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How can policy makers in sub-Saharan Africa make early warning systems more effective? The case of Uganda

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ABSTRACT

Sub-Saharan Africa is affected by three main weather-related hazards: floods, droughts, and tropical cyclones. Effective early warning systems (EWSs) can reduce the risks posed by these hazards. There have been numerous EWSs set up throughout Africa; however, work out to assess their effectiveness has been limited. This paper covers sub-Saharan Africa using Uganda as a case study. Recently in Uganda there has been a proliferation of EWSs targeted at various beneficiaries. Engagement with a range of stakeholders via an internet-based survey and interviews in Uganda and the rest of sub-Saharan Africa found that EWSs often do not communicate hazards well to vulnerable communities or reduce their impacts at a local level. There are numerous barriers to providing effective warnings. In many sub-Saharan African countries EWSs are not sufficiently budgeted for by the government despite the benefits that can be realised. In Uganda EWSs and the hydro-meteorological networks on which they often rely are underfunded, a situation that is mirrored throughout Africa. This can lead to an absence of confidence in EWSs, meaning that stakeholders do not use formal thresholds to provide triggers for early action. For EWSs in Uganda and the rest of Africa to be effective they need to have not only a strong scientific and technical basis, but also a strong focus on the people at risk and governments need to set aside sufficient funding to ensure that as a minimum their recurrent costs are covered, which currently is not generally the case.

1. Introduction

Sub-Saharan Africa is prone to a wide variety of weather-related hazards including floods, droughts, tropical cyclones and landslides which cause extensive losses to livelihoods and property, as well as loss of life. Sub-Saharan Africa's population was estimated to be 1.1 billion people in 2015 with many of these people living in areas exposed to natural hazards [33]. Given that the region's population is currently growing at a rate of 2.6% per annum [5] the number of people exposed to weather-related hazards could increase by almost 90% in 25 years' time.

Effective early warning systems (EWSs) can play an important role in reducing risks posed by natural hazards. An EWS detects and forecasts impending hazardous events and allows warnings to be formulated based on scientific knowledge, monitoring and a consideration of the factors that affect disaster severity and frequency. This paper looks at the perceived effectiveness of EWSs for weather-related hazards in sub-Saharan Africa overall, with a specific focus on Uganda, and the challenges faced by policy makers in implementing people-centred EWSs in the region.

Section 2 of the paper focuses on the effectiveness of EWSs in Uganda based on an internet survey and semi-structured interviews with key stakeholders. The country acts as a case study to show some of the challenges that are faced by policy makers in Africa with respect to EWSs and the differences in the perception of the effectiveness of EWSs between government and non-government stakeholders.

Section 3 provides an overview of the existing institutional structure and policy in Uganda, relevant to EWSs. Section 4 outlines the barriers to the provision of effective EWSs in Uganda with Section 5 discussing these more widely in the context of sub-Saharan Africa. The final section provides some pointers to policy makers as to how they can help to ensure that EWSs for weather-related are more effective.

2. The effectiveness of early warning systems in Uganda

2.1. Risk profile of Uganda

Uganda is ranked among the world's malnutrition-burdened countries, with one in five people suffering its effects [35]. Uganda is also at high risk from a variety of weather-related hazards, which have the potential to adversely affect progress on poverty reduction and economic growth. Uganda's disaster profile constructed for the period

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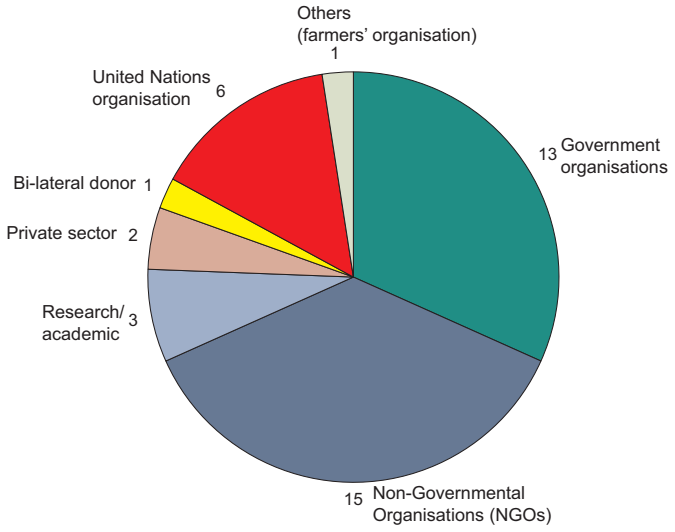

Fig. 1. Types of organisations that responded to the survey on the early warning systems in Uganda.

1933–2012 estimates that over nine million people have suffered the effects of natural hazards [29]. The World Bank has estimated that at least 200,000 Ugandans are affected by disasters each year [25,23].

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 2010–2016) identified drought as the most severe disaster affecting the lives and livelihoods of its citizens [24]. Droughts normally occur in the northern and eastern parts of the country, where the land is semi-arid in nature. The focus of many EWSs in Uganda has been on the Karamoja sub-region, located in the north-east of the country. Karamoja is a semi-arid area, which has historically often suffered from food insecurity partly as a result of its climate. 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 figure was 56% in 2014 [31].

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, displacing 58,000 people. More recently, the floods of 2013 in western Uganda's Kasese district affected 30,000 people, and the floods of November 2014 displaced at least 16,000 people when the Semlikiin River in the west of the country burst its banks. The only flood EWSs in place are a handful of community-based schemes based on observed, not forecast, water levels that are limited in nature, both with respect to their geographical extent, effectiveness and lead times[1] [19].

Landslides are more frequent in the mountainous regions of Mbale, Kabale, Kisoro, Sironko, Kapchorwa and the districts in the Rwenzori region [21]. In 2004 it was estimated that 31% of the total population in Uganda lives in mountainous areas, and is therefore potentially vulnerable to landslides [15]. In 2010, landslides in Bududa district in eastern Uganda, killed over 400 people, leaving another 5000 displaced [2] and in August 2017 over 200 people were forced to move following a landslide that hit three villages in the same district. There are no landslide EWSs in Uganda. Short term rainfall forecasts could be used with other information and models to give warnings with lead times for landslides of up to 48 h.

In Uganda only one[2] of the EWSs in use by stakeholders incorporates a forecasting aspect. Most of the EWSs in Uganda are based on situational analyses which are, at best, based on the situation the previous day. The use of seasonal climate forecasts for droughts could provide months of lead time in which to initiate low or no regret actions. For floods, in large catchments short-term weather forecasts could provide lead times of a few hours to several days depending on their size. However, the current lack of flood forecasting models for rivers and lakes in Uganda means floods cannot be predicted in advance.

2.2. Stakeholders perceptions of early warning systems in Uganda

Over the past decade in Uganda there has been a proliferation of EWSs, each monitoring different or, in some cases, the same hazards and issuing their own warnings targeted at various audiences. The successful communication of early warnings in order to engender the desired response in the recipients is often stated by stakeholders in sub-Saharan Africa as being one of the biggest barriers to the effectiveness of EWSs [17].

In 2016, as part of work for the UK Government's Department For International Development (DFID), a survey was distributed to 104 stakeholders with an involvement in EWSs in Uganda to gain an understanding of their perception of their effectiveness [19]. The 104 stakeholders contacted to take part in the survey represented the majority of Uganda's EWS community working at a national level and whose day-to-day work is directly related to EWSs. Of the 104 stakeholders sent the survey: 40 worked for Government organisations; 30 worked for Non-Governmental Organisations (NGOs); 22 worked for UN Agencies; 8 worked for bilateral donors; 3 worked for private sector organisations; and 1 worked for a farming-related organisation. Their contact details were provided by relevant Ministries, Uganda's National Emergency Coordination and Operations Centre (NECOC), United Nation Agencies, as well as donors and international funding agencies such as DFID. The survey was designed so that it could be answered in less than 10 min. A total of 41 responses were received with everybody completing the survey in its entirety (i.e. a 100% completion rate), which was considered to be a reasonable response rate.

The types of organisations and the corresponding number of responses to the survey are shown in Fig. 1. The types of organisations that responded to the survey fell into three different types:

- *Non-Governmental Organisations (NGOs), n = 15 out a total of 30 (50% response rate)*
- *Government organisations, n = 13 out of a total of 40 (32% response rate)*
- *Others (i.e. United Nations organisations, private sector, bilateral donor and farming organisations), n = 13 out of a total of 34 (38% response rate)*

The responses are reasonably representative of the initial target population and this should limit bias in the overall statistical analysis of the responses detailed below.

2.2.1. Stakeholders perceptions of the effectiveness of early warning systems in Uganda related to communication and engendering local actions

The Ugandan stakeholders were asked the following questions related to the effectiveness of EWSs in the country:

- *How well is a threat of a hazard communicated to vulnerable communities?*
- *How well does the warning lead to local actions?*

The respondents were given four choices to these questions which were: “very well” (#1); “well” (#2); “poorly” (#3) or “very poorly” (#4) of which they were able to pick one. Their answers are shown in Fig. 2. The null hypothesis (H0) tested was that existing EWSs do the following “very well” (#1) or “well” (#2):

[1] This is the time between the warning being issued and the forecast event occurring.
[2] The Famine Early Warning System (FEWS) NET attempts to forecast the effects of droughts in advance of their occurrence.