatham House Report. The Royal Institute of International Affairs, UK.

3. Chaudhry, Qamar-uz-Zaman (2006). *Strengthening National Capacities for Multi Hazard Early Warning and Response System.* Department of Meteorology, Pakistan.

4. Disaster Management Information Network (2008). *Disaster Management Information Link Report* 1. Asian Disaster Preparedness Center.

5. International Federation of Red Cross and Red Crescent Societies (2010). *Early Warning – Early Action: A Regional Guideline for Effective Engagement.* South East Asia Office.

6. International Federation of Red Cross and Red Crescent Societies (2012). *Community early warning systems: guiding principles*. Geneva.

7. Meissen Ulrich and Fuchs-Kittowski Frank (2014). Towards a reference architecture of crowdsourcing integration in early warning system. *Proceedings of the 11th International ISCRAM Conference*

8. MoH (2011). *National Technical Guidelines for Integrated Disease Surveillance and Response*. GoU.

9. Ogwang, Malika (2011). *Draft Good Practice Principles for Community Linked Early Warning Systems in the Drylands of The Horn of Africa.* ACTED Uganda.

10. Okonya, J. S. and Kroschel J. Indigenous knowledge of seasonal weather forecasting: A case study in six regions of Uganda, *Agricultural Sciences 4 (2013)* 641-648.

11. Ongwen Tobias Angura, Bugembe Richard and Max Alfred Anyuru (2012). *Study on Lessons Learnt from Drought Early warning Systems in Uganda and Kenya*. ACTED, Kampala

12. Practical Action (2010). *Scaling up Early Warning Systems in Nepal: case studies and good practices*. Practical Action, Nepal Office.

13. Pulwarty S. Roger and Mannava V. K. Sivakumar (2014). Information systems in a changing climate: Early warnings and drought risk management.*Weather and Climate Extremes 3(2014)14–21.*

14. Rogers, David and Tsirkunov, Vladimir (2011). *Implementing Hazard Early Warning Systems*. Global Facility for Disaster Reduction and Recovery.

15. UNEP (2012). *Early Warning Systems: A State of the Art Analysis and Future Directions*. Division of Early Warning and Assessment (DEWA), United Nations Environment Programme (UNEP), Nairobi.

16. UNISDR (2006). *Developing Early Warning Systems: Checklist*. Third International Conference on Early Warning. United Nations.

17. UNISDR (2009). *Disaster Risk Reduction Terminology*. United Nations.

18. UNISDR (2010). *Early Warning Practices can Save Many Lives: Good Practices and Lessons Learned.* United Nations Secretariat of the International Strategy for Disaster Reduction (UNISDR), Bonn, Germany.

19. United Nations (2006). *Global Survey of Early Warning Systems*, United Nations report, 2006.

20. World Meteorological Organization (2006). *Drought monitoring and early warning: concepts, progress and future challenges*. WMO - No. 1006

21. Zommers Zinta (2012). *Climate Early Warning System Feasibility Report: Early Warning Systems and Hazard Prediction*. United Nations Environment Programme.

Annex II: DisInventar Reporting Card

[header]	NAMEOF YOURINSTITUTION DRR Information Collection Data Card

Serial: [_____] Date(YMD): [____] [__] [__] Duration: [____] Source: [_____]

Province [_____] District [_____] Block [_____]

Event [_____] Place [_____]

Cause [_____] Descr. Cause [_____]

Killed [____]	Missing [____]	Injured [____]	Magnitude [_____]
Men [____]	Men [____]	Men [____]	
Women [____]	Women [____]	Women [____]	Latitude: [____]
Children [____]	Children [____]	Children [____]	Longitude: [____]
Elder [____]	Elder [____]	Elder [____]	GLIDE number: [____]

Afectados [____]	Vítimas [____]	Transferidos [____]	Evacuados [____]
Families [____]	Families [____]	Families [____]	Families [____]
Men [____]	Men [____]	Men [____]	Men [____]
Women [____]	Women [____]	Women [____]	Women [____]
Children [____]	Children [____]	Children [____]	Children [____]
Elder [____]	Elder [____]	Elder [____]	Elder [____]

Houses destroyed [____]	Houses damaged [____]	Schools destroyed [____]	Schools damaged [____]
Brick/Concrete [____]	Brick/Concrete [____]	Classrooms [____]	Classrooms [____]
Wood/Bamboo [____]	Wood/Bamboo [____]	Students [____]	Students [____]

Hospitals destroyed [____]	Health Centres destroyed [____]	Heath posts destroyed [____]
Hospitals damaged [____]	Health Centres damaged [____]	Heath posts damaged [____]

Religiousbuildingsdestroyed [____]	Publicbuildingsdestroyed [____]	Costdamages(local) [____]
Religiousbuildingsdamaged [____]	Publicbuildingsdamaged [____]	Costdamages($USD) [____]

Hectares crops destroyed [____]	Damaged Roads (Mts) [____]	Bridges destroyed [____]
Hectares crops damaged [____]	Destroyed Roads(Mts) [____]	Bridges damaged [____]
Cabezasde Gado [____]	Affected Roads# [____]	

Watersourcesaffected [____]	Wellsdestroyed [____]	Wellsdamaged [____]

OTHERDAMAGES: [_____]

AFFECTEDSECTORS

Transport [ ]	Communications [ ]	Relief [ ]	Tourism [ ]
Agricultural [ ]	Water supply [ ]	Sewerage [ ]	Minery [ ]
Energy/Power [ ]	Industrial [ ]	Education [ ]	Commerce [ ]
Othersectors [ ]	Health [ ]	Fisheries [ ]	

Comments:

[_____]

Collector: [_____] Date [_____]

Annex III: Key informant interview guide

1. **General Information**
   - What is the name and location of the institution providing EW information?
   - How long has it been in operation?
   - What is your geographical coverage?

2. **Data management**
   III. What hazards are monitored?
   IV. What type of data is collected?
   V. What is your evidence base for prediction?
     - parameters/indicators monitored,
     - methods of data collection and acquisition,
     - periodicity,
     - sources of data/information,
     - quality management,
     - data management and archival system,
     - availability/access to historical data and information,
     - is data up to date?

3. **Information reporting and dissemination**
   - How do you report/present your information?
     - products, formats, content, frequency and nomenclature;
     - protocols, thresholds and standards for levels of risk; are they nationally or internationally recognized;
   - How do you disseminate your information?
     - target audience, users, warning lead times, frequency, medium/channels employed, dissemination protocol, management of dissemination capacity, verification of receipt of warnings, etc.;
   - How do you characterize the recipients of the alerts?
     - capacity to receive, recognize, understand and respond to alerts, perception of alerts and the issuing authority, etc.;
   - Do you have a feedback protocol to allow corrective measures or improvement of the EWS?

4. **Financing and partnerships**
   - What is the source funding for maintenance, sustainability and improvement of the EWS?
   - Are you collaborating with any other EWS in Uganda or the eastern Africa region?
   - What is your information and data sharing protocol with other EW agencies?
   - Are you willing to be linked to the NEWS?

DISASTER RISK MANAGEMENT (DRM) EARLY WARNING SYSTEM CONSULTANT

Background

Uganda has in the recent past experienced a number of disasters; most significantly floods and drought, and also landslides, human and livestock epidemics, pests, forest fires and conflicts, which in most instances have resulted in deaths, property damage and loss of livelihoods. With the increasing manifestation of negative effects related to disasters, building public awareness about disaster risks with proactive engagement of the various stakeholders is becoming critical. The government is refocusing disaster management attention away from reactive response to proactive preparedness and prevention.

The hazards listed in the previous paragraph are all predictable, some more precisely than others. Indicators of an imminent threat can be observed, analyzed and reported. Hazard early warning is an element of the GoU's proactive preparedness initiative in Disaster Risk Management (DRM): a mechanism which raises public awareness of immediate threats of predictable hazards. Early warning systems (EWS) generate information products that reflect the capacities of their diverse audiences to understand them, and disseminate them through media commonly available to the recipients. The messages identify the hazard, its geographic scope; start time and severity, and possibly its duration and actions by recipients. Key message attributes are timeliness, accuracy and respected authority.

UNDP has supported the establishment and operationalization of the National Emergency Coordination and Operations Centre (NECOC). The third facility of its kind and capacity in Africa, one of its primary functions is the generation of early warning information products and their dissemination by appropriate media to members of the National Platform for Disaster Risk Management, District Disaster Management Committees, and communities.

 The Department of Meteorology[1] in the Ministry of Water and Environment is the best-known, established institution for early warning in Uganda. Its daily weather predictions prepare the country with knowledge of imminent meteorological hazards, through communications about heavy rain, electrical storms, high winds, hail storms and extreme temperatures. The Ministry of Agriculture analyses recent trends of these data and others to predict and warn against conditions that prejudice cultivation, such as drought, plant and animal diseases and pests.   These agencies are actively involved in the preparation of early warning information products in the NECOC. International agencies publish early warnings and analysis relevant to Uganda. USAID funds the Famine Early Warning System[2]which reports on climate, livelihood and food security conditions in regions that include East Africa and specifically in countries including Uganda. International NGOs have EWS projects in Uganda, such as ACTED's Drought Early Warning System in the Karamoja region.

Current gaps in DRM: In response to the frequent disasters which Uganda faces, the government of Uganda put in place measures to address the effect of emergencies and disasters on the population. These measures include the launch of the National Policy for Disaster Preparedness and Management, training of staff on DRM and a system of District Disaster Management committees. Despite this, a number of issues still challenge DRM in Uganda; among these is an ineffective hazard early warning infrastructure and system.

Different hazards require different early warning systems. Links between analysis and action may be weak, particularly between technical capacity to issue the warning and the public capacity to respond effectively. Accuracy and reliability of information are difficult to maintain but essential for public confidence. Achieving timely coverage of the stakeholders in the scope of the warnings is an ambitious but necessary goal. Effective communication with all communities is problematic in Uganda with developing infrastructure and diversity of cultures, development stages and geographies. Devolution of localization and dissemination of early warnings to local authorities is a solution but with 112 districts in Uganda this would be a large capacity development programme. Once early warning systems are operational, information fatigue may set in.

Need to harmonize approaches to DRM: This study will provide a basis for bringing efficiency, coherence and synergy to the diversity of early warning systems and warnings in the country. It will promote the extension of NECOC capacity to provide early warnings with greater hazard coverage and better focused warnings in terms of stakeholder needs and locations.

Duties and Responsibilities

Objectives

The main objective of the consultancy services is to map existing early warning systems in Uganda to specific hazards, economic and social sectors, and geographic locations and areas, and to propose how the NECOC could integrate or redistribute these EWS channels.

Specific objectives

I.   Catalogue existing sources of hazard early warnings in Uganda, and regional and global sources with relevance to Uganda;
II.   Characterize the early warning sources in terms of usefulness to the NECOC, considering their hazard scope, geographic range, kinds of recipients, frequency, credibility, lead times and sustainability, etc;
III.   Gather global best practices on early warning systems and distill learnings that are applicable to Uganda;
ᴵⱽ.   Propose modalities and tools with which these system can be integrated/linked and how the NECOC can receive, integrate and disseminate the sources' early warning information.

Scope of the Uganda EWS study

OPM and UNDP through the Programme, Strengthening Capacities for DRM and Resilience Building, expects the consultant with requisite expertise and experience to study and analyze early warning systems in Uganda, and relevant external systems. The consultant's scope of work will consist of the following tasks:

Review and catalogue existing early warning systems in, and available to, Uganda, and for each provide or assess the following minimum set of attributes (Consultant is encouraged to include other relevant attributes):

- Institution name and location;
- Funding source(s) and sustainability;
- Years of operation;
- Hazards predicted;
- Evidence bases of prediction (e.g., sources of information, kinds of instruments);
- Characterization of alert recipients, in terms of their capacity to receive and understand alerts;
- Geographic scope of warnings;
- Range of warning lead times;
- Information sharing, dissemination and recipient feedback protocols

Assess existing institutional arrangements for information sharing, early warning dissemination and recipient feedback:

- How do the EWS institutions assure the quality (accuracy, timeliness, completeness) of the data they acquire to make the predictions on which they base their early warnings?
- What measures do the institutions take to deliver early warning messages to people with no communication media access, e.g., in remote communities?
- How do they maintain and improve their dissemination capacity in terms of transmission media and distribution lists of recipients?
- How do they follow up on early warning dissemination to verify that their messages are received, understood, taken seriously and acted upon?

- How compatible is their EWS with the capacity and scope of the NECOC, in terms of the attributes listed in section i) above and their strengths and weaknesses as sources of NECOC early warning information?

Conduct a desk review of best practices on early warning systems in other countries and distill learnings that are applicable to Uganda.

- What are the characteristics of effective and efficient early warning systems?
- What makes these systems work? What are those innovative and cutting edge approach used?
- What was the process used in establishing these systems?
- What characteristics, components, etc. of those systems are applicable in Uganda?
- How should those characteristics, components, etc. be applied into the Uganda early warning system?

Propose modalities and tools with which these system can be integrated/linked and how the NECOC can receive, integrate and disseminate early warning messages from the diversity of sources available, within Uganda and externally.

Focus on those source institutions which can productively and reliably interface with the NECOC.
Detail at least one feasible protocol for the NECOC to receive early warning information from each source. Assess issues related to implementing the Common Alerting Protocol.

- What incentives have, or could have, each source to provide its early warning information to the NECOC?
- What capacities in the EW source agencies need to be strengthened to enable effective information sharing?
- What changes to NECOC resources may be required to accommodate information exchange?

Methodology

The Consultant is expected to undertake a comprehensive desk review of proven effective and efficient early warning systems globally and those that are existing in Uganda. This will be complemented by a close examination of the operation of each of the information sources in the scope of the study. Some travel may be required, depending on their locations. The Acting Commissioner, DDPM/OPM, will provide letters of introduction to facilitate their cooperation. The Consultant is also expected to present the draft report to stakeholders, particularly the National Platform on Disaster Preparedness and Management.

Duration

- 1st week - consultation with relevant agencies, review documents, policies and strategies and submit inception report;
- 2nd week - conduct detailed assessments of the NECOC's and other agencies' EWS, conduct comprehensive desk review of global early warning systems;
- 3rd week – analyze the findings, prepare the draft report and submit it for comments;
- 4th week – share and incorporate feedback/comments, finalize and submit report to OPM and UNDP.

Deliverables

- An Inception Report with a detailed work plan for the assignment;
- Draft Technical Report covering the scope of study as indicated in Section IV of this ToR;
- Presentation of initial findings to the National Platform on Disaster Preparedness and Management and other stakeholders;
- A final technical report/study as per the scope of study indicated in Section IV of this ToR.

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