

Building the concept
and plan for the
Uganda National
Early Warning
System (NEWS)
Final report



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Report summary

There are currently significant levels of investment across Uganda into systems that collect and share early warning information on a range of hazards including: floods, droughts, diseases and conflicts. The UK Government's Department for International Development (DFID) has contributed to these early warning systems both at a national level and with a specific focus on the drought-affected sub-region of Karamoja, which experiences some of the highest levels of poverty and vulnerability in Uganda.

The overarching goal of this work was to facilitate an agreement with the key actors in Uganda around a roadmap for the development of a multi-hazard National Early Warning System (NEWS). This report describes the elements of an effective Early Warning System (EWS) and the generic principles of what constitutes an effective EWS and National Early Warning System (NEWS). It also provides some feedback with respect to Ugandan stakeholders' perceptions of the effectiveness of existing EWSs. With respect to existing EWSs and relevant tools in Uganda the following can be concluded:

- Many of the current EWSs in Uganda are piecemeal in nature and not complete. Many do not appear to be sustainable from both a financial and technical point of view. Over 90% of stakeholders who responded to an anonymous internet-based survey stated that existing EWS were “never” or only “occasionally” financially sustainable.
- Few of the tools incorporate a forecasting aspect and little use appears to be made of internationally, freely available short- (i.e. <10 days) and medium- term (i.e. <40 days) climate forecasts. Most of the EWSs currently used in Uganda are based on situational analyses which are, at best, founded on the situation the previous day. The incorporation of climate forecasts could help encourage early action rather than responding to a crisis once it has unfolded, which is usually significantly more costly and less effective than responding in advance. For example, there are a number of drought EWSs focusing on Karamoja but only one of these (FEWS NET) attempts to forecast the effects of droughts in advance of their occurrence.
- The number of different, sometimes parallel, initiatives reflects a lack of coordination between government ministries, donors and NGOs with respect to existing EWSs and relevant tools. For example, in Karamoja an Open Data Kit is used by various organisations to collect data relevant to food security in the sub-region. There is potential to coordinate data collection related to droughts, food security and disaster risk financing. The lack of coordination between stakeholders is reflected by respondents to a survey, 75% of whom said that existing EWSs “never” or only “occasionally” facilitate effective coordination between multiple government stakeholders.
- A number of useful innovative evaluation tools, related to droughts and food security, have been piloted in Uganda. However, they do not appear to be widely used or to receive the appropriate amount of funding to make them financially sustainable. These tools have the potential to improve the effectiveness of EWSs related to food security and droughts.
- After droughts, floods are considered by many stakeholders in Uganda to be the second most relevant hazard to them. However, there is currently nothing in place that resembles a national or regional flood forecasting system.



- There would appear to be a limited amount of monitoring and evaluation carried out of the effectiveness of existing EWSs with respect to meeting their stated objectives.
- The donor community needs to ensure that systems are in place to integrate EWSs throughout the development and humanitarian cycle.
- The gap between information provided by the EWS about impending hazards and the ability of government to act to reduce these threats in advance, would appear to be the main shortcoming. The capacity of stakeholders to interpret and disseminate early warning information to engender contingency plans in advance of a threat is limited. Some 75% of stakeholders responding to a survey (see Annex 1) stated that existing EWSs “never” or only “occasionally” emphasise preventative actions.
- The current mission of NECOC and the role of a NEWS needs to be clarified, as there is some confusion over their roles, both within NECOC and with respect to other key actors.
- The percentage of the national budget allocation for disasters in Uganda is not currently commensurate with the impacts that natural hazards have on the country’s GDP.
- The current institutional framework for disaster preparedness and management would appear to be inadequate and lack transparency and accountability.

As part of the report a road map on the way forward for the NEWS has been developed. The key recommendations are as follows:

- The actions detailed in the road map that is developed in this report for a NEWS need to be agreed and the way forward to implement them needs to be scoped out with the relevant government agencies and donors.
- It should be ensured that there is strong political recognition of the institutional capacities and the need for the establishment of a coordinated structure and process for the NEWS by the Ugandan Government, relevant ministries, UN agencies and donors.
- It should be ensured that capacities are aligned with resources across national to local levels to enable development of relevant EWSs, the NEWS and relevant response mechanisms.
- The NEWS should be implemented using a scalable strategic plan that enables decision processes to address the impacts of natural hazards across all levels of government.
- The NEWS should be established within the country’s disaster risk management planning and legislation.
- The operations of the NEWS should be detailed within disaster risk management related plans and legislation.
- Existing government organisations for specific hazards should maintain a mandate and autonomy for the dissemination of warnings; however, this should be coordinated with NECOC and the NEWS.



List of abbreviations

ACCRA	Africa Climate Change Resilience Alliance
ACTED	Agency for Technical Cooperation and Development
AMSS	Automatic Message Switching System
DDMC	District Disaster Management Committee
DEWS	Drought Early Warning System
DFID	Department for International Development
DRF	Disaster Risk Financing
ECMWF	European Centre for Medium Range Weather Forecasting
EWS	Early Warning System
FAO	Food and Agriculture Organization
FEWS NET	Famine Early Warning System Network
GDP	Gross Domestic Product
GEF	Global Environmental Fund
GHACOF	Greater Horn of Africa Climate Outlook Forum
GLOFAS	Global Flood Awareness System
GoU	Government of Uganda
ICT	Information and Communications Technology
IPC	Integrated Food Security Phase Classification
IFRC	International Federation of the Red Cross and Red Crescent Societies
LIPW	Labour Intensive Public Works
MAAIF	Ministry of Agriculture, Animal Industries and Food
MoWE	Ministry of Water and the Environment
NDVI	Normalized Difference Vegetation Index
NECOC	National Emergency Co-ordination and Operations Centre
NEWS	National Early Warning System
NGO	Non-Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration
ODK	Open Data Kit
OPM	Office of the Prime Minister
PET	Pictorial Evaluation Tool
PHEOC	Public Health Emergency Operation Centre
SCIEWS	Strengthening Climate Information and Early Warning Systems
SDMC	Sub-County Disaster Management Committee
SMS	Short Message Service
SOP	Standard Operating Procedure
UN	United Nations
UNAP	Uganda Nutrition Action Plan
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Emergency Fund
UNISDR	United Nations International Strategy for Disaster Reduction
UNMA	Uganda National Meteorological Authority
USAID	United States Agency for International Development
VAM	Vulnerability Analysis and Mapping
WFP	World Food Programme



SECTION 1

Introduction

1.1 Background and overarching goal

There are currently significant levels of investment across Uganda into systems that collect and share early warning information on a range of hazards including floods, droughts, diseases and conflicts. The UK Government's Department for International Development (DFID) has contributed to these early warning systems both at a national level and with a specific focus on the drought-affected sub-region of Karamoja, which experiences some of the highest levels of poverty and vulnerability in Uganda.

In October 2014 the Ugandan Government's Office of the Prime Minister (OPM) launched a National Emergency Coordination and Operations Centre (NECOC) to provide "*timely and early warning information on disasters, climate modelling and forecasting, and also to help coordinate emergency responses*" (UNDP, 2014).

Over the past decade in Uganda there has been a proliferation of Early Warning Systems (EWS) each monitoring different, or in some cases the same hazards and issuing their own warnings targeted at various audiences. A review of the existing Early Warning Systems (EWS) carried out by the United Nations Development Programme (UNDP) in 2014 (see Atyang, 2014) made the following recommendations:

- NECOC needs to establish a roadmap for collaboration with existing early warning systems at district and national levels to harmonize data collection and reporting and analysis.
- A multi-hazard National Early Warning System (NEWS) should be set up with a single national authority issuing warnings.

The overarching goal of this work was to respond to the need to establish a roadmap for the NEWS and to assist with facilitating an agreement with the key actors in Uganda around a roadmap for the development of a multi-hazard National Early Warning System (NEWS).

1.2 Objectives

The specific objectives of this work were as follows:

- Understand and set out the objectives for an effective NEWS.
- Establish an advisory group of key stakeholders.
- Review the EWS activities being undertaken and assess their efficiency and effectiveness in reaching the objective of developing a multi-hazard National Early Warning System.
- Set out the components of an ineffective NEWS.
- Advise on the degree to which existing project activities are able to deliver any or all of the components, highlighting any technical or institutional obstacles.

- Set out the current United Nation (UN) resources devoted to early warnings.
- Set out the government and donor finance sources for current EWS.
- Propose a process for the development of a NEWS, which identifies key partners, funding, technical and institutional constraints to its development and operation.

1.3 Method

The work was carried out between 25 January 2016 and 9 March 2016 as follows:

- A review was undertaken of existing EWSs currently operating in Uganda and other relevant literature (see the References and bibliography section).
- Some 60 key actors (see Section 9), with an involvement in EWSs in Uganda, were engaged with via:
 - An internet-based survey sent to 105 people of which 41 stakeholders responded, the results of which are detailed in a standalone Annex that accompanies this report (see Annex 1).
 - Face-to-face interviews with key actors during a 14 working day period spent in Kampala between 29 January 2016 and 18 February 2016.
 - A half-day workshop held in the OPM on 12 February 2016, attended by 25 stakeholders involved in EWSs in Uganda.

The documents reviewed and the names of the stakeholders engaged with are provided in Sections 8 and 9 respectively.

1.4 Report structure

The report is structured in three main parts as follows:

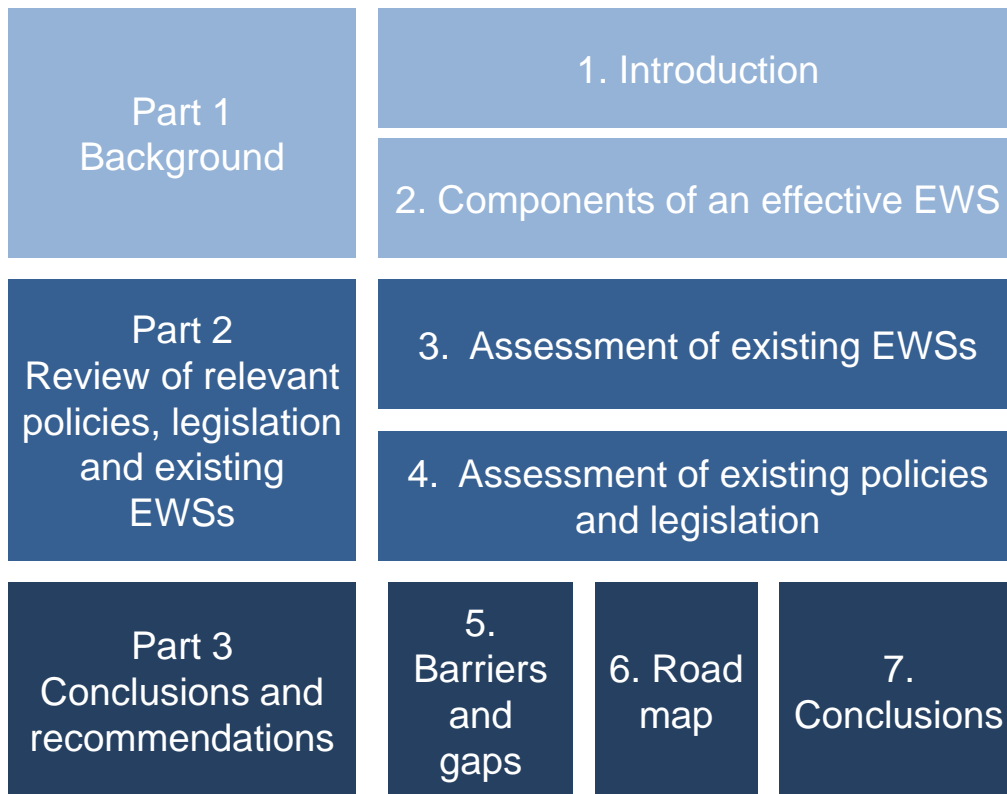
- Part 1 provides the background to the risk profile in Uganda and the components of effective EWSs and NEWSs.
- Part 2 reviews the existing EWSs operating and the relevant policies in Uganda.
- Part 3 provides a roadmap with recommendations as to how NECOC should develop and implement a NEWS over the next five years.

The main report structure and section numbers are summarised in Figure 1. The report is accompanied by a standalone Annex as follows:

- **Annex 1 - Results of a stakeholder survey** detailing the findings of an internet-based survey aimed at key actors in Uganda who implement or use the results of EWSs. Results of this survey are referenced in this report.



Figure 1 Structure of the report



1.5 Risk profile of Uganda

Uganda is at high risk from a variety of hazards, which have the potential to adversely affect progress on poverty reduction and economic growth. Uganda’s disaster profile constructed for the period 1933 to 2012 estimates that over nine million people have suffered the effects of natural hazards (UNISDR, 2013). The World Bank has estimated that at least 200,000 Ugandans are affected by disasters each year (Oketch, 2013; OPM, 2011). This section briefly outlines the risk profile of Uganda.

1.5.1 Droughts

More people have been affected by droughts in Uganda than by any other kind of natural disaster. The Government of Uganda’s Disaster Risk Reduction Five Year Strategic Plan (2010 to 2016) has identified drought as the most severe disaster affecting the lives and livelihoods of its citizens (OPM, 2012). Droughts normally occur in the northern and eastern parts of the country, where the land is semi-arid in nature. The focus of many Early Warning Systems (EWSs) in Uganda has been on the Karamoja sub-region. This report has a greater focus on these systems because the majority of investments by donors have been on EWSs to assist with food security in this sub-region.

1.5.2 Floods

The regions which are most prone to floods are Kampala in central Uganda, the Lake Victoria basin, and the eastern, western and northern parts of the country. In November 2007, heavy rains led to flooding in the Teso region and more recently flooding occurred in October and November 2015 in the north of the country.



1.5.3 Landslides

Landslides are more frequent in the mountainous regions of Mbale, Kabale, Kisoro, Sironko, Kapchorwa and the districts in the Rwenzori region. In 2004 it was estimated that 31% of the total population in Uganda lives in mountainous areas, and is therefore potentially vulnerable to landslides (IFRC, 2011).

1.5.4 Earthquakes

Earthquakes are not common in Uganda. However, the western and the central parts of the country are considered seismically vulnerable. The biggest earthquake in Uganda occurred in Fort Portal, in the south-west of the country in March 1966, and is estimated to have killed around 100 people (IRFC, 2011). In 1994, a strong earthquake hit the Rwenzori region, affecting 50,000 people.

1.5.4 Lightning

Lightning strikes result in a significant number of deaths. Around 205 and 160 primary school pupils died as a result of lightning strikes in 2012 and 2014 respectively (Agaba, 2015).

1.5.5 Communicable diseases

Communicable diseases are a significant source of mortality in Uganda. The priority epidemic-prone diseases for the country are: cholera; meningitis, hepatitis E, typhoid, ebola, marburg and the plague (IFRC, 2011).

1.5.6 Livestock diseases

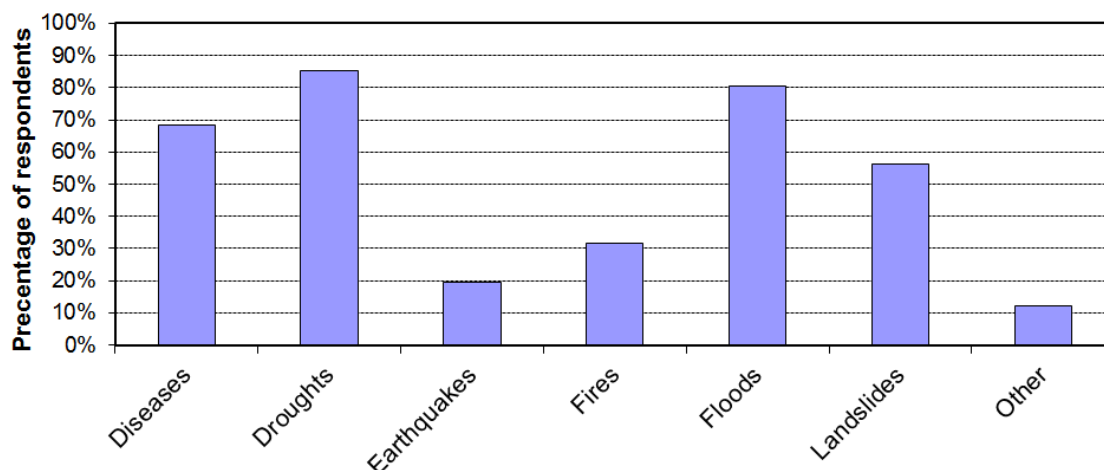
Livestock diseases have a significant impact on livelihoods in Uganda. Important endemic diseases include: foot and mouth disease; contagious bovine and caprine pleuropneumonia; peste des petits ruminants; a host of tick-borne diseases (including babesiosis, anaplasmosis, and theileriosis); helminthosis; tsetse-transmitted trypanosomiasis; contagious ecthyma; Newcastle disease; infectious bursal disease; coccidiosis; salmonellosis; African swine fever; tuberculosis; brucellosis; and anthrax (Henninger and Landsberg, 2010).

1.6 Stakeholders' perceptions of relevant hazards

A survey filled in by stakeholders, (see Annex 1), in which they were asked which hazards were most relevant to them and their organisations showed the top four hazards as being: droughts; floods; diseases; and landslides, as shown in Figure 2.



Figure 2 Stakeholders' perception of the hazards that are most relevant to them and their organisations in Uganda



(Source: Annex 1)

1.7 Karamoja and food security

Uganda is ranked among the world's malnutrition-burdened countries, with one in five people suffering its effects (UNSCN, 2011). Karamoja is made up of seven districts: Abim, Amudat, Kaabong, Kotido, Moroto, Nakapiripirit and Napak. The area has a combined population of about one million people (i.e. 2.8% of the national population) (UNDP, 2015). There has been limited progress in income poverty reduction in Karamoja because of the marginal growth in household income. The mean "per adult equivalent" income increased from US\$24,224 in 2005/6 to US\$27,695 in 2012/13. This is equivalent to an annual rate of growth of 1.9%, which is significantly lower than that observed for the rest of the severely affected sub-region (5.3% per annum) (UNDP, 2015).

Karamoja is a semi-arid area, with only one rainy season) which has historically always suffered from food insecurity¹ partly as a result of its climate and it it experiences some of the highest levels of poverty and vulnerability in Uganda (UBOS, 2012). At a national level, 6.3% of all Ugandans face some form of food insecurity at one point or another during the year, but in Karamoja, this category accounted for 56% in 2014. Some 37% of children in Karamoja experienced severe stunting owing to insufficient food (Wamani, 2014). A food security and nutritional assessment carried out by the WFP and UNICEF in 2014 revealed that food was accounting for 70% of the typical household's expenditures. It also noted that 49% of households reported debts, and that 70% of these debts arose because of the need to meet food requirements (UNDP, 2015). It will take many years to reduce chronic food insecurity and vulnerability in Karamoja (DFID, 2016).

The shift from humanitarian assistance has been accompanied by declining levels of external assistance to meet immediate food and nutrition needs. This places an immediate emphasis on the need for effective Early Warning Systems (EWS). This report is focused on producing a roadmap for a multi-hazard National Early Warning System (NEWS); however, it

¹ The FAO defines food security as food security as a situation in which all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life (FAO, 2003)



is recognized this needs to be defined within the challenge of an early warning system that addresses the issues of drought and food security in Karamoja.



SECTION 2

Components of an effective Early Warning System (EWS)

2.1 Introduction

This section describes the elements of an effective Early Warning System (EWS) and the generic principles of what constitutes an effective EWS and National Early Warning System (NEWS). It also provides some feedback with respect to Ugandan stakeholders' perceptions of the effectiveness of existing EWSs.

2.2 Elements of an effective Early Warning System (EWS)

An EWS is a system that allows for the detection and *forecasting* of impending hazardous events to allow effective warnings to be formulated based on scientific knowledge, monitoring and a consideration of the factors that affect disaster severity and frequency. There is a lack of literature which specifically defines what constitutes an effective and sustainable EWS (Seng, 2012). The UNISDR (see UNISDR, 2006) has defined an effective, people-centred EWS as comprising four inter-related elements as follows:

- **Risk knowledge** – An assessment of the risks should be made to assist in prioritising EWSs and for preparing adaptation measures and responses by those affected.
- **Monitoring, forecasting and warning** – There should be a sound scientific basis for monitoring and forecasting hazards 24 hours a day. Warning services for different hazards should be coordinated where possible.
- **Dissemination and communication** – Warnings should be communicated and disseminated effectively using a range of media and communication channels.
- **Response capability** – Communities and other key actors should know how to respond appropriately to best avoid loss of life and adverse effects on their livelihoods.

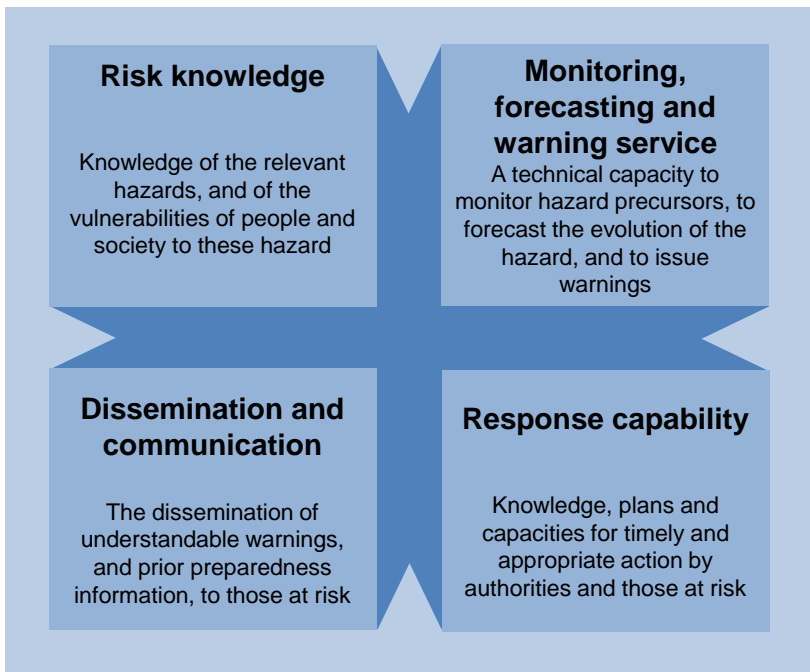
These four elements are shown in Figure 3. In addition to the four elements shown in Figure 3 from work carried out by UNISDR (see UNISDR, 2006) and engagement with stakeholders in Uganda, there are a number of other cross-cutting issues that need to be taken into account:

- **Governance and institutional arrangements** – These are encouraged by robust legal and regulatory frameworks which are supported by long-term political commitment and should encourage local decision making and participation.
- **EWSs should be nationally owned, inclusive and have a clear mandate** – At the national level, EWSs should be located within government structures and operate



- within a clear legal framework. However, EWSs should also operate and be integrated at a range of levels including communities, local and regional government.
- **Multi-hazard approach** – Where possible EWSs should link all hazard-based systems together.
 - **Involvement of local communities** – There needs to be direct participation of the people at risk.
 - **Consideration of gender perspectives and cultural diversity** – It is important to recognise that culture, gender and other characteristics of people at risk (e.g. disabilities) affect people’s vulnerability and the way in which they respond to disasters.
 - **Trust** – The analysis and warnings provided must have the confidence of its users.
 - **Accountability and transparency** – For example, the accuracy of forecasts, if produced, and the effectiveness of the responses to warnings, should be assessed and be transparent. This helps to strengthen and improve trust in the EWS.
 - **Sustainability** – The EWS should be both financially and technically sustainable.

Figure 3 The four main elements of effective people-centred Early Warning Systems



(Adapted from Basher, 2006; UNISDR, 2006)

2.3 The importance of end user feedback in EWSs

Many EWSs are systematic end-to-end early systems that involve the organized, linear and largely unidirectional delivery by experts of warnings to users (Basher, 2006). A typical example of such an EWS is the forecasts and warnings, developed by meteorological services, for weather-related hazards.

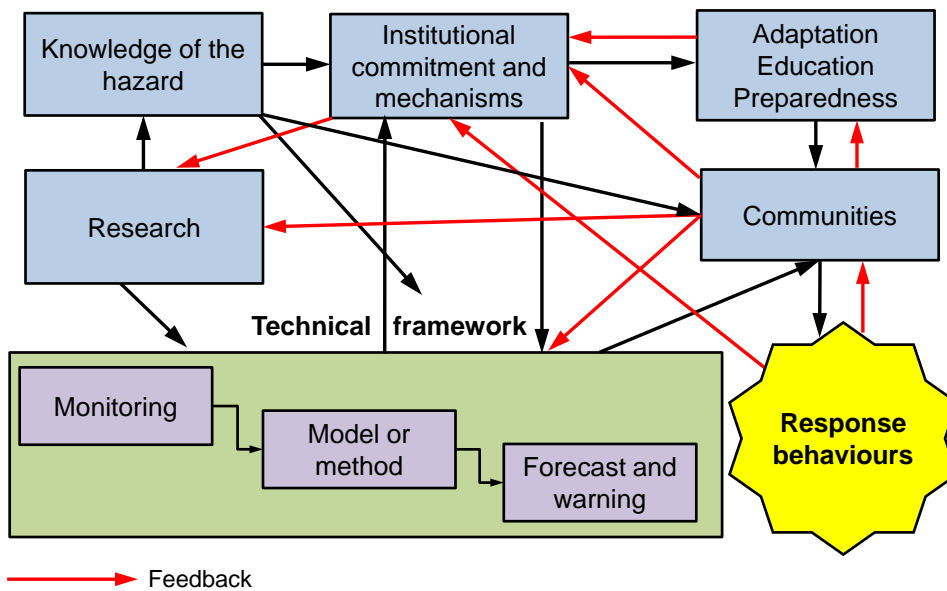
An effective and sustainable EWS needs to have not only a strong scientific and technical basis, but also a strong focus on the people at risk. This requires an integrated approach including feedback from the population at risk and links to the research community, as well

as international communities. Figure 4 shows an example of such an integrated EWS with feedback from key actors so that the system can be continually improved.

The successful communication of early warnings in order to engender the desired response in the recipients is one of the biggest barriers to the effectiveness of early warning systems (Lumbroso et al., 2014). Several studies have shown that stakeholders feel that the main barrier to the lack of effectiveness of EWSs lies within the “last mile”; that is, the raising awareness, and making warnings relevant to vulnerable communities’ livelihoods (Lumbroso et al., 2014).

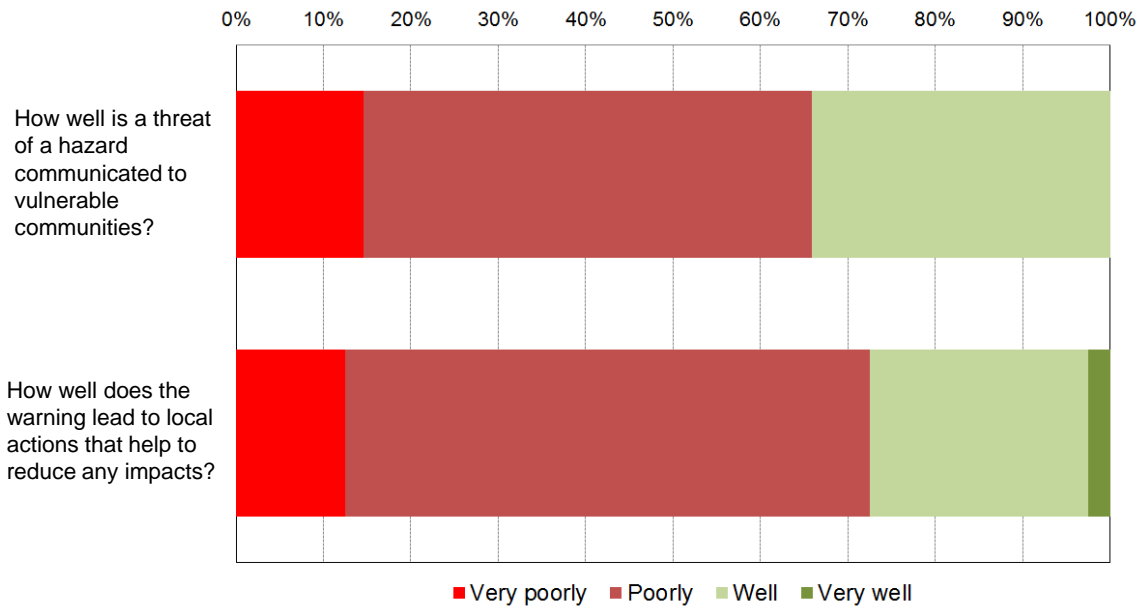
In a recent study looking at the effectiveness of drought EWSs in sub-Saharan Africa, two-thirds of the respondents to a survey indicated that although EWSs exist for drought, an overwhelming majority stated they are not effective in reducing loss of life. One of the reasons given for this is that the warnings are not being effectively communicated, especially to the most vulnerable sectors of society (Lumbroso et al., 2014). It is interesting to note that when similar questions were posed to stakeholders in Uganda with respect to the effectiveness of EWSs a similar response was given as shown in Figure 5 (see Annex 1 for more details).

Figure 4 An example of an integrated Early Warning System for one hazard



(Source: Adapted from Basher, 2006)

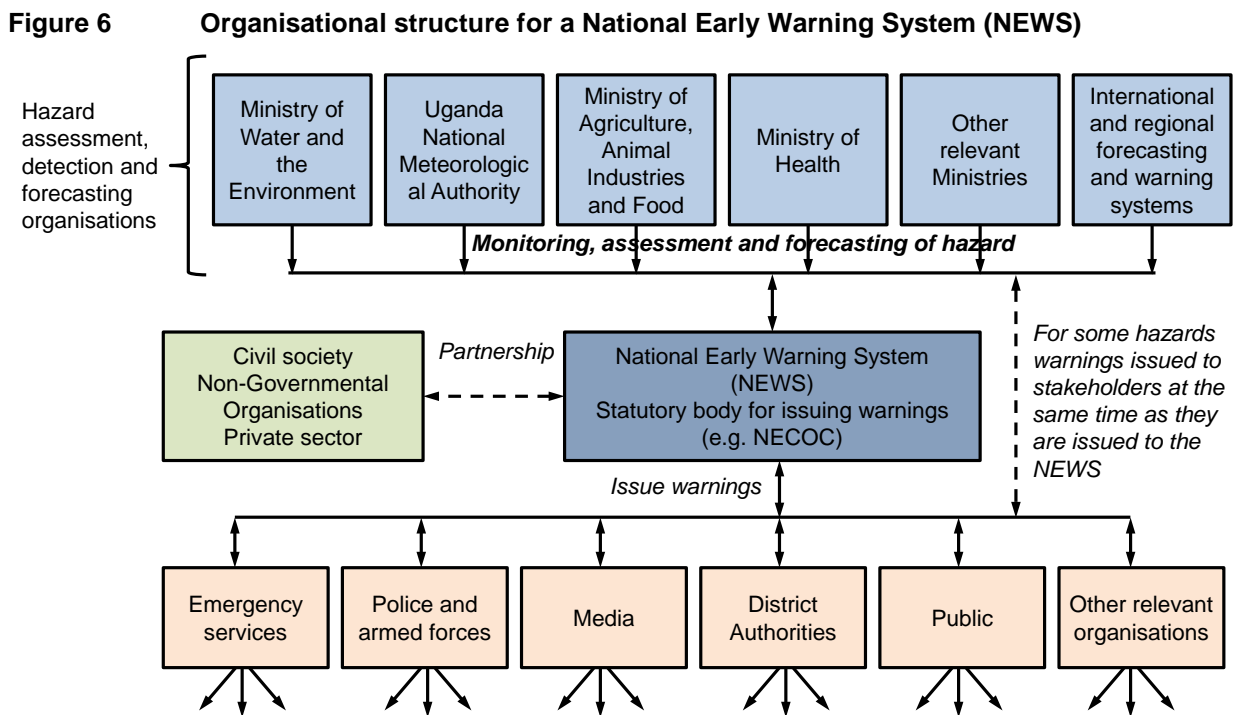
Figure 5 Ugandan stakeholders’ perceptions of the effectiveness of existing Early Warning Systems



(Source: Annex 1)

2.4 Elements of an effective National Early Warning System (NEWS)

Figure 6 shows the organisational structure for a National Early Warning System (NEWS) in the context of Uganda.



Any multi-hazard NEWS that provides early warnings which are directly supplied by the government has to include design elements and safeguards that will ensure acceptable levels of performance. To be effective a NEWS has to provide for the following:



- **Access to information** - An effective multi-hazard NEWS requires access to timely and accurate information on the various hazards. This should include forecasts of these hazards, as well as up to date situation analyses.
- **Relevant expertise** - A NEWS requires personnel with the relevant expertise to efficiently interpret the information on various hazards.
- **Suitable levels of technology and equipment.**
- **Adequate funding** - The government should provide sufficient budget for the NEWS to operate effectively.
- **Independence** – The NEWS should be insulated from day-to-day political interference and be resilient to regime change.
- **Organisational transparency and accountability.**
- **Performance accountability** - Warnings are often based on incomplete information and judgment. There needs to be a method via which the performance of the hazard monitoring, assessment, forecasting and effectiveness of the warnings can be assessed.
- **Autonomy of expertise within the relevant organisation** - Allowing technical expertise for the assessment, monitoring and forecasting of individual hazards to remain within the relevant ministry or organisation where the expertise for that hazard lies (e.g. in Uganda the expertise relating to livestock diseases resides within the Ministry for Agriculture, Animal Industries and Food).



SECTION 3

A review of existing Early Warning Systems (EWSs) in Uganda

3.1 Introduction

This section provides a review of the Early Warning Systems (EWSs) and tools relevant to EWSs that currently exist or are proposed in Uganda, together with an assessment of their sustainability. This report builds on a UNDP funded study on EWSs in Uganda carried out in 2014 for the OPM (see Atyang, 2014). This review provides simplified diagrams of the information flows for each EWS and makes a qualitative judgement on their technical and financial sustainability, based on available literature and stakeholder engagement, using a simple colour coded system as follows:

- Green Sustainable.
- Yellow Moderately sustainable.
- Red Unsustainable.

The EWSs have been grouped by hazard and assessed where possible using the four elements of a people-centred, effective EWS shown in Figure 3. This chapter also provides recommendations on the degree to which any, or all of the components of the EWS, could be incorporated into a NEWS.

3.2 Drought and food security-related Early Warning Systems (EWSs)

3.2.1 Drought Early Warning System (DEWS)

Background

The Karamoja Drought Early Warning System (DEWS) was established in 2008. The system is based on data collection and analysis, taken from a representative sample of 10 households per parish, (75 parishes in total are sampled), recording and communicating data on key indicators through a variety of means, including mobile phones. The system is largely implemented by district local government supported by the Non-Governmental Organisation (NGO) ACTED.

There are 31 indicators that are collected that fall into four main categories:

- Livestock.
- Crops.
- Water.
- Livelihoods.
- Health and nutrition.



Once the data is collated, it is analysed by District Heads of Department with oversight from line ministries and, each month, drought bulletins are produced for the seven districts of Karamoja. Monthly drought bulletins, providing four drought risk classifications, are issued to decision makers via email, dramas in role plays and radios are used to disseminate messages to communities.

In 2012 an exit strategy was developed aimed at a phased handover to the government, both in terms of the financing of DEWS, and also in terms of independent technical management of DEWS activities. ACTED has also advocated for DEWS to be fully funded and managed by the Government of Uganda by 2016/2017 (ACTED, 2012).

Figure 7 provides a simplified diagram of the information flows for DEWS. Figure 8 provides more details as to how information is collected and disseminated at a District level.

Figure 7 Overview of the information flow for Drought Early Warning System (DEWS)

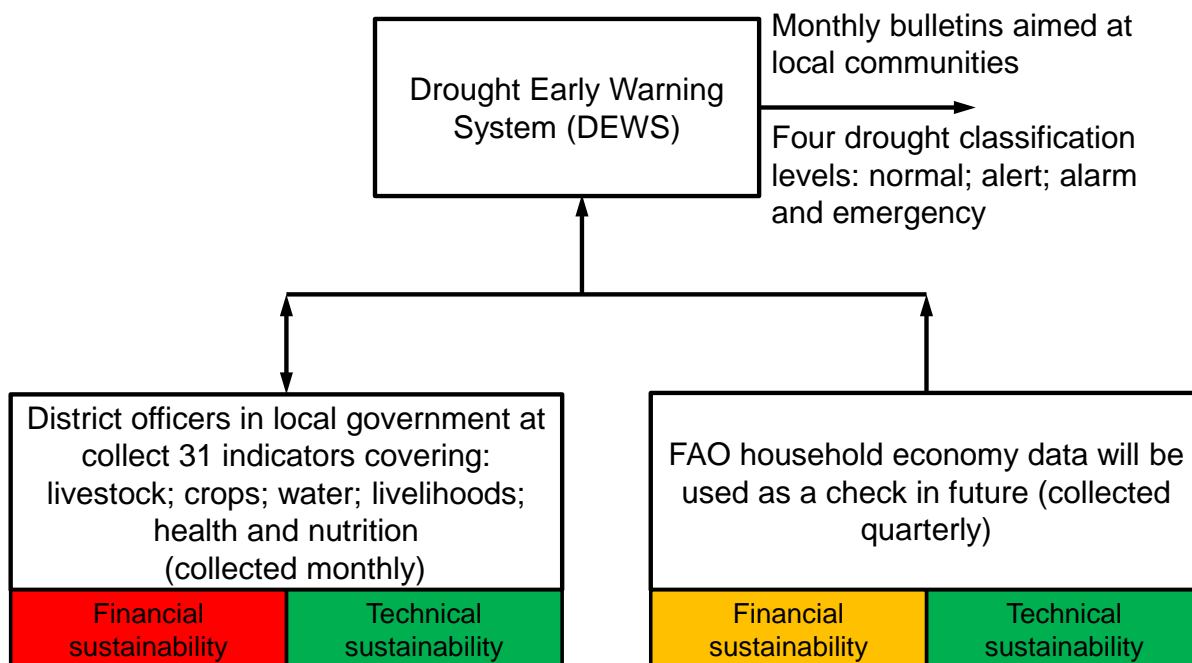
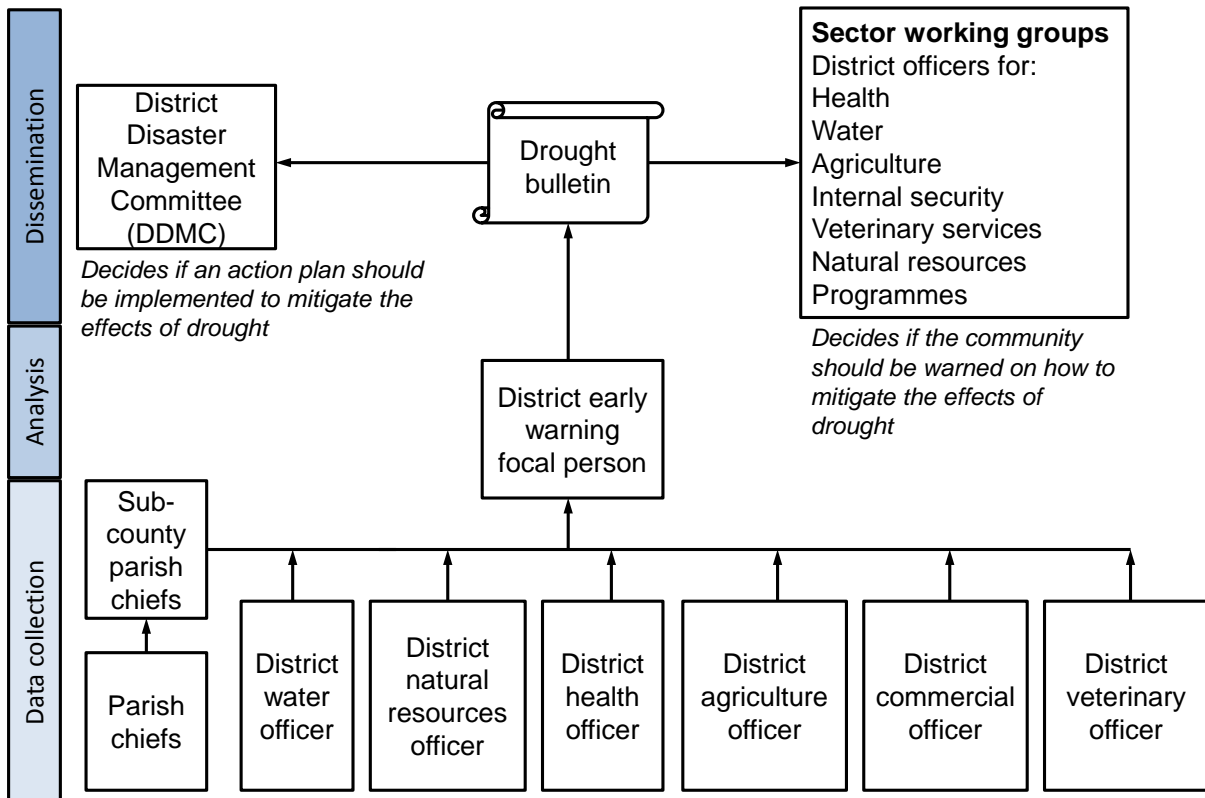


Figure 8 Data collection and warning dissemination for DEWS at a District level



(Source: Adapted from ACTED, 2010)

Risk knowledge

The data relating to drought on-set are systematically collected from 10 households at 10 to 13 selected sentinel sites per district on a monthly basis. The DEWS was named by seven of 41 respondents to the internet-based survey (see Annex 1) as being an example of a successful EWS in Uganda partly because of its strong community involvement and community-based dissemination. Drought risk maps have not been produced as part of DEWS; however, they are currently being produced for a hazard atlas of Uganda, funded by UNDP.

Monitoring, forecasting and warning

There are 31 indicators to monitor hazards and vulnerability. The monitoring data collected are largely reported to be reliable; however some incidences of contestation from technocrats have been reported (ACTED, 2012). DEWS uses the Open Data Kit (ODK), which uses smart phone technology to collect data.

It is important to note that the DEWS *does not* forecast the effects of future droughts using, for example, seasonal forecasts that are available for the region. It is essentially a situation analysis. However, it is important to note that the seasonal forecast produced by UMNA is part of the DEWS bulletin. Translated versions of these forecasts are shared via the radio and together with the bulletin updates they are used to inform the dramas that are presented to communities.

The accuracy and timeliness of the warnings would appear to be modest, with bulletins often disseminated late, according to some of the stakeholders.



Dissemination and communication

There was some criticism by some of the stakeholders that the warnings contained in bulletins do not reach those at risk and that they are overly technical and written in English. However, dramas enacted by schools and drama groups in each district are performed in the local language. A key component of the DEWS involves translating the recommendations outlined in the monthly bulletin into messages which can be clearly understood by the target communities. Radio messages issued by DEWS have the potential to reach a large number of people but are hampered by low radio ownership in Karamoja. The technical risk warnings would appear to be understood at a national and local government level but this is not necessarily translated to a parish and community level. Community dissemination occurs in each district on a monthly basis via community meetings, drama productions, and school disaster risk reduction clubs

Response capability

It is challenging to say whether DEWS truly invokes early action given that the drought risk is not predicted. It would appear that local capacities and knowledge are used in the analysis but not in the response. The communities are aware of the hazard. Some of the stakeholders engaged with as part of this work indicated that communities do respond to warnings. However, it is unclear exactly how well prepared communities are to respond appropriately.

Technical and financial sustainability

DEWS should be technically sustainable in that it has a track record of using District level and community-based actors to collect information. However, from a financial point of view it is currently heavily reliant on donor funding, without which it would not be able to function.

3.2.2 Famine Early Warning Systems Network (FEWS NET)


Background

The Famine Early Warning Systems Network (FEWS NET) was created by USAID in 1985 to help decision-makers plan for humanitarian crises and provides evidence-based analysis for 35 countries worldwide. There are two technical staff located in the FEWS NET office in Kampala. The regional office is in Nairobi, Kenya. The regional office has market, trade, regional livelihood and nutritional specialists who support the Kampala office.

FEWS NET monitors hazards that may have an impact on food security (e.g. droughts, floods, price shocks, livestock epidemics). This is integrated with information and data on markets 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 Difference Vegetation Index² (NDVI), price data, nutrition indices, monthly price data of staple foods, livestock and livelihood commodities such as firewood, charcoal and wage labour.

FEWS NET relies on a network of partners to access the data needed including market prices of staples in Karamoja from the World Food Programme (WFP) and Farmgain Africa

² Normalized Difference Vegetation Index (NDVI) is an indicator that can be used to analyse remote sensing data to assess whether the target being observed contains live green vegetation or not. Calculations of NDVI for a always result in a number that ranges from minus one (-1) to plus one (+1). However, no green leaves gives a value close to zero. A zero means no vegetation and close to +1 (0.8 - 0.9) indicates the highest possible density of green leaves.



Ltd³ for other major markets in Uganda. Seasonal rainfall forecasts are provided by the Uganda National Meteorological Authority (UNMA). These are available after the meetings of the Greater Horn of Africa Climate Outlook Forum (GHACOF). Sometimes there are updates on the rainfall forecast between the meetings of the GHACOF. Forecasts by the European Centre for Medium Range Weather Forecasts (ECMWF), National Oceanic and Atmospheric Administration (NOAA) and others are also used.

There is a general prediction regarding crop performance based on rainfall forecasts and also by asking what people have planted and how it has germinated. These are validated in the field.

FEWS NET is wholly funded by USAID based on a five-year funding cycle. Its reliance on donor funding could affect its long-term sustainability as any change in donor funding priorities would result in its downscaling or termination of the early warning activities.

FEWS NET uses the Integrated Food Security Phase Classification (IPC) scale to determine food insecurity. An example of a typical food security map produced by FEWS NET for Uganda is shown in Figure 9. Figure 10 provides a simplified diagram of the information flows for FEWS NET.

Risk knowledge

Information of food security is mapped (see Figure 9) on a regular basis and these maps are available from the FEWS NET web site. The maps would appear to be aimed at donors and national government level organisations. It is not clear whether the information is used by these organisations in Uganda to respond to the needs of vulnerable communities.

Dissemination and communication

A bulletin on food security and vulnerability in Uganda is issued quarterly. FEWS NET's target audience is policy makers. However, the results produced by FEWS NET do not appear to be widely used by the Ugandan Government. There have also been occasions, according to stakeholders, when FEWS NET has operated sporadically. FEWS NET has a commitment to deliver monthly reports to USAID and hence cannot always wait for the official approval of the Ugandan Government before issuing bulletins. This makes FEWS NET's report independent which could be advantageous in some respects.

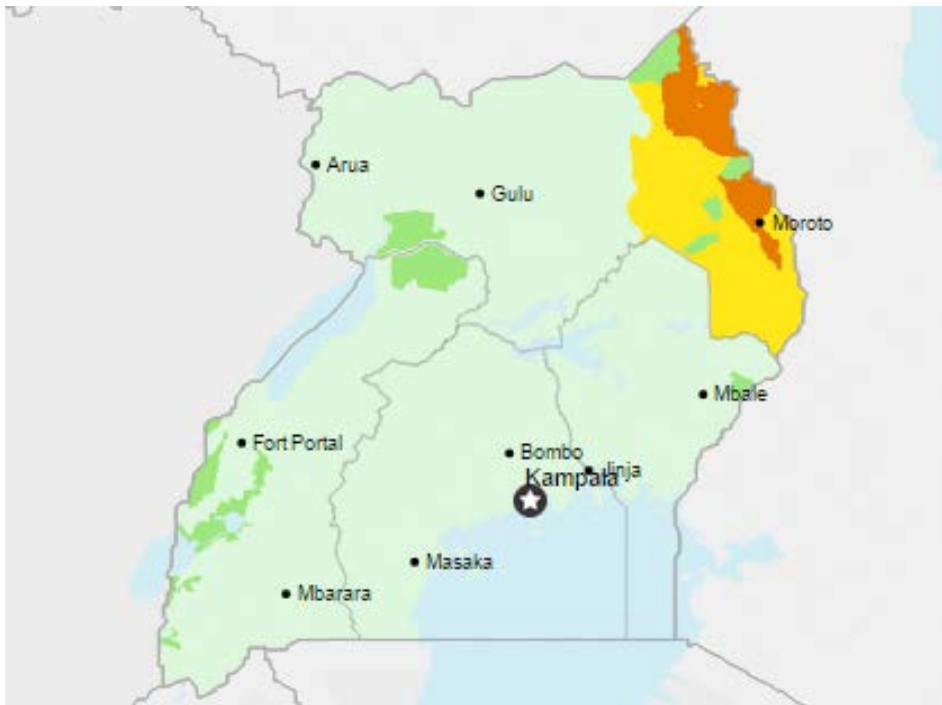
Monitoring, forecasting and warning

In terms of monitoring, FEWS NET relies primarily on third parties for data collection. It is one of the few EWSs in Uganda to make some use of forecasts to predict the future food security situation in Karamoja. However, it is not clear how these forecasts are used to implement low, or no regrets actions, in the sub-region before the food security situation reaches a crisis or emergency level.

³ Farmgain Africa Ltd is a private consultancy firm that specialises in agri-business, market information and agro enterprise development. It provides small and large scale farmers with commodity market information at retail and wholesale level on a weekly basis for major markets and daily for Kampala markets.



Figure 9 Example of a food security map for February 2016 produced by FEWS NET

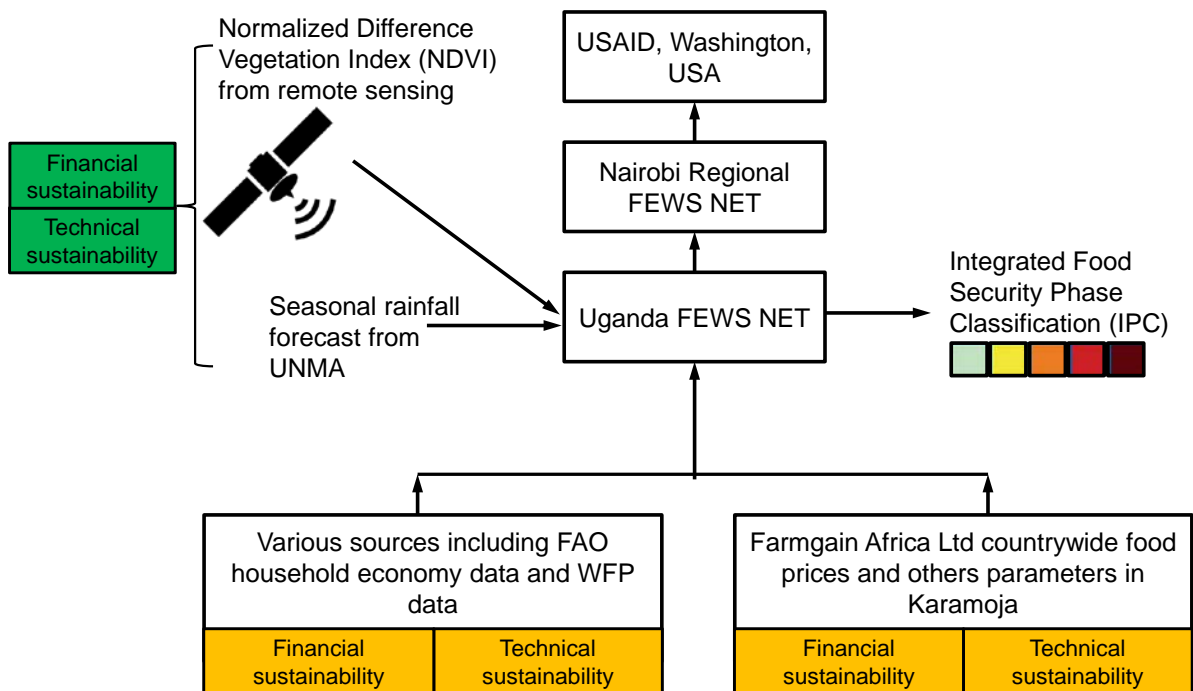


IPC 2.0 Acute food insecurity phase



(Source: <http://www.fews.net/east-africa/uganda>)

Figure 10 Overview of the information flow for the Famine Early Warning Systems Network (FEWS NET)





Response capability

Members of the FEWS NET team participate in a number of relevant disaster risk reduction and response platforms and meetings. Despite the fact that FEWS NET provides forecasts of the food security situation in Uganda it is not clear from the evidence available how successful it has been in engendering early action (see IFRC, 2014).

Technical and financial sustainability

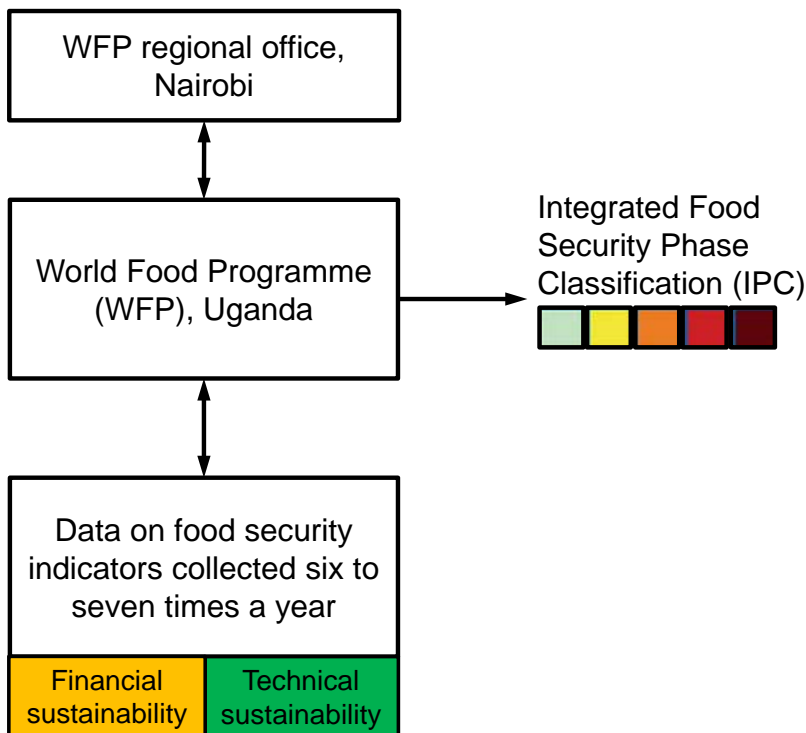
The remote sensing data upon which FEWS NET relies is freely available. However, the data collected on household economy and commodities are reliant on donor funding and the private sector. FEWS NET has been operational for some 30 years. However, without USAID funding it would not function.

3.2.3 World Food Programme (WFP) Vulnerability Analysis and Monitoring (VAM)

Background

The World Food Programme (WFP) regularly collects and analyses various food security, market and nutrition data either as standalone WFP activities or in partnership with other agencies. Twice a year, WFP partners with UNICEF for the food security and nutrition assessment in Karamoja which collects data on several indicators in the region. On a monthly basis, WFP collects food price data on various commodities in major markets across the country (e.g. maize, sorghum, beans and goats) as well as wage rates. Data are freely available from 2012 onwards, on request. The WFP VAM operates independently of other EWSs in Uganda but frequently makes use of information produced by other systems especially FEWS NET. It is important to note that information from other relevant EWSs in Uganda such as DEWS and livestock evaluation tools are not readily available. WFP issues a monthly price bulletin showing analysis of price trends. The bulletins are distributed by email and are also downloadable from the WFP's Vulnerability Analysis and Monitoring (VAM) website. The bulletins are aimed at policy makers at central and district local governments, food security and agricultural livelihoods cluster members and donors. Figure 11 shows an overview of the information flow for WFP's VAM. In addition to the IPC, data generated by WFP is used by various UN agencies and other development partners, local governments and OPM in planning development assistance particularly in the Karamoja region

Figure 11 World Food Programme’s Vulnerability Analysis and Monitoring (VAM)



Risk knowledge

WFP carries out food security and nutrition assessments in Karamoja. The outputs from these include food security situation summaries, maps of Karamoja showing: household food consumption; and the prevalence of malnutrition in Karamoja (e.g. Global Acute Malnutrition (GAM), percentage of people underweight, stunting), as well as programmatic recommendations that are endorsed at local government level..

Monitoring, forecasting and warning

It should be noted that the WFP’s VAM is not strictly an EWS. However, information generated has been used for these purposes given its household level focus and has in the past been effectively used in response planning.

Quantitative data are collected using a standardised questionnaire uploaded on mobile tablets using the Open Data Kit (ODK) (WFP, 2015). Data on food security and other relevant indicators are collected six to seven times a year from sampled households throughout Karamoja (WFP, 2015).

An analysis of trends is carried out showing changes in various key parameters since 2010. However, no use of seasonal climate forecasts appear to be used to predict the potential situation with respect to food security in Karamoja is carried out. The information produced by the WFP would appear to be aimed at policy makers and donor agencies and not directly at the communities themselves. Many of the outputs from the WFP’s analyses are downloadable from the internet (see http://vam.wfp.org/CountryPage_indicators.aspx?iso3=UGA).



Dissemination and communication

The information is disseminated via a variety of forums at which various government and donor agencies meet regularly. Many of the assessments are available for the WFP's internet site and the food price indicators are available to download from the WFP's web site.

Response capability

Various recommendations are made as to how to respond, such as:

- The piloting of post-harvest storage related interventions.
- Expanding or implementing food for work and/or food for assets interventions.
- Scaling up Water, Sanitation and Hygiene (WASH) projects to ensure adequate and safe water and sanitation coverage.

Technical and financial sustainability

The WFP's VAM uses staff at a district levels. From a technical point of view the method utilised to collect the data are technically sustainable. However, without support from WFP these data would not have been collected. It is noteworthy that some of the indicators collected form part of WFP's corporate results based management framework and are reported on annually for WFP's beneficiary sub-groups. It implements a food/cash-for-assets programme in Karamoja to increase resilience-building of vulnerable communities to disasters. It also supports moderately food-insecure households by providing them with conditional food assistance during the lean season, and by enabling them to create assets for land reclamation, soil and water conservation, and water for agricultural production (WFP, 2016).

WFP is also providing technical assistance and policy advice to support the OPM to decentralise disaster risk preparedness and response. Under the Karamoja resilience framework, WFP supports local governments in updating and implementing their emergency response plans. The Karamoja model will be the basis for adoption and training in other regions of Uganda from 2016 onwards (WFP, 2016).

3.2.4 Disaster Risk Financing (DRF)

Background

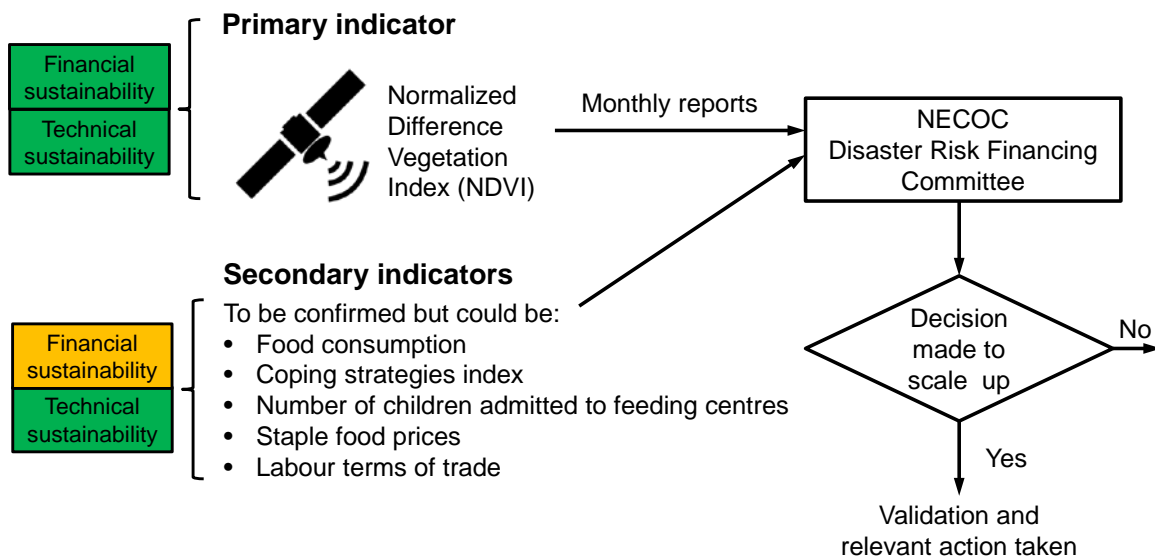
The World Bank is providing a loan to Uganda as part of the Third Northern Uganda Social Action Fund Project (NUSAF III). As part of this loan the World Bank is currently in the process of assisting NECOC to implement a Disaster Risk Financing (DRF) sub-component in Karamoja which will comprise the following:

- Collecting, analysing and storing risk-related information for Karamoja.
- Enabling the Ugandan Government to develop a rapid, transparent and objective process for triggering a scale up of Labour Intensive Public Works (LIPW) under the NUSAF III project, in the event of a disaster, initially focusing on Karamoja.

Currently being decided is the severity of the drought that will lead to a scale up of NUSAF III, i.e. which thresholds will be used for the primary and secondary indicators before a food for public works programme is put in place to assist the affected population.

A simplified diagram of the proposed information flow for the World Bank funded DRF is shown in Figure 12.

Figure 12 Proposed World Bank funded Disaster Risk Financing



It has been decided that the primary indicator for whether DRF should be triggered within Karamoja will be based on NDVI, which is freely available from various remote sensing sources. Five secondary indicators will also be used in conjunction with NDVI. These have still to be decided but they could include indicators that are regularly collected by DEWS, FEWS NET and WFP (e.g. food consumption related indices, coping strategies, the number of children admitted to feeding centres, staple food prices, terms of trade⁴).

It should be noted that the use of a NDVI as a primary indicator has its limitations. Firstly, in many rural areas crops are not a pure stand⁵. There is a need to be verified via sentinel sites. For example, the crop could look green giving a high NDVI; however, the rains may have failed at a crucial point in the growth cycle and the crop could be stunted.

Risk knowledge

Once the DRF is implemented and has been running for a few months it will allow a database of NDVI together with the other five secondary indicators to be built up, which will reside within NECOC. In the future this should provide a useful source of information for NECOC to assess the food security risks and the impacts of droughts in Karamoja.


Monitoring, forecasting and warning

The DRF will use remote sensing data (i.e. NDVI) coupled with various indicators relevant to food nutrition at a household level in Karamoja. The DRF is scaled up if the primary and secondary indicators are exceeded. Once these are exceeded a programme of public works, providing food or cash for work will be put in place in the affected district. This would be implemented by the Ministry of Works and Transport. The thresholds for the primary and secondary indicators are currently being established and will be dependent on an historical data analysis.

The DRF does not currently incorporate any aspects of forecasting. Forecasting future droughts using a variety of freely available products from organisations such as NOAA and

⁴ This is an important measure that provides information on the purchasing power of households. Terms of trade are defined as the ratio of two prices. Examples are the ratio of the price of livestock to the price of a food staple, the ratio of the cash crop price to the price of a food staple, or the ratio of daily wage for unskilled labour to the price of a food staple.

⁵ A plant population comprising exclusively or largely of members of one species, variety, or type.



the Met Office would provide a longer lead time⁶ in which to implement public works programmes in areas that are predicted to be potentially affected by droughts.

Dissemination and communication

It is not clear currently how the information produced by the DRF will be disseminated and communicated. A DRF sub-committee has been formed which has held two meetings since December 2015. It comprises the following organisations: OPM, FAO, WFP, FEWS NET, Ministry of Health, Ministry of Water and the Environment, ACTED, UNDP, UNMA, Makerere University, Ministry of Agriculture, Agricultural Industries and Food and the Ugandan Bureau of Statistics.

Response capability

It is understood that the response will be coordinated by the DRF sub-committee. This will present recommendation reports to the Permanent Secretary of OPM. Once the decision to scale up is made, a communication strategy will be enacted to inform key stakeholders and a government-led response will be initiated.

Technical and financial sustainability

The method proposed for the DRF should be technically sustainable. The financial sustainability of the collection of the secondary indicators is dependent primarily on which organisation is responsible for collecting them and how they are funded (e.g. via the Ugandan Government or donors).

3.2.5 Potential contributions of existing drought EWSs to the proposed NEWS

The DRF system will be owned and operated by NECOC and hence it should be straight forward to integrate this into the proposed NEWS. There should be thought given as to how a forecasting aspect can be incorporated into the DRF using freely available products from organisations such as NOAA and ECMWF.

With respect to DEWS, an exit strategy has been developed by ACTED to handover DEWS to the Ugandan Government. Data collected as part of the DEWS could be used by the proposed DRF system. Similar to the DRF, the inclusion of seasonal and other shorter term weather forecasts into the DEWS needs to be explored. ACTED has provided capacity building to the Ministry of Agriculture, Animal Industries and Food (MAAIF) in the utilisation of DEWS in Uganda (ACTED, 2016). MAAIF is the ministry that houses the expertise on droughts and food security so there is an argument to be made for DEWS residing in this ministry and providing results to the NECOC for use in the NEWS. However, given that the DRF system will reside within NECOC and the data collected for DEWS is complementary to this system it may be more efficient, in the long-term, for DEWS to be operated by NECOC.

FEWS NET and the WFP VAM are likely to continue to function for the foreseeable future. Coordination between NECOC and these two systems needs to be improved so that the results can be fed into the NEWS in a timely manner. One way in which this could be done would be to have a mechanism by which data collected by WFP's VAM and FEWS NET could be shared with NECOC more readily and rapidly.

⁶ The time between the receipt of the warning and the onset of the hazard.



3.3 Flood Early Warning Systems (EWSs)

3.3.1. Introduction

There is no national flood forecasting and warning system for Uganda, neither is there a flood forecasting and warning system specifically for the majority of areas at risk of flooding in Uganda. There have been some initiatives related to flood warning. The two main flood EWSs that have been used operationally are:

- Butaleja District EWS.
- Pilot forecast-based financing scheme for floods in north-east Uganda.

The Strengthening Climate Information and Early Warning Systems (SCIEWS) project currently being implemented by the UNDP in Uganda should also provide information that could assist with early warnings.

3.3.2. Butaleja District flood Early Warning System (EWS)

Background

The Butaleja District flood EWS is located on the River Manafwa in Himuntu sub-county in the Butaleja District. The system was a joint venture between the Ugandan Government and ITU, which is the UN's agency for ICT. The project was implemented in 2014 by Butaleja District and the OPM, Ministry of ICT and the Ministry of Water and the Environment. The aim of the system is to provide communities with sufficient time to move to areas outside the floodplain when high water levels are detected upstream.

There are two sets of sensors located at Namulo and Masulula Bridges on the River Manafwa. Once the water levels reach a certain point on the sensors, a signal is sent to the control command centre to activate a siren. The siren issues a message in English and Lunyole to warn communities about a possible flood and whether they need to evacuate to higher ground. The siren can be heard within a radius of 5 km. Figure 13 illustrates how the system works.

The management of the system has been handed over to the OPM and ownership of the EWS now lies with Butaleja District Local Government.

Risk knowledge

The EWS will contribute to the flood risk knowledge of local populations. However, the system operates over a relatively limited area.

Monitoring, forecasting and warning

The EWS monitors flood levels but does not provide forecasts of flood levels. Warnings are based on upstream water levels and are disseminated to a relatively small area.

Dissemination and communication

The warnings messages are disseminated in English and Lunyole but only reach a relatively small percentage of the total number of people at risk from floods in Uganda.

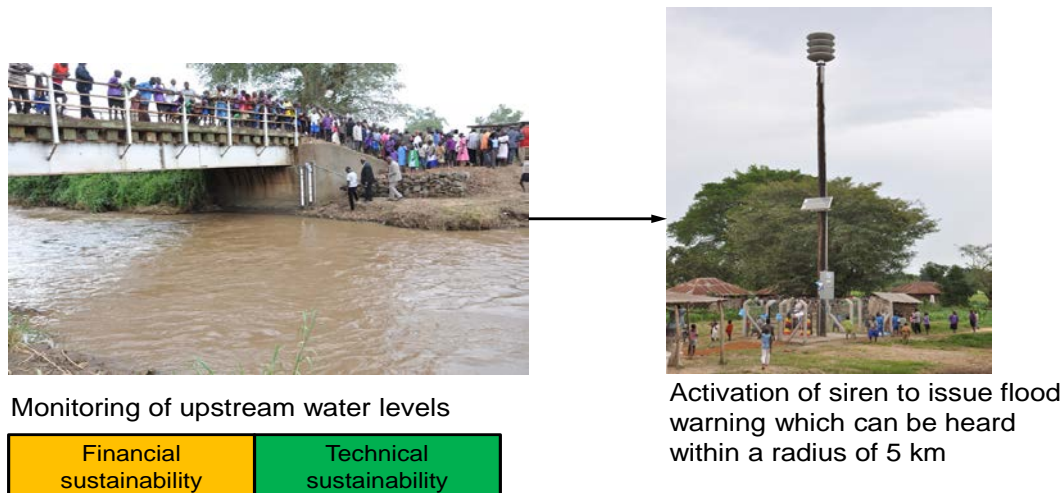
Response capability

The system is reliant on the at-risk communities knowing how to respond to warnings. It is unclear whether, to date, the Butaleja flood EWS has issued any warnings, or whether any exercises or capacity building has been carried out for communities in how to respond.

Technical and financial sustainability

The EWS is relatively simple and would appear to be technically sustainable. However, it is unclear if budgetary provisions have been made at a district level to cover any maintenance issues that may arise.

Figure 13 Butaleja district flood Early Warning system



3.3.3 Pilot forecast-based financing scheme for floods in North-East Uganda

Background

The IFRC Climate Centre, the German Red Cross and the Ugandan Red Cross Society have been piloting a forecast-based financing scheme for floods in north-east Uganda focusing on 16 villages in the Districts of Abim, Katakwi, Kotido and Soroti (Jongman, 2016). The work utilised the Global Flood Awareness System (GLOFAS) which uses probabilistic forecasts of relevant variables (e.g. rainfall, temperature) from the European Centre for Medium Range Weather Forecasting (ECMWF) together with a simple hydrological and hydraulic model to produce probabilistic forecasts up to 40 days in advance.

GLOFAS is set up to produce warnings based on the probability of exceeding certain probabilities of flow (i.e. return periods of 1 in 2, 1 in 5 and 1 in 20 years) (Jongman, 2016). To validate the model the German Red Cross has entered into a partnership with the SMS-based communication platform Ureport (see <http://ureport.ug/>), launched in 2010 and developed and managed by UNICEF. Text messages are used to help to validate the GLOFAS model.

In October 2015, humanitarian action was based on a forecast from GLOFAS in the Teso area, where almost 5,000 non-food items were procured under the forecast-based financing initiative with the support of the German government through the German Red Cross (Stephens et al., 2015). Figure 14 shows how the EWS works.

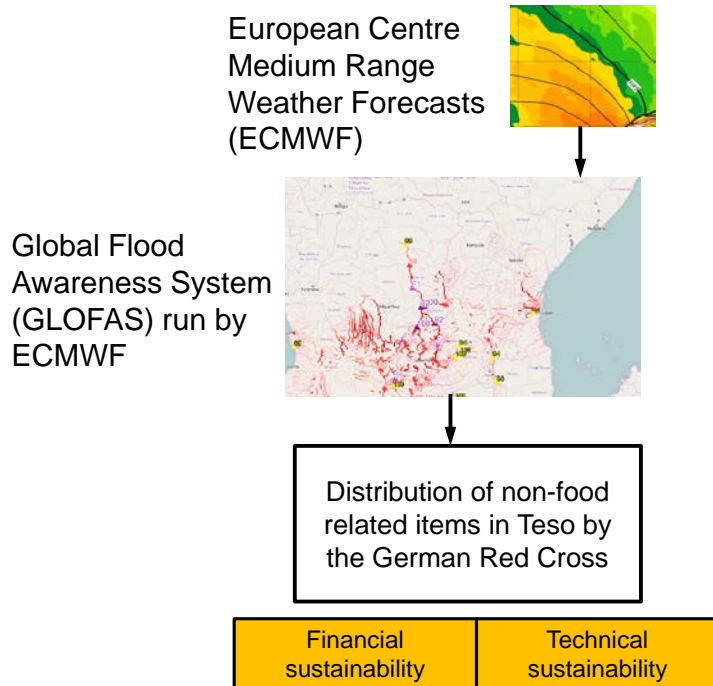
Risk knowledge

The use of the GLOFAS will contribute to the flood risk knowledge of actors such as the IFRC and potentially some Ugandan Government Ministries.

Monitoring, forecasting and warning

GLOFAS forecasts floods up to 40 days in advance. However, it requires verification from SMS messages in order to improve its accuracy. It could provide a useful tool to implement low regrets actions in flood-risk areas. This is one of the few EWSs used in Uganda that utilises a forecast of the hazard.

Figure 14 Piloting of a forecast-based financing scheme for floods in north-east Uganda



Dissemination and communication

The warnings do not appear to have been widely disseminated.

Response capability


The response was initiated by the German Red Cross and has been reported to have been successful.

Technical and financial sustainability

GLOFAS is run by the ECMWF. The GLOFAS web site is freely accessible; however, from a technical sustainability point of view, its accuracy is low. It would also require the Ministry of Water and Environment to set aside sufficient budget to allow its members of staff to assist the ECMWF with improving its forecasting accuracy for large rivers in Uganda.

Case study 1 The successful response to the 2015 Ugandan floods

The forecasting of the floods that occurred in northern Uganda in October and November 2015 has been hailed as a success in many reports (see JRC, 2015; Stephens et al., 2015 and Jongman, 2016). However, the Greater Horn of Africa Climate Outlook Forum (GHACOF) had predicted heavy rains for the months of October and November 2015 three months in advance, in June 2015 with a 95% probability. The high probability of this forecast led to a cabinet paper and meetings of the national platform for disaster preparedness and management, which brings together all the relevant actors involved in



disaster risk reduction. As a result of the forecast the national El Nino contingency plan was prepared which includes:

- Early warning via media and other means e.g. religious institutions, farmers associations.
- Food.
- Rescue.
- Recovery.
- Non-food aid.

There are 112 Districts in Uganda, of which 16 Districts were most affected by the 2015 floods. Stakeholders have stated that the reason that they were able to get the Ugandan Government and other key organisations to act in advance of the floods was because of the high probability given to the heavy rains and flooding by the GHACOF in June 2015. Stakeholders said that for “low” probability events (i.e. those with less than a 60% chance of occurrence) it is difficult to get the government to act in advance.

3.3.4 Strengthening Climate Information and Early Warning Systems (SCIEWS) project

The SCIEWS is a four year project with a US\$4 million budget from the Global Environmental Fund (GEF) that commenced in 2014 and is being implemented by the Ministry of Water and the Environment (MoWE) and UNDP.

The SCIEWS project has procured 25 automatic weather stations that are currently being installed throughout Uganda. Five of these stations will be installed on mobile phone telecommunications masts and will also be able to detect and nowcast⁷ lightning with a 30 minute lead time. An automatic message switching system (AMSS) has also been procured and this will be based at the UNMA office in Entebbe. The AMSS will also receive data from 12 existing synoptic weather stations.

Some 40 solar-power automatic water level monitoring stations are being installed on rivers in Uganda. It is expected that installation will be complete by the middle of 2016.

It is possible that in the future weather and flood alerts will be produced collectively by UNMA and the Ministry of Agriculture, Directorate of Water Resources and issued to NECOC. These alerts may be colour coded. For floods these could be as follows:

- Red – Flooding will occur - take action.
- Orange – Be prepared.
- Green – OK.

Figure 15 shows the possible flow of information from water level monitoring stations to NECOC.

⁷ A short-term forecast, usually for the next few minutes or hours.

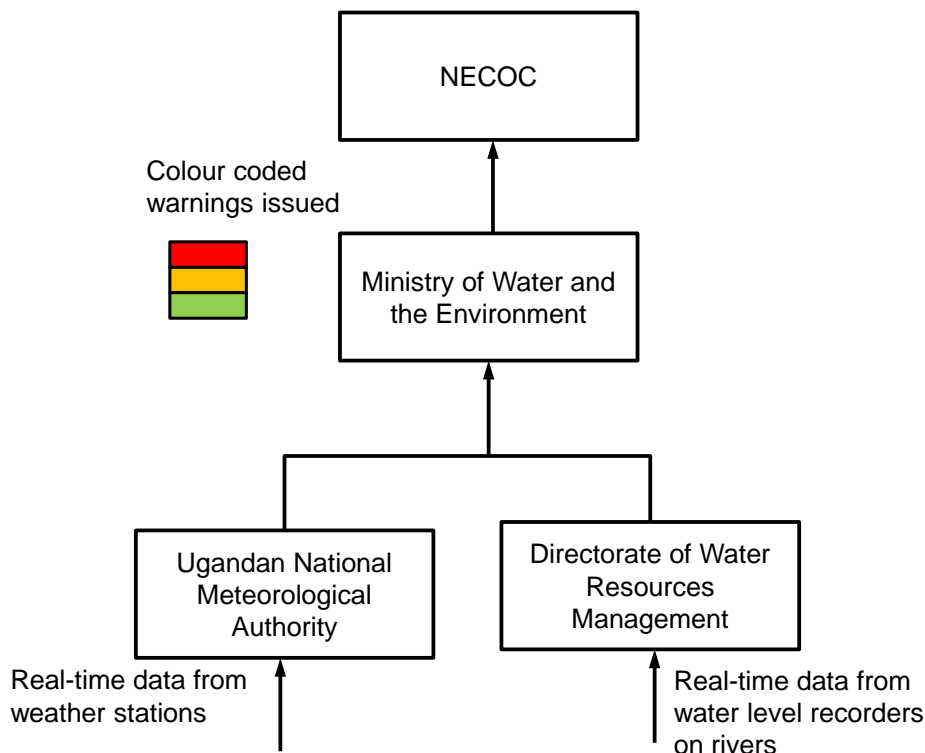
3.3.5 Potential contributions of existing flood EWSs to the proposed NEWS

There is currently no flood EWS covering the areas at risk of flooding in Uganda. There have been some limited studies (see Goretti, 2013 and Wagemaker and Wasswa, 2016) aimed at carrying out some limited mapping and identifying the areas at flood risk. The GLOFAS model has the potential to provide forecasts for large rivers in Uganda. However, to facilitate this there would need to be a budget and mechanism to allow the MoWE to collaborate with the ECMWF.

The automatic water level monitoring stations being implemented as part of the SCIEWS project could also provide warnings for large rivers and provide information that in the long-term could potentially be used to improve the accuracy of the GLOFAS model.

Any flood EWS should reside with the MoWE with warnings being fed through to NECOC, ideally in real-time, as shown in Figure 15.


Figure 15 Possible way in which the Strengthening Climate Information and Early Warning Systems (SCIEWS) project could be used to issue colour coded warnings for flooding and weather



3.4 Weather forecasts and warnings for farmers

3.4.1 Background

Four out of five people in Uganda depend on agriculture for income and food security; hence any threat to agricultural production degrades Uganda’s socio-economic status and puts 80% of the population at risk of poverty and hunger (ACCRA, 2014). In many low-income



countries effectively disseminating weather forecasts and warnings to farmers is challenging and Meteorological Authorities often generate warnings solely in English using technical language. This section details two weather forecasting and warning systems aimed at farmers in Uganda.

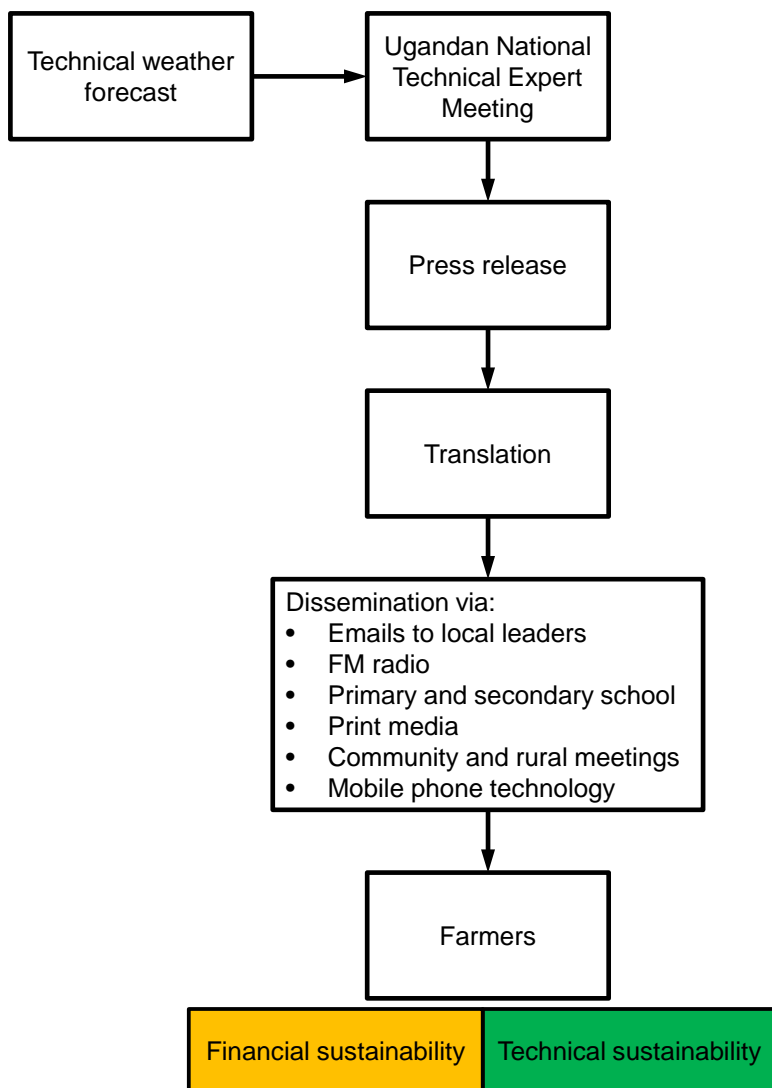
3.4.2 Africa Climate Change Resilience Alliance (ACCRA) weather forecast and warning system

Background

Historically, in Uganda, it has been difficult for farmers to receive weather forecasts and warnings. This was partly because they were only disseminated via email from UNMA to other Government ministries, departments and Local Governments, which often led to untimely delivery (ACCRA, 2014). The messages were often not tailored for farmers and as a consequence many farmers have lost faith in scientific forecasts and have relied on their indigenous knowledge for decision making relating to agriculture (ACCRA, 2014).

Under the ACCRA system, at the beginning of each season, a half day meeting is held with key actors and simplified weather forecasts are produced for each district in Uganda (ACCRA, 2014). The seasonal forecast from GHACOF is translated into local languages. The translations are produced on pre-recorded audio CDs which are then sent to local FM radio stations and posted on the UNMA website as audio broadcasts (Atyang, 2015). The seasonal forecasts are currently available in 22 out of 54 languages spoken in Uganda (Atyang, 2015). Additionally, the forecasts are accessible by FM radio stations, newspapers and local leaders. There have been some limited feedback surveys with farmers to improve the dissemination of the warnings. The system is shown in Figure 16.

Figure 16 ACCRA weather forecast and warning system



In a survey of 41 stakeholders, when asked to identify an example of a successful EWS, 10 respondents stated weather forecasts and warning. The reasons given for their success were because they are disseminated via a range of different media, allow abnormal rainfall patterns to be predicted, cover the entire country and have long lead times (see Annex 1) meaning that there is sufficient time to react to a disaster.

In a review of climate forecasting for agriculture in sub-Saharan Africa, Hansen et al. state that “*seasonal forecasts improve accuracy particularly early in the growing season, but for the most part have not been systematically incorporated into operational food security early warning systems*” (Hansen et al., 2011). MAAIF publicises the seasonal forecasts in national newspapers and other routes. It is not clear how effective these forecasts are in improving the food security situation in Uganda.

Risk knowledge

The EWS will contribute to reducing the agriculture risk for rural farmers, policy makers and other actors in Uganda.



Monitoring, forecasting and warning

The system is one of the few in Uganda that utilises forecasts and generates warnings aimed at a specific user group.

Dissemination and communication

This is one of the few warning systems which disseminates messages in a wide range of languages using different media throughout Uganda.

Response capability

There is some limited evidence that the system has been successful in allowing farmers to react to the weather forecasts and improve their yields.

Technical and financial sustainability

The system is based on regional forecasts from the GHACOF and should be technically sustainable. However, it is unclear if budgetary provisions have been made within the relevant government department with regards to funding.

3.4.3 Mobile 3-2-1 service

Background

Human Network International (HNI) is a global development organization dedicated to bringing the benefits of technology to individuals and organizations working in low income countries. It is currently working with Airtel, a telecommunications company, on a free SMS-based information and warning system. The system will be set up in the districts bordering Lake Victoria and the cattle corridor in Uganda.

The system will be owned and operated by Airtel. The mobile 3-2-1 service provides users with information on issues such as micro-financing, health and water; however, in the future it will also provide weather warnings. To use the service a person has to be an Airtel subscriber. This allows them to have ten free SMSs a month. Such a system has been successfully implemented by HNI in Malawi and Madagascar. In Malawi, the system started in October 2015 and has already had 150,000 people opt into it. An example of the proposed system is shown in Figure 17.

Risk knowledge

The system has the potential to raise awareness of the risks posed by weather including the risks to agriculture.

Monitoring, forecasting and warning

The system will use forecasts and data collected by UNMA.

Dissemination and communication

Although users need to be a subscriber to Airtel, there are currently 7.5 million subscribers to this network in Uganda (Bambino, 2015), which gives significant coverage in terms of households that could potentially be reached.

Response capability

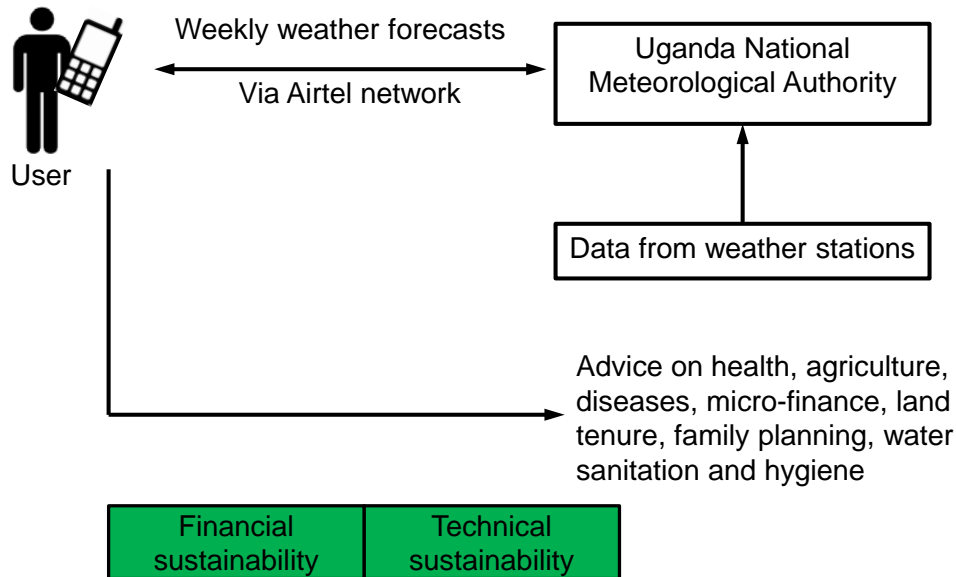
The system is not operational in Uganda and hence it is not possible to comment on its response capacity. The system uses standard mobile phones (i.e. not smart phones). In 2014 it was estimated by the Uganda Communications Commission that 52% of Ugandans

had access to mobile phones. Hence if weather forecasts are disseminated via this the 3-2-1 system they have the potential to reach a large number of people.

Technical and financial sustainability

The system is one of the few primarily reliant on a private sector organisation. However, pilots in Uganda and Madagascar have shown that it has the potential to be both financially and technically sustainable.

Figure 17 Proposed Airtel 3-2-1 warning system



3.4.4 Potential contributions of existing weather forecasting and EWSs for farmers to the proposed NEWS

The ACCRA warning system is run by UNMA. The information that could be disseminated by ACCRA could also be disseminated simultaneously by the NEWS. The mobile 3-2-1 service is in the process of being developed. HNI has stated that it would welcome NECOC’s involvement at various workshops that are being held to develop the system. Potentially, the mobile 3-2-1 service could be used in the future to inform the NEWS.

3.5 Diseases


There are a number of systems in Uganda that are either being piloted or are operational and can provide early warnings for human and livestock diseases. These are briefly outlined in the sections below.

3.5.1 Human diseases

The Public Health Emergency Operation Centre (PHEOC) in the Ministry of Public Health is a specialised agency with the responsibility for coordinating human disease surveillance. The main tool used to provide early warnings for human diseases is mTrac.

mTrac

mTrac was designed to collect aggregate health data and community feedback, and to monitor healthcare delivery bottlenecks. However, the Ministry of Health is now using the platform to monitor and warn of disease outbreaks and to provide a mechanism for community members to report on outbreaks. mTrac uses mobile phones and rapid SMSs



from health workers at all health facilities in Uganda working at all levels within the districts. It stimulates action with a follow up and through the mobilisation of resources. There is a health dashboard at national level. For urgent health messages there are pre-defined distribution lists that provide alerts to districts and ministries.

Case study 2 The use of mTrac for managing outbreaks of diseases

mTrac provides the ability to communicate directly with health workers. This made a significant impact in the response to the July 2012 Ebola outbreak in Kibaale District and the November 2012 Marburg outbreak centred around Kabale. In the past, it was challenging to contact frontline health workers and provide them with critical, real-time information during emergencies. The Ministry of Health national response team was able to quickly prepare a series of SMS messages alerting health workers to the outbreak, the case definition (symptoms), isolation procedures, the location of the nearest isolation facilities and the hotline to the national response team for reporting suspected cases.

(Source: Ministry of Health, 2012a)

Case study 3 Does mTRac provide an example of a sustainable EWS operating in Uganda?

mTrac is an example of a sustainable EWS owing to the strong ownership of the initiative, its affordability and the institutional arrangements. There are three primary reason for this as follows:

1. The mTrac technological platform was developed as a response to a core need of the Ministry of Health and not a donor-driven or externally-imposed initiative. While the system was recognized as a strategy to improve the performance of the Ministry of Health to respond to diverse health needs, especially in remote areas, it was both identified and developed by the government and will be 100% operated by the government at the end of the initial phase.
2. The initial large investments were borne during the first phase of the project. Although donor support was pivotal to getting mTrac launched, once it was fully operationalized the ongoing recurring costs to maintain the electronic system were far cheaper than those under the previous, paper-based reporting system. The cost savings made are expected to be safeguarded within the Health Services Section of the Ministry of Health (where mTrac is situated) and channelled toward priority responses that are detected by the system.
3. mTrac serves as an effective sub-national service delivery tool for one of the Ugandan Government's priority sectors, health. mTrac links community health centres and public health facilities to their respective district-level health offices and ultimately the Ministry of Health. This allows mTrac to feed real-time surveillance and supply information directly to the Ministry of Health to inform national policy-making and budget processes and it also enables headquarters to respond to remote, localized issues that may arise thus strengthening the presence of the state (and its accountability) to areas that were previously disconnected.

(Source: UNICEF, 2012)



Risk knowledge

The system has allowed a good picture of health risks in Uganda to be built up since its inception.

Monitoring, forecasting and warning

The system does not forecast potential disease outbreaks but does provide effective monitoring

Dissemination and communication

Weekly bulletins on health issues are disseminated to key actors (e.g. NGOs, United Nation agencies) and information is made available to the public via various media including the radio.

Response capability

The system would appear to be effective in responding to outbreaks of major diseases (see Case study 2).

Technical and financial sustainability

The mTrac system appears to be technically sustainable. It is understood that mTrac is currently funded by UNICEF. It is not clear if there is a budget provided to the Ministry of Health from the central government for mTRac.

3.5.2 Livestock and agriculture

There are a number of tools in Uganda that are used or are being piloted for the surveillance of livestock diseases. These are briefly described below. Owing to the fact that these tools are not strictly EWSs the four sub-headings used to analyse other EWSs have not been used in this section.

Pictorial Evaluation Tool (PET)

This is an objective, ground-based system to provide an objective means of rapidly assessing crop yields and livestock condition by comparing observations in the field with photo-indicators of actual crops and livestock. The Pictorial Evaluation Tool (PET) is in a pilot phase. Training is currently being carried out for the District Administrative Officers (DAOs). There is also a PET-Crops manual for Karamoja which contains photo-indicators to assist assessors in estimating crop yield at harvest time specifically in that sub-region. Figure 18 provides a simplified indication of the information flow for the PET. It is not clear how financially or technically sustainable the PET is. It could be used in conjunction with other existing systems to assist with improving food security in Karamoja. The Pictorial Evaluation Tool (PET) needs to be scaled up. Staff from the Ministry of Agriculture, Animal Industries and Fisheries have been trained in its use by the FAO.

EMPRES-i event mobile application

EMPRES-i is a mobile application that helps with the reporting of outbreaks of animal disease. The application allows field workers to use smart phones to communicate disease outbreaks to the Ugandan National Animal Disease Diagnostics and Epidemiology Centre. Figure 19 shows the flow of information. EMRES-i was funded by the Irish Government and the FAO. In 2013, a pilot project was undertaken in 10 districts in Uganda. However, although it was found to be useful, it is not clear if EMPRES-i continues to be used and how sustainable it is from a financial and technical point of view. Figure 19 provides an overview of the information flows for the EMPRES-i event mobile application.

Figure 18 Pictorial Evaluation Tool (PET)

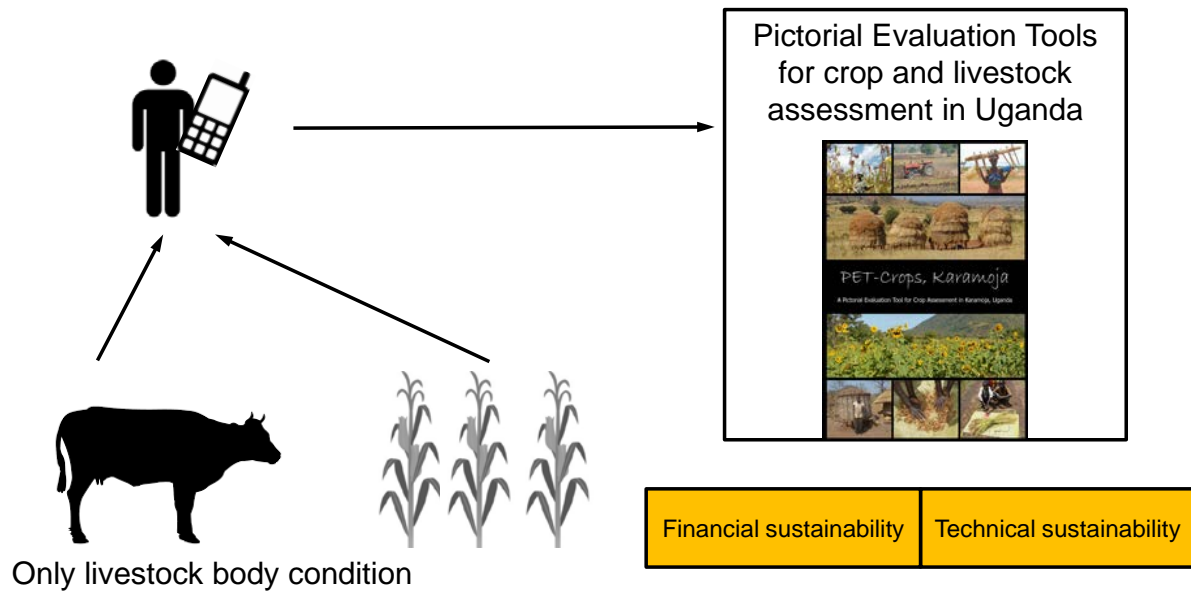
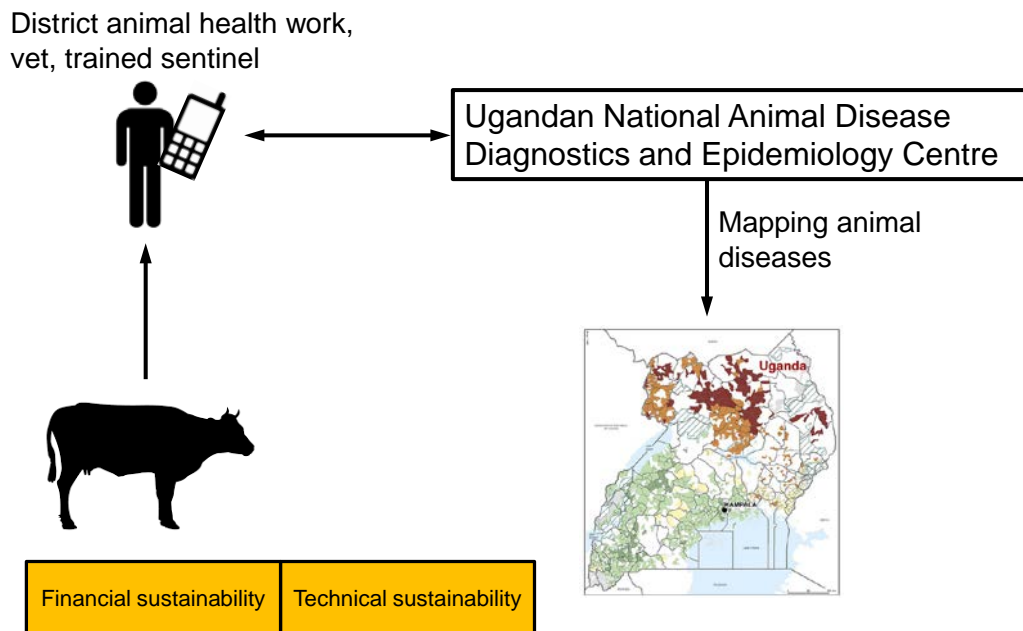



Figure 19 EMPRES-i event mobile application



Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) Early Warning System (EWS)

The Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) planning unit handles early warnings. MAAIF gets seasonal forecasts from the Ugandan National Meteorological Authority (UNMA) and looks at the implications of these for agriculture. They provide advisory messages and mitigation measures for crops, livestock and fisheries. In the middle of the growing season crop, livestock and fish monitoring takes place. A post-harvest assessment is also carried out.



Data analysis is carried out at the national level with an IPC working group which includes the MAAIF, FAO, WFP, Makerere University and other key actors. There is a specific report for the Karamoja Region because it is the most vulnerable region in Uganda.

The dissemination of the information takes place via advisories twice a year through newspapers and emails to local government, as well as via local radio. MAAIF has a challenge in getting the data from the field to analysis. Although there are significant quantities of data collected for Karamoja the data are not always adequate. For example, monitoring of livestock, fish and crops is carried out but not necessarily on a regular basis. The triggers for response have also not been set.

Similar to most other EWSs in Uganda the MAAIF EWS does not forecast the risk although it is stated that it receives seasonal climate forecasts from UNMA. It would appear to be under-resourced and the lack of a feedback mechanism makes it difficult to ascertain how effective it is in reaching vulnerable communities and engendering a response. It also raises questions over its financial and technical sustainability.

3.5.3 Potential contributions of existing disease EWSs to the proposed NEWS

With respect to the NEWS, in the future it should be possible to link warnings from the PHEOC in the Ministry of Public Health to the system, so that NECOC can also monitor disease outbreaks in real-time. The EWS tools available for agriculture do not appear to be consolidated or particularly widely used. MAAIF should be the ministry that owns these tools feeding warnings into the NEWS.

3.6 Lightning, storm and weather forecasts for fishermen

Background

There is no method for forecasting lightning in Uganda. The University of Makerere is piloting a severe weather early warning system for fishermen which will be piloted from February 2016 to April 2016 with 300 fishermen. The system uses a smart phone application. The system will provide 30 minute nowcasts including lightning and initially it will be free. Following the piloting phase the system will cost users US\$4 per month.

Risk knowledge

The system has the potential to raise awareness of the impact of lightning and storms in Uganda.

Monitoring, forecasting and warning

The system will use forecasts and data collected by UNMA.

Dissemination and communication

The dissemination of the warnings is limited by the current low level of smartphone ownership.

Response capability

The system is not operational and hence it is not possible to comment on its response capacity.



Technical and financial sustainability

Only 5% of Ugandans have a smart phone and the system requires at least 1,000 subscribers at US\$4 per month to be financially sustainable (PewResearchCenter, 2015; Tushemereirwe, 2016). Given this low level of smart phone ownership and the relatively high cost of the scheme, it does not appear to be financially or technically sustainable.

3.7 Conflicts

The Conflict Early Warning and Response Mechanism (CEWARN) provides early warning of conflicts in the Horn of Africa. In Uganda, CEWARN covers the Karamoja sub-region and is implemented by the Conflict Early Warning and Response Unit located in the Ministry of Internal Affairs. CEWARN collects a wide range of data on conflict incidents which in Karamoja are mainly related to theft of livestock (see Atyang, 2014 for more details)

In July 2003, CEWARN correctly forecasted and prevented a violent raid in Northern Uganda. A country coordinator passed information gathered by the field monitor to CEWARN analysts, who in turn alerted the local district commissioner (Levy and Meier, 2003). The CEWARN appears to be successful. Warning produced could be fed directly to the NEWS.

3.8 Landslides

There are few if any functioning EWSs for landslides in sub-Saharan Africa (see Lumbroso et al., 2014). Some work is being carried by Makerere University in utilising scientific and indigenous systems to assess areas where landslides are likely to occur (see Okiror, 2016).

3.9 Earthquakes


Earthquake EWSs detect and measure earthquakes fast enough that a warning can be given before the strongest shaking arrives. However, such systems usually only give people seconds, or at best minutes, to respond. The Department of Geological Survey and Mines in the Ministry of Energy and Mineral Development is responsible for monitoring earthquake events. There are some seismometers in at risk areas of Uganda; however, the density of the network is low. It is not clear if a database of seismic activity is maintained by the department.

3.10 NECOC Disaster Monitoring System

Background

The NECOC Disaster Monitoring System is a community-led alert system managed by the Department of Disaster Preparedness and OPM. It was developed with support from UNICEF. It is a web based application system that receives and sends SMS messages with the use of a short code; an innovation that ensures community-led, early response to hazard occurrences through the use of mobile-based communication tools. The system covers the whole of Uganda. The system is currently being rolled out with capacity building at a District level with training for community leaders on how it works, (i.e. how to use it and answer phones). UNICEF has recently signed a transition agreement with OPM intended to lead to an official hand-over of the system to OPM in August 2016. While the product has room for further development, it is planned that UNICEF will hand it over to OPM in the interest of ensuring that it is in their hands hence forth. OPM has taken the step to apply to Uganda





Communications Commission for a toll-free number so that users can send SMSs without charge. This will ensure minimal operational costs (UNICEF, 2016).

The districts will have an interactive web-based interface showing the number of messages and the level of vulnerability (based on a vulnerability analysis). The long term objective is to get one trusted member of the community at a sub-county level operating the system (i.e. one person per 60,000).

Smart phones and tablets are currently being piloted to aid data collection. Data are collected by the Chief Administrative Officer at the District Level using the Open Data Kit (ODK) to collect more detailed information to inform the response to a disaster. The ODK has a number of forms that cover issues relating to a hazard such as:

- How many households have been affected.
- Origins of the data.
- Co-ordinates of hazard.
- Number of mothers affected.
- Number of children affected.

The ODK uses the DesInventar proforma for collecting and generating data sets (see <http://www.desinventar.net/whatisdesinventar.html>). A District Disaster Management Committee validates and profiles the nature of the disaster and decides on how to respond, i.e. at a district level or whether to refer the matter to the relevant ministry for support.

The system has been used in the Tera sub-region to report floods and waterlogging during El Nino in November 2015. Views of the data flow and web-based dashboard are shown in Figures 20 and 21 respectively.

Risk knowledge

Once operational, the system has the potential to raise awareness amongst communities affected by a range of different hazards.

Monitoring, forecasting and warning

The system does not forecast hazards but it could provide an effective way of responding to hazards when fully implemented.

Dissemination and communication

The system has the potential to offer a number of ways in which warning messages can be sent to vulnerable communities (e.g. directly via SMS, radio, District Authorities, trusted community members).

Response capability

It is not clear how effective the system has been, or will be, in engendering an effective response to a reported hazard to date. This is primarily because, although the system is “live”, it is still in a pilot phase and is not currently being operated on a 24 hour basis.

Technical and financial sustainability

The system is currently funded by UNDP. It is not clear whether the OPM has provided NECOC with a defined budget in the future to operate and maintain the system. NECOC has the ICT infrastructure to operate the system; however, it will need to have a dedicated team to manage it, especially during a major event, for it to be technically sustainable.



Figure 20 Information flow within the NECOC Disaster Monitoring System

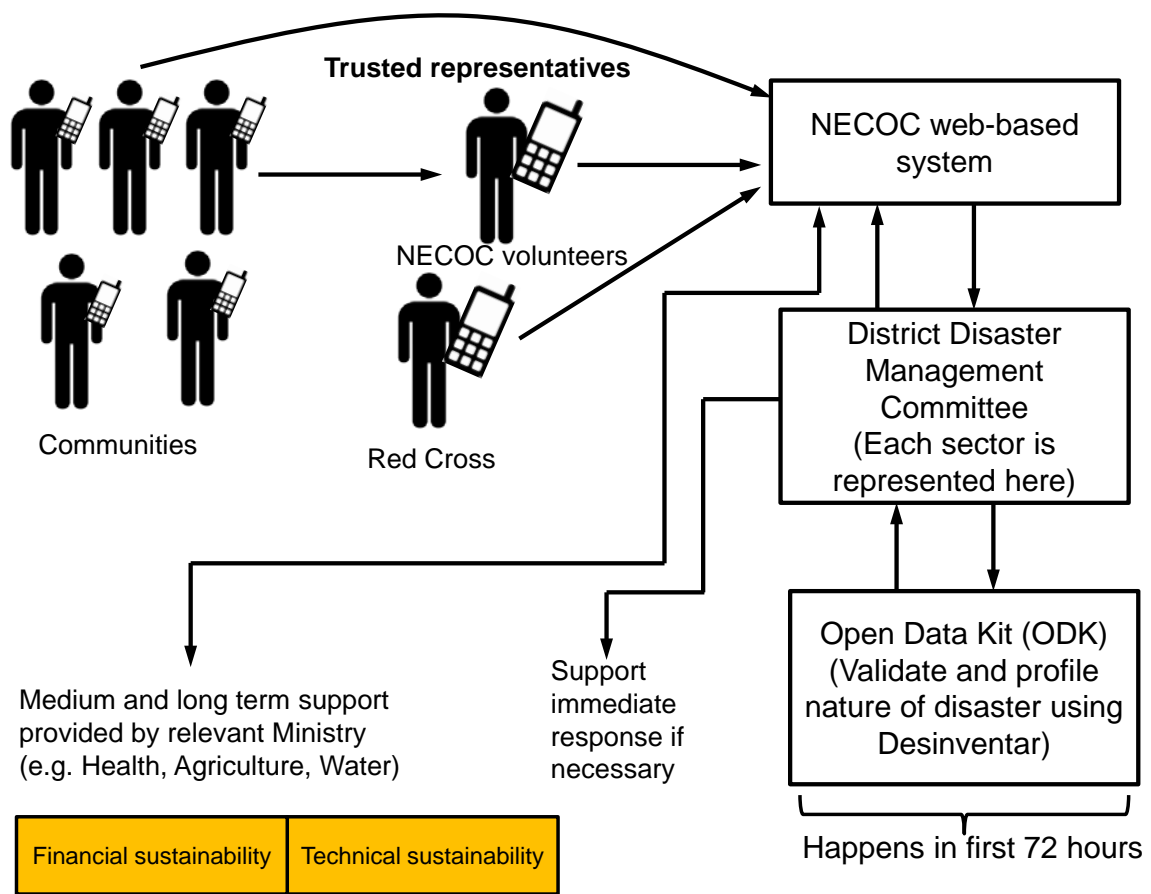
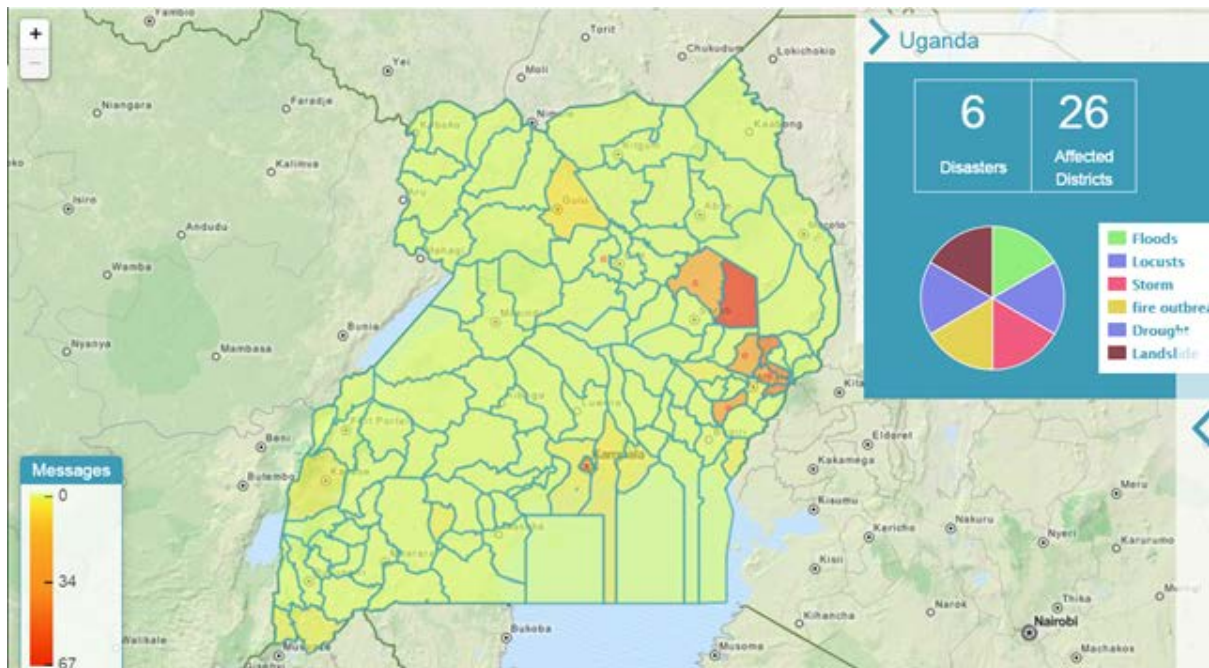


Figure 21 Screenshot of the NECOC Disaster Monitoring System dashboard





3.11 Stakeholders' perceptions of existing Early Warning Systems (EWSs) in Uganda

As part of this work, (see Annex 1), 41 stakeholders with a strong interest in Early Warning Systems (EWSs) in Uganda responded to the following questions concerning existing EWSs:

- Are existing EWSs technically sustainable?
- Do existing EWSs take into consideration indigenous early warning systems?
- Do existing EWSs encourage the participation of the public and non-governmental organisations?
- Do existing EWSs facilitate effective co-ordination between multiple government stakeholders?
- Do existing EWSs emphasise preventative actions rather than responses?
- Do existing EWSs address the most important issues of local communities?
- Do existing EWSs communicate clear warnings and actions to different groups of stakeholders?
- Are existing EWSs financially sustainable?

The respondents were given the following options to respond:

- No This is not represented at all
- Occasionally In some aspects this is included, but it is ad hoc and does not really influence practice
- Often In many ways this is genuinely supported and results in some practical reductions in the impacts of hazards
- Completely This is systematically incorporated in policy and planning of current EWSs and is clearly helping to establish a culture of hazard prevention

The results of the questions are summarised in Figure 22.

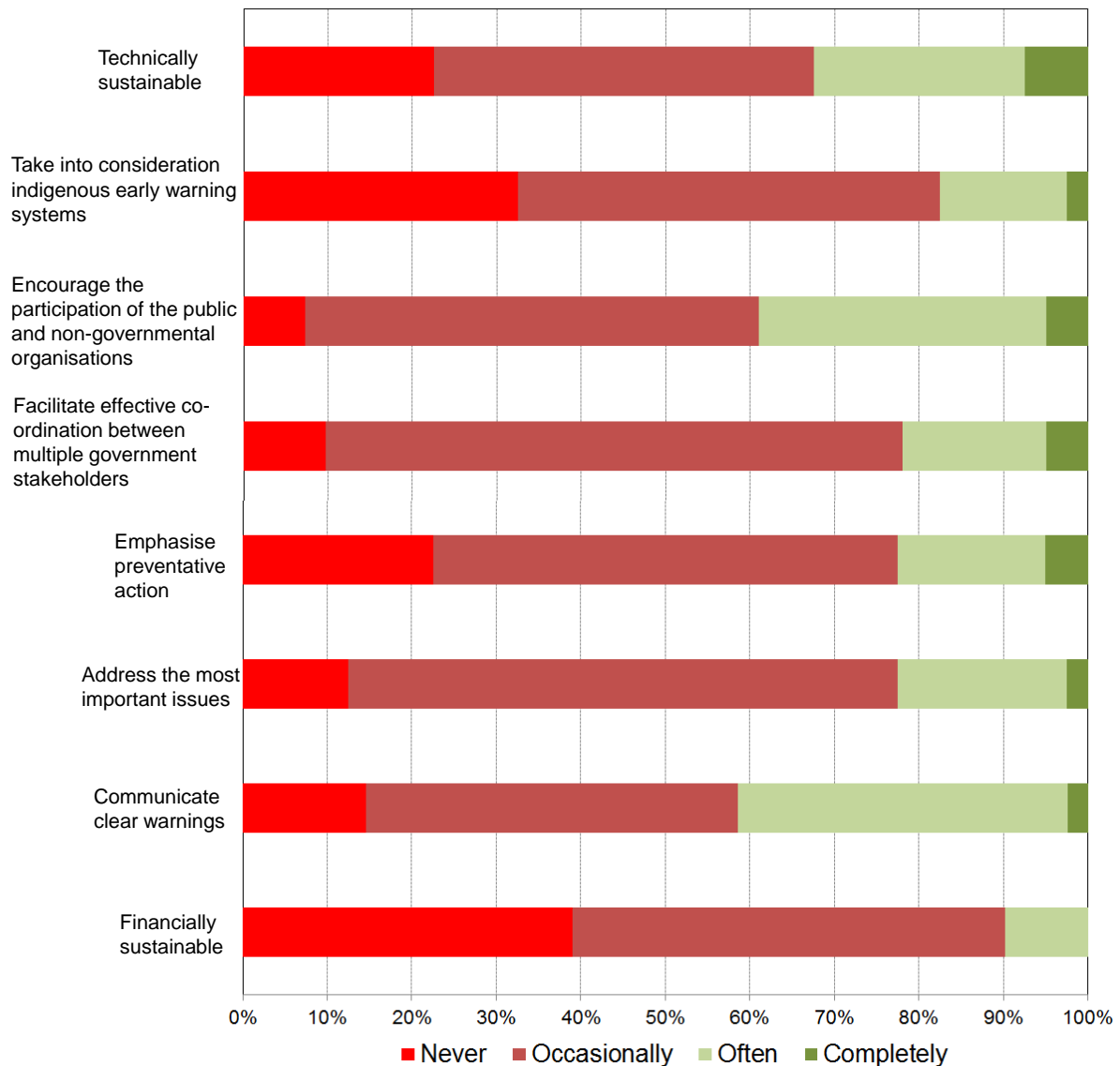
Over 90% of respondents thought that existing early warning systems were either not or only occasionally financially sustainable and 80% of respondents felt that they never or only occasionally take into consideration indigenous early warning systems. Coordination would also appear to be an issue with 78% of respondents stating that existing early warning systems never or only occasionally facilitate effective coordination between multiple government stakeholders.

There is also a perception that EWSs do not completely address the most important issues of local communities or emphasise preventative actions by the recipients of the warnings. It was felt by some respondents that EWSs were primarily aimed at Government or other organisations operating at a national or regional scale in East Africa (e.g. local government or donors).

As well as not being financially sustainable, EWSs are not perceived to be particularly technically sustainable or to encourage the participation of the public and NGOs. Neither do they tend to take cognisance of indigenous EWSs and methods. On a more positive note, 41% of respondents believe that early warning systems often, or always, communicate clear warnings and actions to different groups of stakeholders.



Figure 22 Stakeholders' perceptions of existing early warning systems in Uganda




(Source: Annex 1)

3.12 Conclusions

The following can be concluded regarding the existing EWSs and those currently being piloted in Uganda:

- There are a number of drought EWSs focusing on Karamoja. However, only one of these (FEWS NET) attempts to forecast the effects of droughts in advance of their occurrence. This prevents early, low, or no regrets actions being implemented. This potentially leads to more costly responses once a crisis has developed.
- There is potential to coordinate data collection through the Open Data Kit for a number of different EWSs related to droughts, food security and disaster risk financing

- 
- A number of useful and innovative evaluation tools, related to droughts and food security, such as the PET and EMPRES-i have been piloted in Uganda. However, they do not appear to be widely used or to receive the appropriate amount of funding to make them financially sustainable. These tools have the potential to improve the effectiveness of EWSs related to food security and droughts.
 - Although floods are considered by many stakeholders to be, after droughts, the second most relevant hazard in Uganda, there is nothing currently in place that resembles a national or regional flood EWS.
 - Many of the current EWSs are piecemeal in nature and not complete. None of them provide an integrated EWS as shown in Figure 5.
 - The number of different, sometimes parallel initiatives, reflects a lack of coordination between government ministries, donors, NGOs and other agencies when it comes to implementing effective EWSs for different hazards.
 - Little use appears to be made of internationally produced short (< 10 days) and medium term (<40 days) forecasts of climate (e.g. precipitation and temperature). Many of these are freely available and could be used to inform drought, food security and flood forecasts.



SECTION 4

A review of existing institutional structure, policy and legislation relevant to Early Warning Systems (EWSs) in Uganda

4.1 Introduction

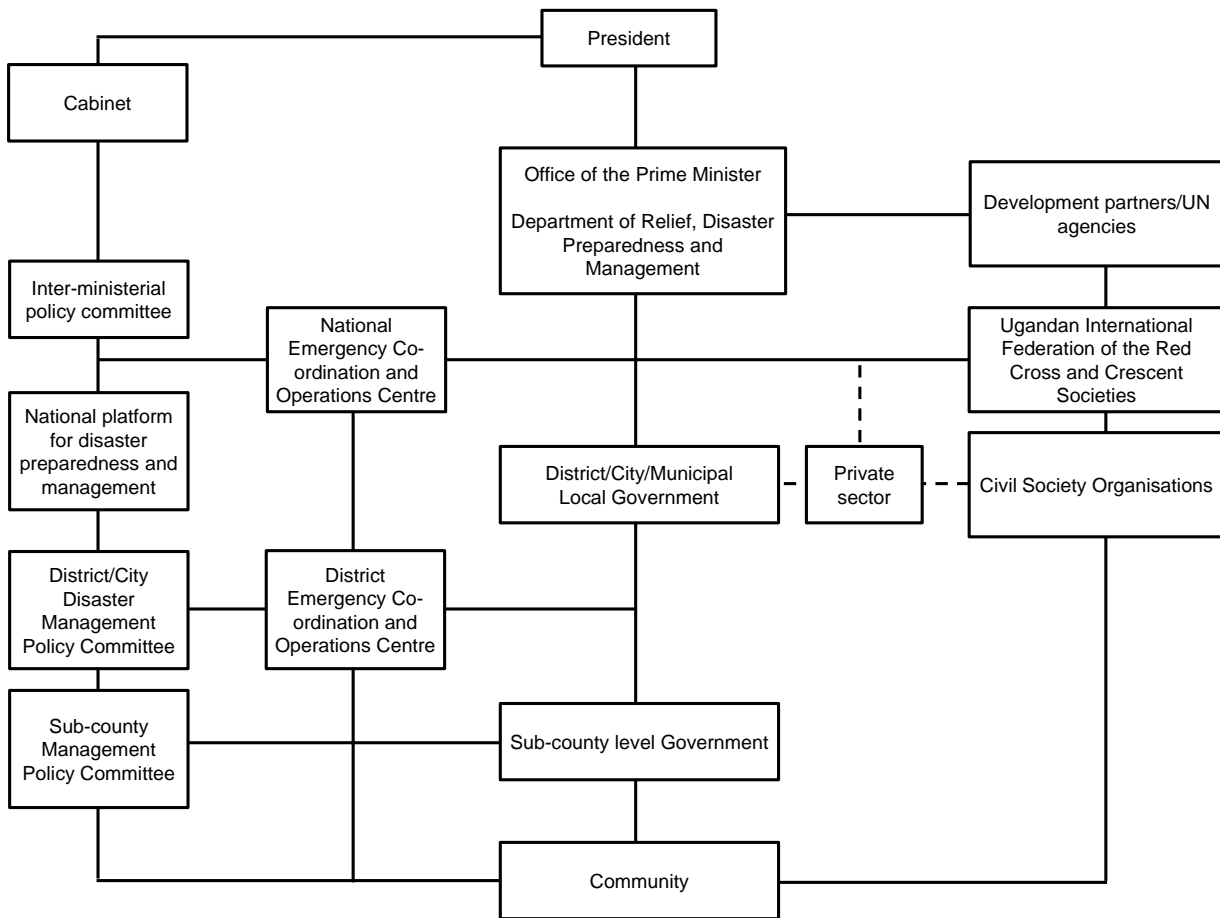
The Department of Disaster Preparedness and Refugees in the Office of the Prime Minister (OPM) is the lead agency for disaster preparedness and management in Uganda. The coordination of international and domestic disaster relief is undertaken by this Department through the National Emergency Operations Centre (NECOC). The institutional structure is shown in Figure 23. In addition, the Department is responsible for mobilising resources in collaboration with UN agencies, Uganda Red Cross Society and other humanitarian organisations, to assist disaster victims immediately after a disaster and in the restoration of their lives (IFRC, 2011).

The policies for disaster management in Uganda follow a bottom-up, hierarchical reporting, structure that include: Sub-county Disaster Management Committee; District Disaster Management Committees; District Disaster Policy Committee; National Platform for Disaster Management, also referred to as the Inter-Agency Technical Committee and the Inter-Ministerial Policy Committee, which reports to Cabinet and the Head of State.

Uganda has ratified a number of international and regional legal instruments relevant to disaster response, however, few of them have been promulgated into national legislation. Currently, Uganda does not appear to have a law dedicated exclusively to disaster management. The Ugandan national policy for disaster preparedness and management was produced in OPM in April 2011. Parts of the policy relevant to Early Warning Systems (EWSs) are summarised below.

The Uganda Red Cross also plays a significant role in complementing Government efforts during emergency response and disaster management. It is a neutral auxiliary agency that works to complement the State and its functions are recognised by national legislation. Depending on the magnitude of the challenge, the Uganda Red Cross often addresses emergency rescue and response, within a framework managed by the responsible Ministry under the OPM.

Figure 23 National disaster preparedness and management institutional structure




(Source: OPM, 2011)

4.2 National policy for disaster preparedness and management

4.2.1 Introduction

This section summarises the Government of Uganda’s national policy for disaster preparedness and management. The policy states that the primary responsibility for disaster risk management rests with its citizens. The overarching goal of the policy is “to establish institutions and mechanisms that will reduce the vulnerability of people, livestock, plants and wildlife to disasters in Uganda” (OPM, 2011). There are seven policy objectives, one of which is to “generate and disseminate information on early warning for disasters and hazard trend analysis”. The policy has 12 guiding principles, of which the following are relevant to Early Warning Systems (EWS):

- Sound planning using a multi-sectoral approach based on community vulnerability.
- Community participation.
- Public awareness and education.
- Institutional capacity building.
- Adequate expertise and technology.
- Vulnerability analysis.
- Social and environmental costs.

- 
- Partnership and coordination (e.g. between all sectors of government, NGOs, UN agencies, donors, civil society organisations, communities, private sector).
 - Regional and international partnerships.

Policy aims relevant to EWSs for each hazard are summarised in the section below.

4.2.2 Responsible organisations and policy actions for different hazards

The lead and supporting organisations for each hazard in Uganda are shown in Figure 24. It is interesting to note that although weather-related hazards have the greatest impact on loss of life and livelihoods the Uganda National Meteorological Authority (UNMA) is only mentioned as a supporting organisation for droughts, when it should have an important role to play in EWSs related to floods, famine/food security, landslides, heavy storms, certain human epidemics (e.g. cholera and malaria) and certain types of pest infestations.

Figure 24 Lead and supporting organisations for hazards in Uganda

Organisation	Hazard									
	Droughts	Famine/Food Insecurity	Floods	Heavy storms	Landslides and mudslides	Human epidemics	Crop and animal diseases	Pandemics	Pest infestations	Earthquakes
Ministry of Water and Environment	•	□	•	•	□	□	□		□	□
Ministry of Agriculture, Animal Industry and Fisheries	□	•	□	□	□	□	•	□	•	□
Ministry of Health			□	□	□	•	□	•	□	
Uganda National Meteorological Authority	□									
National Environment Management Authority	□		□		•		□			
Ministry of Lands, Housing and Urban Development	□	□	□	□	□		□			□
Office of the Prime Minister	□	□	□	□	□	□	□	□	□	□
Ministry of Local Government	□	□	□	□	□	□	□	□	□	□
Ministry of Gender, Labour and Social Development		□								
Ministry of Works and Transport				□	□					□
Ministry of Internal Affairs - Immigration and Police								□		
Ministry of Trade, Tourism and Industry								□		
Ministry of Information, Communication and Technology								□		
Ministry of Defence				□				□		□
Ministry of Education and Sports				□						□
Ministry of Energy and Mineral Development										•
Directorate of Information and National Guidance								□		
Department of Geological and Mine Survey					□					
National Forest Authority	□				□					
Local Governments	□	□	□		□	□	□	□	□	□
Uganda Wildlife Authority	□				□		□	□	□	□
Research institutions	□	□		□	□		□		□	□
Community, private sector and civil society groups	□	□	□	□	□		□	□		□
UN agencies and NGOs		□	□	□	□	□	□	□	□	
Kampala Capital City Authority			□							
Makere University Geography Department					□					
Uganda Virus Research Institute						□				
Joint Clinical Research Institute						□				
Uganda Seismic Safety Association										□

• Lead organisation □ Supporting organisation

(Source: Based on information in OPM, 2011)

The national policy for disaster preparedness and management has a number of policy actions listed under each hazard. The ones that are relevant to EWSs have been summarised below.

Droughts

For droughts the policy actions for EWS are as follows:

- Establish proper mechanisms for weather prediction, early warning and drought information message dissemination.
- Map and zone drought-prone and agriculturally viable areas.
- Establish a national database on drought.



Floods

The policy states that “*flood risks can be minimised through forecasting and studying seasonal patterns*” (OPM, 2011). However, there is no policy action specifically relating to EWSs, although there is a policy action to “*create awareness in the communities on flood risk reduction measures*” (OPM, 2011).

Landslides and mudslides

There is only one policy action relating to EWSs which is to “*map and gazette landslide and mudslide prone areas and prohibit settlement in such risk areas*”.

Epidemics

The policy states that it is important to “*establish and develop early warning systems through routine surveillance and training in emergency operations*”. With respect to policy actions, the one most relevant to EWS is to “*strengthen entomological services and disease surveillance*” (OPM, 2011).

Heavy storms

There is a policy action to “*establish weather stations and early warning systems*” (OPM, 2011)

Pest infestations

There is a policy action to create awareness and EWSs in communities (OPM, 2011).

Earthquakes

There is a policy action to acquire technology to monitor and detect the occurrence of earthquakes.

Internal armed conflicts and internal displacement

There is a policy action to develop conflict EWSs.

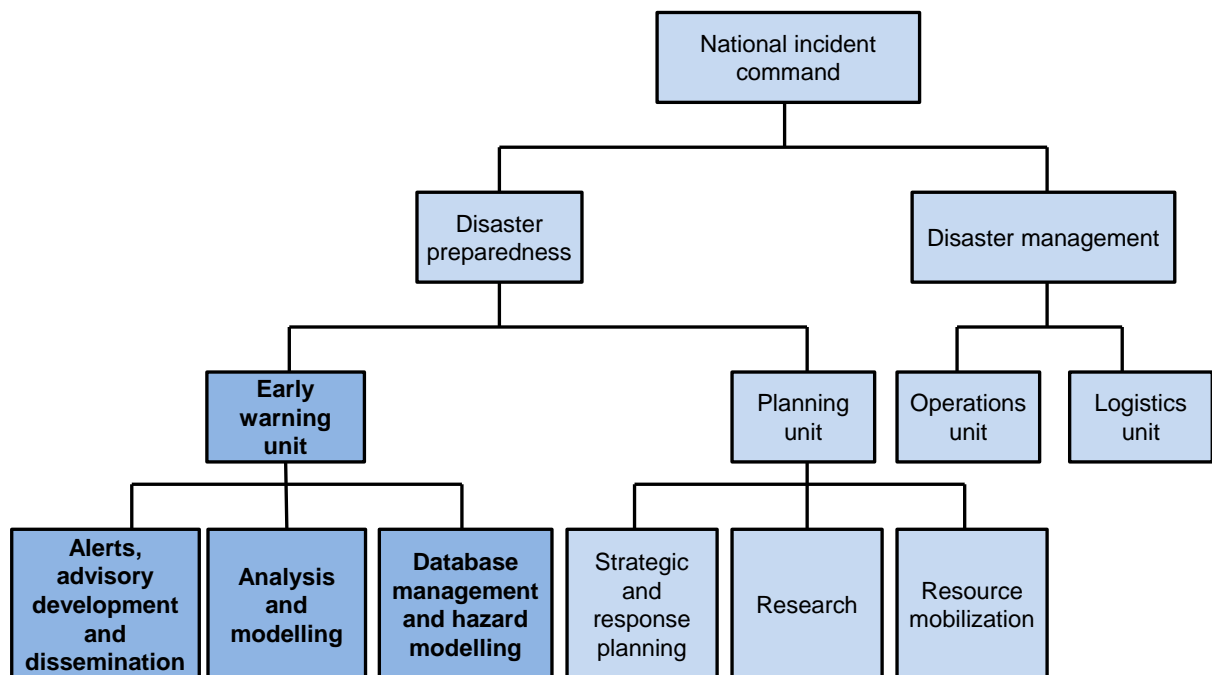
4.2.3 Functions and structure of National Emergency Coordination and Operations Centre (NECOC)

The policy defines NECOC as carrying out “*the production of early warning products (alerts, bulletins, advisories) using disaster and climate modelling systems*” (OPM, 2011). The policy is confusing in that climate modelling systems are quantitative methods to simulate the interactions of the important drivers of climate, including atmosphere, oceans and the land surface.

With respect to EWSs and a National Early Warning System (NEWS), NECOC should primarily be a coordinating body and trusted source of early warnings with technical tasks, such as modelling of a particular hazard, carried out by the relevant organisation (e.g. flood forecasting and modelling should be carried out by the MoWE). The current structure of NECOC is shown in Figure 25. Although it is clear that the NECOC early warning unit should deliver warnings, carry out some analysis related to multiple hazards and manage databases of risks, it is not clear why it needs a modelling capability. Modelling expertise should reside with the relevant Ministry.



Figure 25 Structure of NECOC with respect to early warnings



(Source: OPM, 2011)

4.3 Relevance of the current policy on EWSs and legislation on food security in Uganda


4.3.1 Introduction

With respect to EWSs and food security in Uganda the key question is what institutional mechanisms are in place to ensure that adequate food is available and accessible during natural disasters. Rukundo et al. carried out research into this question, gathering data from 52 key stakeholders working in relevant positions of authority in relevant organisations in Uganda (e.g. OPM; Ministry of Disaster Preparedness and Management; Ministry of Health; MAAIF; MoWE; IFRC) (Rukundo, et al., 2014).

4.3.2 Uganda Nutrition Action Plan (UNAP)

The Uganda Nutrition Action Plan (UNAP) 2011 to 2016 framework shifted the responsibility to coordinate food and nutrition policy from MAAIF to OPM. However, “*this was done in a legal vacuum as there is neither legislation nor a budget framework in place to implement this process despite the financial implications of this added mandate to the OPM. In effect, concrete implementation had not yet taken off as three budget years had been lost without financial commitment towards the UNAP implementation*” (Rukundo et al, 2014).

Rukundo et al’s review of the costs of the UNAP compared to the budgetary framework of the OPM also revealed a “*reality gap*” (Rukundo et al., 2014). The plan had high implementation costs without any consideration being made of institutional budgets. It is pointed out that in the financial year 2010/2011 the OPM and its affiliates received an annual budget estimated at US\$56 million, which was below UNAP’s projected cost of US\$63 million. UNAP’s budget for mitigating disasters was four times higher than the estimated



US\$4 million that the Government allocated towards relief for disaster victims in the financial year 2011/2012 (Rukundo et al, 2014).

4.3.3 Budgetary requirements

The value of damage and losses caused by rainfall deficit conditions in Uganda in 2010 and 2011 has been estimated at US\$1.2 billion. This amount was equivalent to 7.5% of the country's gross domestic product (GDP) in 2010 financial year. These losses resulted from: crop failures; death of livestock; losses in, and higher costs of, production of goods and services (OPM, 2012). It has been estimated that 98% of the damage and losses were sustained by private individuals and enterprises compared to only 2% for the public sector (OPM, 2012). However, a review of the complex Government budget architecture established that the Ministry responsible for Disaster Preparedness and Management has been receiving less than 1% of the national budget allocation (Rukundo et al., 2014).

It is estimated that annual funding for disaster relief in Uganda is equivalent to approximately US\$4 million. It has been estimated that at least 200,000 Ugandans are affected by disasters every year (Oketch, 2013). This figure equates to a per capita allocation of about US\$20 per disaster victim per year, which does not appear to be adequate.

4.3.4 Stakeholder feedback related to the institutional framework and budgetary aspects

A survey undertaken of 52 actors involved in disaster risk reduction reported that disaster management was not treated as a priority by the Government (52%) (Rukundo et al., 2014). A majority (73%) stated that the institutional framework for disaster preparedness and management was inadequate, and that the Ugandan Parliament had not instituted the necessary measures to assure the right to adequate food to Ugandans during disaster situations (71%) (Rukundo et al, 2014). Rukundo et al. also raise issues of corruption and lack of accountability “with a [recent] release of a special financial audit report by the Office of the Auditor General that highlighted a number of financial irregularities in the use of public and donor funds earmarked for disaster management in the Office of the Prime Minister” (Rukundo et al, 2014).



SECTION 5

Barriers and gaps to the provision of a National Early Warning Systems (NEWS)

5.1 Introduction

One of the reasons for a NEWS arises because if different EWSs are not coordinated by NECOC, early warnings may not be received or identified by vulnerable communities, even if the monitoring and forecasting systems are in place. For example, two different organisations may individually have important information, but it may only become an early warning signal if these two information sources are put together. This chapter details the barriers and gaps to the provision of a NEWS in Uganda. In terms of the following:

- Gaps in governance and finance.
- Technical challenges and gaps.
- Stakeholders' perceptions of the main barriers to establishing a multi-hazard NEWS.

5.2 Gaps in governance and finance


Well-developed governance and institutional arrangements support the foundations and successful development and sustainability of EWSs. Good governance is encouraged by robust legal and regulatory frameworks and supported by long-term political commitment and effective institutional arrangements. This section addresses some of the current gaps in governance and financing.

5.2.1 Legal mandate for the issuing of warnings and warning protocols

One of the governance issues concerns the mandate for issuing a warning when a hazard has been predicted or identified. The development of technology (e.g. the proliferation of mobile phones) has brought a new trend in early warning in that EWSs have become in part “individualised”. There have been cases where the organisations that have been responsible for early warnings do not react in time and civil society actors have issued de facto early warnings.

Whilst it not possible to hinder these developments by legal means it is important that the task of issuing warnings belongs to a national authority, (e.g. NECOC together with the responsible ministry), which will then be responsible for any false warnings, for the accuracy and authenticity of the information, as well as for related costs.

The enactment of such a law would be of great benefit to the coherence and clarity of competencies and responsibilities in disaster response. In addition, legal provisions may be enforced should that be necessary. A comprehensive law on disaster risk management and food-security related emergencies should be enacted to strengthen Uganda's institutional framework for disaster management. This would include the establishment of the Disaster Management Commission as required by the Constitution, as well as operationalising the



procedures for a state of emergency. It should also set out the broad outlines of the roles and responsibilities of other governmental divisions, the Uganda Red Cross Society (as an auxiliary to public authorities in the humanitarian field) and other civil society organisations in the full cycle of disaster management (from risk reduction to recovery), for which the Disaster Policy should provide additional details (Rukundo et al., 2014). It is understood that the OPM has commenced the process of developing a Disaster Preparedness and Management Bill that is envisaged to take into account these issues.

Currently there would appear to be a dearth of agreements between the key actors to ensure the consistency of the warning language and communication channels for the warnings, especially where different hazards are handled by different ministries and organizations. The NEWS will have to develop these before it can become operational.

For many hazards, pertinent data for early warnings are often not available in real-time and warnings are not always generated in an efficient and timely manner that meet end users' requirements. This is probably as the result of funding and governance issues.

5.2.2 Coordination of the response and accountability

For many hazards (e.g. droughts), early warning information is transmitted to Ministries, NGOs and other agencies. In some cases different actors select and plan with parts (but not all) of the early warning information. This makes triggering early warning information for coordinated early action impossible across all departments, for a coordinated and timely response.

In some cases the interpretation of the early warning information to a particular contingency plan has not been institutionalised based on a relevant policy. This makes it challenging to test and refine plans that need to be implemented by the NEWS prior to an event occurring. The absence of a legal framework for many of the major hazards makes it hard to make any individual or institution accountable for not operationalising contingency plans triggered by early warning information.

For the NEWS to be effective accountability and transparency will be important. If institutions and governments are held accountable for the loss of even a single human life owing to the hazard event, there is definitely a great scope and incentive for improvement of EWSs.

5.2.3 Financing EWSs and the NEWSs

There would appear to be a failure to fund existing EWSs and potentially a NEWS in the domestic budget, owing to anticipation of external assistance from donors and international agencies. Owing to the paucity of resources allocated for disaster preparedness and management in the country, a humanitarian relief approach risks being institutionalised (Rukundo et al., 2014). In Uganda, the Uganda Red Cross which is by legal design a neutral auxiliary agency, in some cases, contributes a seemingly leading role in the Government during emergency response and relief operations across the country. If EWSs and the NEWSs are not sufficiently budgeted for by the Ugandan Government such an approach may institutionalize humanitarian relief and potentially undermine the Government's commitments to EWSs and a NEWSs. The Ugandan Government should allocate a defined budget for EWSs and the NEWS and vote in the financial systems to facilitate their funding and sustainability.



5.3 Technical challenges and gaps

Few of the early warning systems in Uganda have a forecasting element to them which makes it difficult to engender early action. From the consultation with the key actors in Uganda (e.g. UNMA, OPM, NECOC and others) it would appear that forecasts are not used for three reasons:

1. The perception that the accuracy of forecasts is low (i.e. they are too uncertain).
2. Lack of technical capacity.
3. Insufficient funding.

5.3.1 Appropriate indicators and thresholds

In the absence of confidence in the EWSs, organizations in Uganda “triangulate” using a wide range of tools, but there is little agreement over the selection of appropriate indicators. There also appears to be little use of formal thresholds to provide triggers for early action. For action to be triggered, clear and accountable decision-making structures, roles and responsibilities for all EWSs and the NEWS, at all levels, should be in place. This calls for common triggers and protocols to be in place, in order to escalate early warnings to decision makers at the local, national, regional and global level to mobilize early action.

5.3.2 The role of Uganda National Meteorological Authority (UNMA) and the hydro-meteorological network

Given that most hazards in Uganda are weather related, the substandard quality of hydro-meteorological networks has a significant impact on the forecasting and monitoring of many important hazards (e.g. floods and droughts). In terms of the role of organisations in the national policy, UNMA does not appear to be perceived by the Government to be important (see Figure 24). Although there are currently a number of ongoing initiatives to strengthen the hydro-meteorological network in Uganda, the role of UNMA in forecasting and warning of weather-related hazards needs to be given more prominence.

5.3.3 The piecemeal nature of current EWSs

In most cases, the specific type of vulnerability dictates the nature of the Early Warning System (EWS). This is why, although it is important for the results of the EWS of a particular hazard to be integrated into a national centre, an EWS for a specific hazard (e.g. floods) will have a very different EWS than one used for another hazard (e.g. livestock diseases).

In practice, in most cases a comprehensive NEWS comprises several hazard-specific EWSs. Currently the coverage and effective of EWSs for individual hazards in Uganda is piecemeal. For the NEWS to be effective, the EWSs owned by the Ministries responsible for each hazard, need, in most cases, to be significantly strengthened. The current disaster management policy for Uganda (see OPM, 2011) confuses the role of NECOC by stating that part of its role is to do “*modelling*”. NECOC should act as a trusted, coordinating body which acts as a conduit and coordinator for all EWSs so that the Government has an overall view of current and forecast risks from all hazards.



- *“A centralized warning system with one gatekeeper may lead to manufactured crisis (social and political objectives) or ignored hazards/disasters. The system’s inputs, methods and results must remain transparent and open to expert scrutiny”.*
- *“Before the final merger, each piece of existing early warning system needs to be perfected in its current condition. The merger should be only a technical fix or link allowing the systems to operate autonomously. Concerned government agencies can still exercise the mandate of warning dissemination and response coordination”.*
- *“The design of an EWS needs to clearly set out the activities, outputs, products and communication channels that will link national and local scales. If this is not well thought out then the EWS will fail. Promoting the sharing of data and information between institutions on a regular basis, especially within government will help a great deal”.*
- *“The country needs a national multi-hazard early warning system with central coordination mechanism and involving all stakeholders”.*
- *“There is need to first develop the National Early Warning Strategy for the country. This will form the blue print to effectively develop an integrated NEWS”.*

Coordination and funding were also raised by many respondents, with many indicating that funding for a National Early Warning System has to be *“anchored into the government planning and budget process, so that it becomes one thematic area of focus that facilitates planning and implementation of any investment, in any sector”.*

The funding constraints outlined above were also echoed by another respondent who stated that:

“NECOC was established by financial support from donors (UNDP), the ongoing legislation and Act on Disaster Risk Management is being supported by a donor (UNDP). This process of having an EWS is donor funded, DFID. Where is government in all these processes, how long shall government be on the receiving end? Are we not just going to have frameworks/policies that are in place but not addressing vulnerability of at risk communities. What is the point of having a EWS framework that has no budget to facilitate early action and response?”

The point was also made that early warning systems need to move from reacting to disasters to predicting them in advance. Many of the major hazards affecting Uganda are climate-related which means that the use of accurate climate forecasts is important. However, it was felt by some that the Uganda National Meteorological Authority (UNMA) *“is not adequately facilitated. Equipment is lacking including observation station networks coverage as well as radar and other logistics”.*

Some of the stakeholders engaged with indicated that there is quite a lot of duplication of effort in Uganda and within the East Africa region in general, and that more collaboration could lead to more efficient use of scarce financial resources.



SECTION 6

Road map for the development a multi-hazard National Early Warning System (NEWS)

6.1 Introduction to the NEWS roadmap

The road map for the NEWS is outlined in Tables 1 to 3 as follows:

- Table 1 outlines issues related to mandate and policy.
- Table 2 covers data systems and communication related issues.
- Table 3 summarises issues related to coordination and monitoring and evaluation related.

For each of these areas each table provides the following:

- Activities with an approximate timeframe in months.
- Progress.
- Indicators that progress has been made.
- National and international stakeholders that should be involved in each activity including potential donors.

Sections 6.2 to 6.6 provides further details of each of the activities that should be carried out under each of the five areas (i.e. mandate and policy; data systems; communication; coordination; monitoring and evaluation).

It is important to note that the OPM's NECOC and the NEWS should act as the focal point for early warnings in Uganda. However, it is key that the EWSs for individual hazard are improved as only the mTrac system, used to monitor human epidemics, would appear to provide country wide warnings and be sustainable from a financial and technical point of view. EWSs for different hazards should still be able to operate autonomously. However, they should operate in parallel with *not* in competition with the NEWS. The relevant government organisation should still be able to exercise their mandate of warning dissemination and response coordination. However, warning messages and responses for different hazards need to be standardised to avoid messages coming from different sources being confusing for the recipients and responses to warnings coordinated with NECOC.

Area	Elapsed time (months)	Activities	Progress	Indicators	Stakeholders and international organisations	
					National	Potential donors and international organisations
Mandate and policy	12	Establish memorandum of understanding for NEWS with all relevant actors	Memorandum of understanding drafted by NECOC	Memorandum of understanding signed by all relevant stakeholders	NECOC	UNDP
	12	Develop Standard Operating Procedures	Standard Operating Procedures (SOPs) drafted	Standard Operating Procedures agreed with all key stakeholders	NECOC, all relevant ministries	UNDP, DFID, FAO, World Bank
	12	Clarify decision making structures with all stakeholders providing warnings and information to NECOC	In parallel with the development of SOPs, clarify the decision making structures within relevant stakeholder organisations with respect to the warning information provided	A report on decision making structures completed and agreed	NECOC	UNDP
	12	Establish a clear vision for the District Disaster Management Committees (DDMCs) including integrating the Drought Early Warning System (DEWS) and the relationship with NECOC focusing on contingency planning	Vision for the DDMCs drafted by NECOC and DDMCs	DDMC vision established including integration of the DEWS and relationship with NECOC focusing on contingency planning	DDMCs, NECOC	UNDP, DFID, ACTED, FAO
	12	Establish how the NEWS will be linked to response mechanisms	Disaster response strategy linked to NEWS	Independent evaluation of responses following a major disaster	NECOC, all relevant ministries	UNDP, World Bank
	16	Establish the economic benefits of the NEWS	Study commenced to assess benefits	Study completed and agreed with all relevant stakeholders	NECOC	UNDP, DFID
	24	Integrate and develop agreements with the private sector	Initiate regular meetings with the private sector where they are involved in early warning systems (e.g. Airtel 3-2-1 system)	Formal agreements between NECOC and the private sector agreed	NECOC; private sector organisations	UNDP
	36	Establish the warning chain between different ministries within government policy and legislation	Warning chain established by NECOC in partnership with key stakeholders	Warning chain between NECOC and other key ministries established in national policy and where necessary legislation	NECOC, all relevant ministries	DFID, UNDP, World Bank
	36	Capacity assessment of responsible actors at the national, district and sub-county level in charge of issuing warnings and delivering response	Capacity assessment conducted, gaps identified in terms of human and physical resources to NEWS	Capacity constrains addressed	NECOC, DDMCs	UNDP, DFID
	36	Integrate the NEWS into economic planning at a national level	Discussions with key budget holders undertaken	Budgets agreed with Ugandan treasury	NECOC, all relevant ministries, Ugandan	UNDP





Table 1 **Proposed road map for the development of a multi-hazard National Early Warning Systems (NEWS) – Mandate and policy related**

Data systems	12	Data from SMS-based Disaster Monitoring System analysed	Method established to analyse data	Analysis of data completed and reported on	NECOG	UNICEF, UNDP, DFID, World Bank			
	12	Disaster Risk Financing system operational	Disaster Risk Financing system used regularly (i.e. at least once a week)	Result of the Disaster Risk Financing system disseminated to relevant stakeholders	NECOG	UNDP, World Bank			
	24	Multi-hazard risk assessment completed where risk = probability of hazard occurring x consequence	Information on different hazards, exposure and vulnerability collected and produced. Risks based on economic damage, impact on livelihoods and loss of life established	Risk assessment completed	NECOG	UNDP			
	24	Seasonal forecasting products (e.g. rainfall, temperature) included into the Disaster Risk Financing system	Build capacity within the Uganda National Meteorological Agency (UNMA) and NECOC so that seasonal forecasts of rain and temperature at a daily time step start to be used predict the probability that thresholds in the Disaster Risk Financing system will be exceeded	Forecasting products are in use and forecasts are disseminated to key stakeholders	NECOG, UNMA	World bank, UNDP, DFID			
	24	Increase the spatial scale of the Disaster Risk Financing system so it operates across the whole of Uganda	Establish the feasibility of increasing the spatial coverage of the Disaster Risk Financing system and commence pilots in other regions of Uganda	Pilot testing of the Disaster Risk Financing system in other regions of Uganda completed	NECOG	World bank, UNDP			
Communication	12	Monthly bulletin produced by NECOC summarising all the major hazards	Utilise readily available information available from relevant stakeholders to produce a two sided PDF news bulletin	Disseminate two page PDF bulletin to all relevant stakeholders and make it available via the NECOC web site	NECOG	UNDP			
	12	NECOG web site updated at least monthly	Updates occur regularly	NECOG website traffic monitored to assess usage	NECOG	UNDP			
	24	Establish agreements between different actors to ensure that the warnings are delivered in a coherent manner	Agreements drafted	Agreements completed and in place					
	24	Public awareness campaigns to improve awareness and the role of NECOC, as well as other actors in the case of a disaster	Awareness campaign commenced	Survey of stakeholders from communities to a national level carried out to assess the effectiveness of the campaign	NECOG	UNDP			
	24	DEWS/District Disaster Management Committee (DDMC) monthly bulletin produced	Format and layout of DDMC monthly bulletin agreed with key stakeholders	Monthly bulletin agreed at district level in partnership with NECOC's agreement and Standard Operating Procedures (SOP) for the DDMC	DDMCs, NECOC	UNDP			
	24	Establish the roles and responsibilities of all the organisations involved in the warning process for each hazard and how they interact with NECOC	In partnership with the relevant stakeholder establish the roles and responsibilities for the relevant hazard	Roles and responsibilities established for each major hazard (e.g. droughts, floods, livestock and crops diseases, human epidemics)	NECOG, all relevant ministries, DDMCs	UNDP			
	24	Establish a coherent set of warning messages in conjunction with the relevant ministry for each major hazard (i.e. floods, droughts, health-related and agriculture-related)	Development of consistent warning messages and symbology commenced	Warning messages for each major hazard produced and agreed with a wide range of stakeholder groups including District Disaster Management Committees and communities	NECOG, all relevant ministries	UNDP, World Bank, DFID, UNICEF			
	36	Establish a warning message improvement cycle	Method via which warnings can be improved commenced	Warnings for different hazards improved with input from various levels of stakeholders	NECOG, all relevant ministries	UNDP, World Bank, DFID, UNICEF			





Table 2 Proposed road map for the development of a multi-hazard National Early Warning Systems (NEWS) – Data systems and communication related



Coordination	12	Establish the roles and responsibilities of each organisation involved in the warning process for each major hazard and designate a coordinating body at the national, district and sub-county level	NECOC to work with key stakeholders to establish their responsibilities	Roles and responsibilities established for each organisation responsible for warnings	NECOC, all relevant ministries	UNDP
	36	Develop low and no regret responses for a range of hazards and identify key actors in charge of delivering response (from the national to the sub-county level)	Study to develop low and no regret responses commenced and funding identified	Low and no regrets responses for different hazards initiated and funding secured for timely response	NECOC, all relevant ministries	UNDP
	36	Simulation exercise of a major event led by NECOC and involving all key actors held	Design of simulation exercise undertaken by NECOC and agreed with key actors	Simulation exercise held annually	NECOC, all relevant ministries	UNDP, World Bank, DFID
Monitoring and evaluation	24	Evaluate whether or not the early warning systems already established are being operated effectively as per the prescribed frameworks and procedures and contributing to achievement of expected outcomes	Survey of stakeholders including those at district and national level within different ministries to establish if prescribed frameworks are being used	An agreed percentage of the stakeholders questioned (e.g. 70%) deem the frameworks and procedures are being followed	NECOC	UNDP
	24	Evaluate whether or not early warning messages were disseminated among the agencies and communities concerned in time by early warning systems with the result that these agencies and communities benefit from the messages	Survey of stakeholders including those at community, district and national level to establish if prescribed frameworks are being used	An agreed percentage of the stakeholders questioned (e.g. 70%) deem the warnings to be understandable and effective	NECOC	UNDP



Table 3 Proposed road map for the development of a multi-hazard National Early Warning Systems (NEWS) – Coordination and monitoring and evaluation related

6.2 Mandate and policy related issues

Establishment of a memorandum of understanding to steer the development of the NEWS

Establishing a memorandum of understanding would help enhance cooperation and coordination between NECOC and other ministries and actors in the development of the NEWS. A draft memorandum of agreement is included in Appendix A of this report.

Develop Standard Operating Procedures (SOPs)

A standard operating procedure is a document which describes the regularly recurring operations to ensure that the operations are carried out correctly and consistency. The implementation of a NEWS will require clear standard operating procedures (SOPs) to enable effective coordination among different ministries and other stakeholder agencies who own and operate early warning systems for different hazards at national and local levels. SOPs should be developed in partnership with all the key stakeholders to provide clear guidance on the processes that should be followed to ensure coordination and timely response for each major hazard in Uganda. The development of SOPs by ministries and other stakeholders in partnership with NECOC should help NECOC to become a trusted source of warning information.

Clarify decision making structures with all stakeholders providing warnings and information to NECOC and NECOC staff

Decision making structures with all stakeholders providing warning information need to be clarified. This includes the staff running the NEWS. They should be characterised by a clearly defined mandate, tasks and goals with clear divisions of responsibility, clear leadership and decision-making structures, clarity in the chain of command, clear communication systems and, where appropriate, responsiveness to organisational change.

Establish a clear vision for the District Disaster Management Committees (DDMCs)


There is a need to establish a clear vision for the District Disaster Management Committees (DDMCs). This includes:

- Ensuring the functionality of DDMCs. It would appear that in many parts of Uganda that the DDMCs do not meet regularly.
- Regular review of district contingency plans.
- Regular data collection to inform indicators (e.g. through DEWS or a similar system).

The DDMCs require an adequate budget in order for them to function. If local government is also to play a role in dissemination to communities, then the resources and capacity for this must also be decentralised.

Establish how the NEWS will be linked to response mechanisms

There is a need for a disaster response strategy to be linked to the NEWS. In many districts of Uganda there are no disaster response strategies in place and district officials often have little capacity to respond, thus it is done on an ad hoc basis, or when it is too late. There is a need for the NEWS to link to a clear response strategy, with designated roles and



responsibilities for different actors at national, district and local level, coupled with readily accessible funding for a timely response.

Establish the economic benefits of the NEWS

Research carried out in Kenya has shown that responding on time and before the full impact of drought is felt, is both cheaper and more effective. The model and assumptions used were based on actual costs wherever possible and yielded a cost per head approximately 50% lower in both drought and non-drought years (Fitzgibbon, 2012). Early response needs to become the standard approach to drought response; however, evidence of the economic benefits of early action will need to be collated by NECOC to show the benefits of the NEWS.

Hard evidence, based on a systematic study of the cost and benefits of NEWS for Uganda, could convince politicians to invest in EWSs in general. To fully appreciate the costs and benefits of an EWS and NEWS, the overall operational cost of the system, the societal and economic losses owing to false alarms and the societal and economic savings as a result of timely action, need to be quantified.

Integrate and develop agreements with the private sector

The predicted increase in coverage of mobile and smart phones in Uganda could lead to a greater participation of the private sector in the development of EWSs. When these occur they should be integrated into the NEWS.

Establish the warning chain between different ministries within government policy and legislation

The dissemination of warnings needs to be established in government policy and/or legislation to ensure that this process is clear to government, NGOs and other organisations.

Capacity assessment of responsible EWS actors at the national, district and sub-county level in charge of issuing warnings and delivering response

A capacity assessment of the responsible EWS actors at the national, district and sub-county level in charge of issuing warnings and delivering responses should be undertaken. Capacity building for local government disaster risk reduction structures, appear to be required, to ensure that DDMCs are able to:

- Appropriately identify early warning indicators.
- Interact with one another i.e. other DDMCs and Sub-County Disaster Management Committees (SDMCs).
- Plan and initiate responses.
- Communicate resources needs to line ministries i.e. developing clear proposals.
- Effectively coordinate with development actors.

Integrate the NEWS into economic planning at a national level

EWSs in Uganda, currently do not receive sufficient central government funding given the benefits that they yield. To ensure financial sustainability NECOC should lobby senior civil servants and politicians in order to integrate the NEWS and other EWSs into economic planning at a national level. **However, it is important that each EWS retains its own funding stream** and that NECOC does not administer funds for all EWSs.



6.3 Data systems related issues

Data from SMS-based Disaster Monitoring System analysed

In Uganda there is a paucity of observed data with respect as to how people respond to different hazards. However, ownership levels of mobile phones in Uganda are relatively high and their usage is growing rapidly. Data gathered from the SMS-based Disaster Monitoring System should be analysed because this could be used to generate a clear picture of the actions of the stakeholders during emergencies and the effectiveness of the system itself.

Disaster Risk Financing system operational

The Disaster Risk Financing system should be being used regularly (i.e. at least once a week). The results of the Disaster Risk Financing system should be being disseminated to relevant stakeholders.

Inclusion of seasonal forecasting products into the Disaster Risk Financing system

Seasonal forecasting is the attempt to provide useful information about the "climate" that can be expected in the coming months. Seasonal forecasts are available from organisations such as NOAA and these can provide an outlook of the evolution of drought. It should be investigated as to how freely available seasonal forecasts can be used as inputs to the Disaster Risk Financing system to allow early, no regrets actions to be implemented in at risk areas, such as Karamoja, in advance of a drought.

Multi-hazard risk assessment

A multi-hazard national risk assessment for all hazards in Uganda should be carried out. This activity would quantify the magnitude and frequency of natural hazards and their associated impacts and aggregate these results for each district. It will provide the foundation for the prioritisation of risk reduction interventions and support national decision-making processes. A hazard atlas is currently being produced for UNDP but is not clear if this atlas will include risk, where risk is defined by the probability of the hazard occurring x consequences.

Increase the spatial scale of the Disaster Risk Financing system

The Disaster Risk Financing system is currently only planned to cover the Karamoja sub-region. The feasibility of increasing the spatial coverage of the Disaster Risk Financing system should be established and pilots should be carried out in other regions of Uganda.

6.4 Communication related issues

Production of monthly bulletin summarising all hazards

NECOC should produce a bulletin summarising all the major hazards. This bulletin would be produced monthly and collate all the information on the major hazards to affect Uganda. The bulletin would comprise two pages and bring together key information on the extent and location of droughts; food security; floods; animal diseases; human diseases; conflicts and other relevant information for policy makers and national level actors. The bulletin would be distributed a variety of means including email and also be made available via NECOC's and the participating organisations' websites.



NECOC web site updated at least monthly

The NECOC web site should be updated regularly. At a minimum on a monthly basis and the traffic to the web site should be monitored and reported.

Establish agreements between different actors to ensure that the warnings are delivered in a coherent manner

The dissemination of warnings needs to be established in government policy and/or legislation to ensure that this process is clear to government, NGOs and other organisations. There will be the need to establish an agreement between different actors to ensure that the warnings are delivered in a coherent manner.

Public awareness campaigns to improve awareness and the role of NECOC, as well as other actors in the case of a disaster

There is a requirement for a public awareness campaign to improve knowledge of the role of NECOC and other actors. The first step in developing and improving awareness of NECOC would be to create a plan of action to ensure that the key stakeholders at all levels (i.e. national, regional and local) fully understand the mission and goals of NECOC.

District Disaster Management Committee (DDMC) monthly bulletin produced

Monthly bulletins should be produced by the DDMCs. In Karamoja this could be based on information produced by the DEWS.

Establish the roles and responsibilities of all the organisations involved in the warning process for each hazard and how they interact with NECOC

The roles and responsibilities of all the organisations (e.g. ministries, WFP, private sector organisations, FEWS NET) need to be clearly defined and agreed in advance of the commencement of the operation of the NEWS by the Ugandan Government and all the relevant stakeholders. Although the national policy for disaster preparedness and management does this to a certain extent there is a need for more clarity. This will limit any duplication and improve the effectiveness of warnings. It will be important to allow the relevant organisation to maintain ownership of the warning for their own particular hazard to avoid confusion both in issuing warnings and with the recipients. It needs to be established which organisation has a role in the following:

- Developing risk knowledge.
- Monitoring, forecasting and warning.
- Dissemination and communication.
- Response.

The flow of information between Ministries, NGOs, projects, as well as other key actors and NECOC needs to be established.

Establish a coherent set of warning messages in conjunction with the relevant ministry for each major hazard

There is a need to establish a coherent set of warning messages with the relevant ministry for each major hazard in Uganda. Issues that currently exist with some of the warnings that are produced are as follows:

- The warning and messages are often too general and are not geographically or livelihood zone specific.

- The warnings produced are often not specific about the nature of the threat and its impacts. There is limited evidence of mechanisms in place to inform the community when the threat has ended.
- There is an absence of evidence on how people access and interpret early warning messages and lessons learnt incorporated into message formats and dissemination processes.

Establish a warning message improvement cycle

A method needs to be established whereby warnings can be improved. The current warnings for all major hazards need to be improved so that they are focussed on the correct responses by stakeholders. They should address the challenge of how effective responses can be encouraged from stakeholders for different hazards and the role that warnings have within that process. Warnings for different hazards should be improved with input from various levels of stakeholders. Communication, trust and credibility in the sources of warnings need to be looked at to avoid investing in accurate EWSs whose warnings are ignored. There is an absence of evidence on how people access and interpret early warning messages and how the lessons learnt are incorporated into message formats and dissemination processes.

In general the following principles should be adhered to:

- Warning methods need to be tailored to reach different types of stakeholders.
- Messages need to focus on actions to enable people to respond effectively.
- Communication, trust and credibility of the warning sources need to be high, otherwise these will undermine attempts to improve methods and messages.

6.5 Coordination related issues

Establish the roles and responsibilities of each organisation involved in the warning process for each major hazard

The roles and responsibilities of each organisation involved in the warning process for each major hazard should be established together with designating a coordinating body at the national, district and sub-county level. NECOC should work with key stakeholders to establish their responsibilities.

Develop low and no regret responses for major hazards

Develop low and no regret responses for a range of hazards and identify key actors in charge of delivering a response (from the national to the sub-county level). This could be carried out by identifying both the low and no regret responses commenced and the funding associated with them.

Development of a simulation exercise of a major event led by NECOC and involving all the key actors

A simulation exercise of a major event should be developed. This should be led by NECOC and involve all the key actors. The development of a simulation exercise and the subsequent holding of regular simulation exercises would allow the effectiveness of the NEWS to be assessed. This would include the dissemination of warnings and the response. Given the impacts of droughts in Karamoja it could be used as a region where this is carried out initially.



6.6 Monitoring and evaluation related issues

Evaluation of the effectiveness of early warning systems

An evaluation of early warning systems should be undertaken. This would evaluate whether or not the EWSs already established are being operated effectively, as per the prescribed frameworks and procedures and contributing to achievement of expected outcomes. This evaluation of EWSs should occur on a regular basis (e.g. annually). This could be undertaken via a survey of stakeholders at a variety of levels (e.g. national, regional and local levels).

Evaluation of the effectiveness of the dissemination of early warning messages

Following a major event it should be evaluated whether or not early warning messages were disseminated among the agencies and communities concerned in time by EWSs and also to assess if the relevant stakeholders have benefited from the messages.

6.7 Proposed programme for the NEWS roadmap

A proposed outline programme for the implementation of the NEWS roadmap is given in Tables 4 and 5.



Activities within different areas	Month																																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36				
Mandate and policy																																								
Establish memorandum of understanding for NEWS with all relevant actors																																								
Develop Standard Operating Procedures																																								
Clarify decision making structures with all stakeholders providing warnings and information to NECOC																																								
Establish a clear vision for the District Disaster Management Committees (DDMCCs)																																								
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Establish the economic benefits of the NEWS																																								
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Data systems																																								
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Disaster Risk Financing system operational																																								
Multi-hazard risk assessment																																								
Seasonal forecasting products included in the Disaster Risk Financing system																																								
Increase the spatial scale of the Disaster Risk Financing system so it operates across the whole of Uganda																																								

Table 4 Proposed programme for the implementation of the road map for the development of a multi-hazard National Early Warning Systems (NEWS)



Table 5 **Proposed programme for the implementation of the road map for the development of a multi-hazard National Early Warning Systems (NEWS)**



SECTION 7

Conclusions and recommendations

7.1 Conclusions

This section details the conclusions of this work under relevant headings below.

7.1.1 Existing Early Warning Systems (EWSs) and tools in Uganda

The following can be concluded with respect to existing EWSs and relevant tools in Uganda:

- Many of the current EWSs in Uganda are piecemeal in nature and not complete. Many do not appear to be sustainable from both a financial and technical point of view. Over 90% of stakeholders who responded to an anonymous internet-based survey stated that existing EWS were “never” or only “occasionally” financially sustainable.
- Few of the tools incorporate a forecasting aspect and little use appears to be made of internationally, freely available short- (i.e. <10 days) and medium- term (i.e. <40 days) climate forecasts. Most of the EWSs currently being used in Uganda are based on situational analyses which are, at best, based on the situation of the previous day. The incorporation of climate forecasts could help encourage early action, rather than responding to a crisis once it has unfolded, which is usually significantly more costly and less effective than responding in advance. For example, there are a number of drought EWSs focusing on Karamoja but only one of these (FEWS NET) attempts to forecast the effects of droughts in advance of their occurrence.
- The number of different, sometimes parallel, initiatives reflects a lack of coordination between government ministries, donors and NGOs with respect to existing EWSs and relevant tools. For example, in Karamoja, an Open Data Kit is used by various organisations to collect data relevant to food security in the sub-region. There is potential to coordinate data collection related to droughts, food security and disaster risk financing. The lack of coordination between stakeholders is reflected by respondents to a survey, 75% of whom said that existing EWSs “never” or only “occasionally” facilitate effective coordination between multiple government stakeholders.
- A number of useful innovative evaluation tools, related to droughts and food security, such as the PET and EMPRES-i have been piloted in Uganda. However, they do not appear to be widely used or to receive the appropriate amount of funding to make them financially sustainable. These tools have the potential to improve the effectiveness of EWSs related to food security and droughts.
- After droughts, floods are considered by many stakeholders to be the second most relevant hazard in Uganda. However, there is currently nothing in place that resembles a national or regional flood forecasting system.
- There would appear to be a limited amount of monitoring and evaluation carried out on the effectiveness of existing EWSs with respect to meeting their stated objectives.
- The donor community needs to ensure that systems are in place to integrate EWSs throughout the development and humanitarian cycle.

- The gap between information provided by the EWSs about impending hazards and the ability of government to act to reduce these threats in advance, would appear to be the main shortcoming. The capacity of stakeholders to interpret and disseminate early warning information to engender contingency plans in advance of a threat is limited. Some 75% of stakeholders responding to a survey (see Annex 1) stated that existing EWSs “never” or only “occasionally” emphasise preventative actions.

7.1.2 Existing policies and legislation relevant to EWSs in Uganda

- The current mission of NECOC and the role of a NEWS needs to be clarified, as there is some confusion over both their roles, within NECOC and with respect to other key actors.
- The percentage of the national budget allocation for disasters in Uganda is not currently commensurate with the impacts that natural hazards have on the country’s GDP.
- The current institutional framework for disaster preparedness and management would appear to be inadequate and lack transparency and accountability.

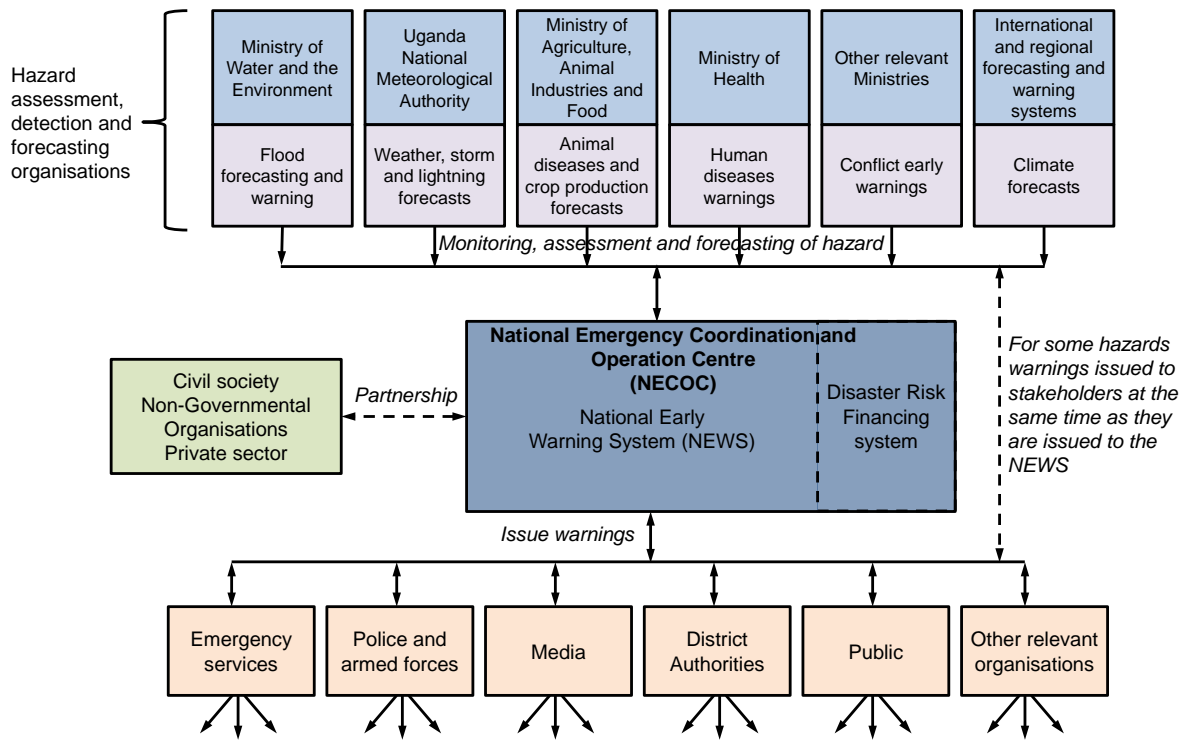
7.2 Recommendations

In order for the proposed National Early Warning System to be effective the following needs to be put in place:

- The actions detailed in the road map in Tables 1, 2 and 3 need to be agreed and a way forward to implement them needs to be scoped out with the relevant government agencies and donors.
- It should be ensured that there is strong political recognition of the institutional capacities and the need for the establishment of a coordinated structure and processes for the NEWS.
- It should be ensured that capacities are aligned with resources across national to local levels to enable development of relevant EWSs, the NEWS and relevant response mechanisms.
- The NEWS should be implemented using a scalable strategic plan that enables decision-making processes to address the impacts of natural hazards across all levels of government.
- The NEWS should be established within a country’s disaster risk management planning and legislation.
- The operations of the NEWS should be detailed within disaster risk management related plans and legislation.
- Existing government organisations for specific hazards should maintain a mandate and autonomy for the dissemination of warnings; however, this should be coordinated with NECOC and the NEWS.
- The national early warning Committee or secretariat should be established and operationalised.

A recommended possible structure for the NEWS is shown in Figure 27.

Figure 27 Possible future organisation of NECOC and the NEWS in relation to other EWSs





SECTION 8

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SECTION 9

Consultees

Catherine Ahimbisibwe, Senior disaster preparedness officer, Office of the Prime Minister

Kenneth Aguret, Economic development officer, Mercy Corps

Monica Anguparu, Care Uganda

Lawrence Aribo, Uganda National Meteorological Authority

Jamie Arkin, Programme manager, Human Network International

Agnes Atyang, Independent consultant

Deus Bamanya, Director, Uganda National Meteorological Authority

Yazidhi Bamutaze, Makerere University

Kenneth Barigye, Country director, Lutheran World Relief

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Imogen Bryson, ACTED, Uganda

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Vivien Deparday, Disaster risk management specialist, World Bank

Solomon Elungat, Senior disaster preparedness officer, Early warning and awareness, Office of the Prime Minister

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Martin Fowler, Senior Agriculture Adviser, USAID Uganda

Cristiano Giovando, Terrapan Labs

Steven Goldfinch, Disaster risk management advisor, United Nations Development Programme (UNDP)

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Bill Leathes, UK Met Office International development manager
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 Barry Maher, Senior risk financing and insurance specialist, The World Bank
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 Henry Massa Makuma, Environment and geo-information manager, ESIPPS International Ltd
 Gerald Simon Menhya, Office of the Prime Minister
 Roy Mugoya Mhanga, Office of the Prime Minister
 Samuel Mugarura, National technical manager, Famine Early Warning Systems Network (FEWS-NET)
 Geoffrey Muhindo Muhumuza, Disaster risk reduction and adaptation coordinator, Save The Children
 Titus Muhofah, Senior disaster management officer, Office of the Prime Minister
 Joseph Muhumuza, Country coordinator, Conflict Early Warning and Early Response Unit (CEWERU)
 Brian Mugabe, Northern Uganda data centre, Office of the Prime Minister
 Racheal Muleke, Independent consultant
 Khalid Muwembe, Uganda National Meteorological Authority
 Augustine Mwendya, Chief executive secretary, Uganda National Farmers Federation
 Catherine Lilian Nakalembe, University of Maryland/Office of the Prime Minister
 Olwa Nickson, Deputy head of conflict early warning and early response unit, Ministry of Internal Affairs
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 Otim Faustine Charles Obeke, Uganda National Meteorological Authority
 Enid Kabasinguzi Ocaya, Disaster risk reduction and community resilience manager, World Vision
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 Pascal Okello, Strengthening Climate Information and Early Warning (SCIEWS), United Nations Development Programme (UNDP)
 Fred Owera Odom, Disaster risk manager, Plan International
 Jimmy Ogwang, Disaster preparedness officer, Office of the Prime Minister
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 Gabriel Agiro Okot, Programme specialist, International Institute of Rural Reconstruction (IIRR)



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Lilu Thapa, Country Director, Danish Refugee Council

Hamido Tusime, World Food Programme

Martina Ulrichs, Overseas Development Institute, UK

Mattias Wengelin, Executive director, Safe Waters Foundation

Milton Makoba Wetaka, Public Health Emergency Operations Centre (PHEOC), Ministry of Health

Christine Wright, Head of safety nets and resilience, World Food Programme



APPENDIX A

Draft memorandum of agreement

The National Emergency Coordination and Operations Centre (NECOC) and **[ADD RELEVANT ORGANISATION'S NAME HERE]** each hereafter referred to as an “Organisation” or “Organisations” consider that it is within the Organisations’ common interest, as well as the public’s interest to enhance their co-operation in contributing to early warnings for **[ADD HAZARDS RELEVANT TO THE CO-OPERATING ORGANISATION]** as part of progressing towards an integrated multi-hazard National Early Warning System (NEWS) for Uganda.

This Memorandum of Understanding (MOU) takes note of the ongoing co-operation and progress achieved to date in the identification of possible areas of mutual interest concerning early warnings and the ongoing efforts on joint co-operation.

This MOU acknowledges the respective mandates as set out in the Ugandan Government’s National Policy for Disaster Preparedness **[NOTE THIS MAY BE DIFFERENT FOR NGOs AND UN ORGANISATIONS]** and the joint need to further develop information exchange and better mutual understanding between both Organisations with the overall goal of progressing towards an integrated NEWS for Uganda.

1. Purpose of the Memorandum of Understanding

The purpose of this Memorandum of Understanding (MOU) is to enhance co-operation between NECOC and **[ADD RELEVANT ORGANISATION'S NAME HERE]** on matters of mutual interest in particular through efforts at information exchange, better mutual understanding and increased co-operation with respect to delivering an integrated NEWS for Uganda.


2. Areas to which the MOU applies

In accordance with their respective mandates co-operation between the two Organisations will relate to early warnings for **[ADD RELEVANT HAZARD HERE]** and any other matters related to early warnings falling within the remits of the two organisations with respect to the development on an integrate NEWS.

3. Mutual consultation

NECOC and **[ADD NAME OF RELEVANT ORGANISATION]** undertake where possible and appropriate to:

- Participate in regular steering group meetings on the development of the integrated NEWS
- Consult each other regularly and endeavour to keep each other informed on strategic matters of common interest related to early warnings
- Consult each other to ensure a degree of co-ordination in regards to early warnings in which both Organisations have an interest

- 
- Consult each other in the event of an emerging **[ADD NAME OF HAZARD]** that may affect public health and safety
 - Consult each other when delivering scientific advice and risk assessments that concern **[ADD NAME OF HAZARD]**

4. Confidentiality of information

Each Organisation will ensure that any information exchanged on the basis of this MOU will be treated in accordance with applicable laws and regulations governing the processing and release of information.

5. Amendments

This MOU may be amended by the mutual consent of NECOC and **[ADD NAME OF RELEVANT ORGANISATION]** at any time.

6. Entry into force

This MOU will enter into force upon signature of both Organisations.

FOR THE NATIONAL EMERGENCY
COORDINATION AND OPERATIONS CENTRE

FOR **[ADD RELEVANT
ORGANISATION'S NAME]**