

**FINAL REPORT: FLOOD FORECASTING AND EARLY WARNING
SYSTEM (FFEW) ASSESSMENT FOR SOUTH SUDAN**

**FLOOD FORECASTING AND EARLY WARNING ENHANCEMENT
PROJECT**

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ENTRO is an organ established to implement the Eastern Nile Subsidiary
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EXECUTIVE SUMMARY

South Sudan is a new country that came to exist as a sovereign and an independent state on 9th July 2011. As a new country it is imperative that challenges, gaps and inconsistencies of any kind including flood forecasting and early warning systems cannot be ruled out. In this respect therefore the launching of this Eastern Nile Flood Forecasting and Early Warning Project came at right time. Following the review, mapping and survey carried out by the consultant during the study exercises, much useful information about the project which is important and beneficial to Eastern Nile countries was identified.

The rationale for establishment and launching of this project is because of the presence of the inconsistencies, gaps and challenges that exist in the sub-basin including the presence of different models which make it difficult to upgrade whenever a new one is developed. These challenges created an idea in the minds of members of Eastern Nile countries to think of how something better and useful should be done to correct the status quo. It becomes therefore necessary to develop a single model for the sub-basin which could be used in every Eastern Nile countries. To better understand the nature of these challenges a study has to be done.

The study consists of three separate components. The first was the inception phase. This was mainly done to lay down the foundation of the flood forecasting and early warning programme in the country in regard to nature and status of the flood. The second phase consists of the dynamics, processes and the impacts of the floods. And the final component consists of the specific cases of floods in each and every country of the eastern Nile countries. For the case of South Sudan the third component study concentrated to the flash floods which happened between July and November 2019.

This study which was done in South Sudan, found out that the country is a flood prone country whereby its floods happens annually. For this reason it requires some dynamic and robust flood forecast programme responses to address its impacts on annual bases. The study also identified specific flood prone areas including vulnerable communities. These areas includes, Akobo, Nassir, Malakal, Bor, Juba, Torit, Kapoeta, Aweil, Rumbek, Mangala and other smaller towns in the country. The corresponding communities in those places are the Nuer, Anyak, Dinka, Bari, Chollo, Jur Bel and many other town dwellers of various occupations which are also affected by those floods.

But unfortunately the study also found out that South Sudan has no robust and active flood forecast and early warning systems programme put in place for addressing this phenomenon. Following the mapping, survey and review exercise that was carried by the consultant, the study found out that almost ten to twelve government institutions, national Parastatal agencies and community based organizations which have a stake in flood related management.

The study also identified some challenges of these institutions which hamper their active involvement in flood forecast and early warning systems management. These challenges include among others lack of policy, legal and institutional frameworks and mechanisms, capacity gaps, among the technical and decision and policy makers, budgetary and funding

constraints from government treasury and development partners respectively, communication technology and others. A proposal is also made to ENTRO to extend the capacity building programme which is going on to other stakeholders as well to ensure that the capacity of all the stakeholders in the country can be strengthened and deepened.

Another important item identified and discussed during the study is the issue of communication methodology and technology in flood forecasting and early warning system which are supposed to be applied in flood early warning issues. These methods include the best practice which consists of email, radio, and television and news bulletin in most cases. The study also discusses the current methods of communication which are not really different from the best practices. The challenges of communication were also identified. This includes lack of internet and power, lack of capacity, lack of the facilities, lack of policy, legal and institution framework inadequate funding and lack communication infrastructure.

It is recommended that a unit of communication should be created or established in the Ministry of Water Resources and Irrigation for receiving and sending of quick and urgent messages of flood early warning to vulnerable communities and other stakeholders. It is believed that if the communities are informed earlier, they are able to prepare themselves to address the consequences that flood would occur. One of an important element of communication is the recognition of the indigenous practices. These methods if promoted and encouraged, they can be very useful tools for flood forecasting and early warning systems in the country both in South Sudan and in the other countries.

The other important issues identified in the exercise are the institutional setup between the regional and national levels. The study recognised the role played by the regional and national institutions in flood forecast but it has been discovered that South Sudan does not have a country office for ENTRO in Juba despite the fact that it has these offices in Ethiopia and Sudan. IGAD has an early warning office in Nairobi which can support South Sudan in this particular field as South Sudan is its member but due to inadequate power and internet connectivity in the country, it becomes difficult for the staff of various institutions to access the data and information from the site.

In conclusion, the consultant would like to re-iterate that South Sudan is a flood prone country and being a new country, it is very important to note that flood forecast and early warning systems programme in this country though necessary is still non-existent. The study also recognized that the challenges to flood forecast and early warning system in the country are huge such that a cooperative approach in addressing these challenges is needed.

The consultant would like to make the recommendation that for the ENTRO and South Sudan to succeed of flood early warning management, the issue of capacity and institutional building, resources mobilization and policy development for flood forecasting should be given a priority in their planning. ENTRO and Ministry of Water Resources and Irrigation need to develop guidelines for regulating the activities of those who have gone for those flood training financed by ENTRO so that the efforts to improve the systems will be successful.

Acronyms

AF	Appeal Fund
CBO	Community Based Organization
CISPO	Community Initiative for Sustainable Peace Organization
CSO	Civil Society Organization
DREF	Disaster Response Emergency Fund
ENC	Eastern Nile Countries
ENFFEWSP	Eastern Nile Flood Forecast and Early Warning System Project
ENSFFEWS	Eastern Nile Seasonal Flood Forecast and Early Warning System
ENTRO	Eastern Nile Technical Regional Office
ESCAP	Economic and Social Commission for Asia and the Pacific
HYCOS	Hydrological Cycle Observation System
ICPAC	IGAD Climate Prediction Application Centre
ICRC	International Committee of Red Cross
IGAD	Inter-Governmental Authority for Development
IKS	Indigenous Knowledge Systems
IOM	International Organization for Migration
MAFS	Ministry of Agriculture and Food Security
MEF	Ministry of Environment and Forestry
MHADDM	Ministry of Humanitarian Affairs and Disaster Management
MLF	Ministry of Livestock and Fisheries
MRT	Ministry of Roads and Transport
MWRI	Ministry of Water Resources and Irrigation
NBI	Nile Basin Initiative
NELSAP.CU	Nile Equatorial Lakes Subsidiary Action Programme. Coordination Unit
NGO	Non-Governmental Organization
SSCAA	South Sudan Civil Aviation Authority
SSMA	South Sudan Meteorological Authority
SSRC/RC	National Red Crescent and Red Cross Society
SSRC	South Sudan Red Cross
UNCEF	United Nations Children's Education Fund
UNMISS	United Nation Mission in South Sudan
WMO	World Meteorological Organization

Table of Content

Contents

EXECUTIVE SUMMARY	3
Acronyms	5
1. INTRODUCTION	9
1.1. Rationale and Objectives of Consultancy Work	9
1.1.1. Rationale of the Project.....	9
1.1.2. Objectives of the Project.....	9
1.2. The Study Sub-basins	9
1.3. The Overview of (EN) Seasonal Flood Forecast and Early Warning (ENSFFEW)	9
1.4. Methodology	10
2. THE MAPPING OF STAKEHOLDERS IN FLOOD EARLY WARNING SYSTEM.....	12
2.1. Data and Forecast Providers	12
2.2. Forecast Warning Users.....	15
2.3. The Vulnerability Mapping for Settlements on Flood Prone areas.....	19
3. THE ANALYSIS OF STAKEHOLDERS GAPS IN EARLY WARNING.....	21
3.1. Forecast Providers.....	21
3.2. Forecast Warning Users.....	23
4. THE METHODOLOGY OF COMMUNICATION FOR EARLY WARNING.....	25
4.1. The Best Practices of Global Communication Methods in Early Warning	25
4.2. The Current Early Warning Communication Method in South Sudan	25
4.3. Gaps in Existing Communication Methodology in South Sudan	26
4.4. The Proposed Early Warning Communication Method and Technology	27
4.5. Existing Indigenous Flood Early Practices	27
5. CURRENT RESPONSE ACTIVITIES TO FLOOD EARLY WARNING	30
5.1. Performance of Current Response to Flood Early Warning	30
5.2. The Proposal on how to improve the response to early warning	31

6. INSTITUTIONAL ARRANGEMENT.....	32
6.1. Gaps in the Current Institutional Setup at Regional and National Level	32
6.2. The Proposed setup for an effective Early Warning Systems Level.....	32
7. CONCLUSION AND RECOMMENDATION.....	34
7.1. Conclusion.	34
7.2. Recommendation	34

Table of Figures

Figure 1 The Map of South Sudan Flood Prone Areas and the corresponding Vulnerable Communities and their Villages.	19
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The Political Map of South Sudan



1. INTRODUCTION

1.1. Rationale and Objectives of Consultancy Work

1.1.1. Rationale of the Project

The rationale for the design, establishment and launching of Eastern Nile Flood Forecasting and Early Warning System project by Eastern Nile Technical Regional Office (ENTRO) composes of many factors, gaps and challenges. These includes but not limited to the inconsistencies that prevails in the region, the level of limited capacity of enhancing the current system to an acceptable standard, the presence of different models for different flood prone areas which make it difficult to update whenever a new version is developed and the challenge of communication and dissemination of any information and message to other key stakeholders in the EN countries is causing problems to ENTRO.

To address these challenges, there is need for establishment of a single and unified forecasting and early warning systems so that a detail and in-depth study of communities and their social, economic and cultural characteristics to ensure that a viable, robust and easy to operate response and preparedness mechanism is designed for the entire Eastern Nile countries. This is why Eastern Nile Flood Forecasting and Early Warning Systems project (ENFFEWSP) is necessary to be launched to serve the vulnerable population in the region to avoid loss of lives and properties of some citizens in the EN countries. The project will also take into consideration the recent flash floods which have never happened in recent history.

1.1.2. Objectives of the Project

- To design a robust forecasting and early warning system that effectively and efficiently minimize loss of lives and damage of properties by enhancing, and developing a unified Flood Forecast and Early Warning system for EN countries.
- To support other studies under FFEWS that contribute in addressing flash floods, stakeholder's analysis and flood related DSS development.

1.2. The Study Sub-basins

The overall study of flood forecasting and early warning systems management in the Eastern Nile countries covers three important sub-basins. These are Baro-Akobo-Sobat, Blue Nile, and Tekeze-Setite-Atbara. But in South Sudan the focus of this study is done on Baro-Akoba-Sobat but other sub-basins of Bahr el Jebel, Bahr el Ghazal and White Nile was also studied. There is also a little discussion about the western part of the country.

1.3. The Overview of (EN) Seasonal Flood Forecast and Early Warning (ENSFFEW)

The Eastern Nile Seasonal Flood Forecast and Early Warning is one of the activities carried out by Eastern Nile Technical Regional Office (ENTRO) in fulfilling its mandate of serving the Eastern Nile countries in advancing the Nile cooperation. The ENSFFEW runs from July to September even though the rainy season in South Sudan begins from May to early November. The main purpose of the seasonal forecast and early warning is to monitor rainfall and river levels with an objective of predicting floods so that the lives of about two million

vulnerable communities at risk can be reduced. This year has witnessed abnormal flood situation which is described by some as the first of its kind in their lifetime.

The planned scope of the seasonal flood forecast isto covers all sub-basins of the four Eastern Nile countries of Egypt, Ethiopia, South Sudan and Sudan which lie within the Nile Basin. But practically the flood forecast and early warning is done on Lake Tana in Ethiopia,Baro-Akobo-Sobat in Ethiopia and South Sudan and in Blue Nile and Main Nile in Ethiopia and Sudan respectively. The main flood prone areas covered by the focus are the towns of Gambella and Akobo, Dolet Hills in the outskirts of Malakal town in South Sudan, Ed Deim and Khartoum in Sudan and around L.Tana area in Ethiopia.

The main issues which are covered by the seasonal flood forecasting and early warning includes but not limited to Hydrographs of the rivers which explains the levels of water as a result of rain fall in the basins or sub-basins, rainfall which explains the frequency and duration of rainfall whether it can cause flood or not, flood depths, which explains the level of water which can predict the intensity of flood, flood maps which explains the coverage of floods and information users who are the stakeholders. Some of the issues discussed during the flash floods in South Sudan include unpredictable and unknown sources of the floods

The forecast and early warning systems has produced a lot of data and information during the four or so months of flood forecasts. As a result of this, about 200,000 thousand people do receive alerts and messages of floods in Sudan and about 150,000 thousand people in Ethiopia. But it is not very clear as to how many people have received flood alerts in South Sudan. For the sudden and flash abnormal floods which happened in South Sudan has affected an estimated number of about one million people. The noticeable challenge of this forecasting is that the coverage is very low especially in South Sudan.ENTRO is therefore recommended with the support of the EN countries to widen this scope of this exercise so that a good number of EN countries citizens particularly the citizens of South Sudan can benefit from this forecast and early warning system so that they can save their lives and properties.

1.4. Methodology

The consultant used seven methods during the study to ensure that the information and data obtained from the study is accurate, reliable and of high quality. These methods include the following:-

Literature Review

This method was used to obtain data and information from international best practices and the needs of stakeholders both at the national and at the local levels. Not only success was considered alone but failures of other countries in flood management and early warning were considered. Several documents were reviewed and important and useful data and information was discovered. The emphasis here was to find out about information, communication and dissemination methods which facilitate flood forecasting and early warning processes among global, regional, national and local levels.

Application of Questionnaires

This method was used as a guide to obtain specific data and information from the key stakeholders who address key issues such as who are the responsible people? Which departments within the institutions are responsible for early warning systems managements? How do the communities receive information well in advance before flood happens? What

are the preferable methods of dissemination and communication in the country in general and among the communities in particular? Were there any indigenous early warning methods in the communities or not. Was there any spectacular flood incidence in some of the elders 'lifetime'?

Interview Method

This method was used to obtain data and information from specific groups of people. As a result of this method; a number of people were interviewed by the consultant. These include interest groups and other key stakeholders such as policy and decision makers, local politicians' community and religious leaders, affected communities, chiefs, women leaders, and the youth. The consultant also interviewed some intellectuals both national and foreign nationals.

Observation Method

This method was used to obtain data and information about an event which happens in the presence of the consultant when there is nobody responsible to address the issues affecting people. The example of this was the flooding in Juba town during the months of July and August 2019 which blocked roads and there was no body available to answer questions such as what caused this flooding and who is supposed to address this?. This method was also used for obtaining data and information about the current and preferred methods of information dissemination and communication both at the global, national and local levels.

Dialogues with Key Stakeholders

This method was used to find out the correct information from the members of the same institution. This was because some professionals have a different understanding of what early warning means. To create a common understanding and consensus, they have to dialogue and make extensive discussions and debate about the relevant and contextual methods for South Sudan.

Focus Group Discussions

This method was applied to obtain information from interest groups. The interests of such groups are basically expectations and aspiration of what they think or expect should happen to address this recurring phenomenon. Or the benefits they would gain politically as a result of these disasters. These groups include women, local politicians, religious groups, independent researchers and media professional and members of Parliament. There was also a specific discussion with those affected by the recent abnormal floods in the north of the country in which an approximated one million people were affected by the flood

Research Questions

Research questions are those questions which came out during the course of discussions. As the discussion intensifies it becomes apparent that some of the information requested by the consultant could not be obtained through the questions in the questionnaire. These are questions like what methods do you use as a group or as a person? Which method do you preferred and at what time do you need it to be communicated or disseminated.

2. THE MAPPING OF STAKEHOLDERS IN FLOOD EARLY WARNING SYSTEM

2.1. Data and Forecast Providers

Eastern Nile Technical Regional Office

The mandate of ENTRO is to support Eastern Nile Council of Ministers and the Eastern Nile Subsidiary Action Programme Team with a purpose of advancing and enhancing cooperation among Eastern Nile countries on Water Resources Management and Development.

In regard to flood forecasting and early warning systems management, generates information through the Eastern Nile Seasonal Flood Forecasting and Early Warning and send it to the Ministries of Water Affairs and Universities and Institutions in Eastern Nile Country that are cooperating with them across the sub-basin so that they can send the data to their data users.

In regard to flood forecasting and early warning activities, ENTRO conducts daily monitoring to produce forecasts through its seasonal flood forecasting and early warning system. It uses the rain and hydrological data to model and predicts floods. It generates data and information and communicates and disseminates it to different stakeholders at different levels across the basin countries and hopefully across the communities.

Ministry of Water Resources and Irrigation

The mandate of Ministry of Water Resources and Irrigation is to sustainable harnessing and accountable management of water resources of South Sudan that responses to water related public health needs, livelihoods and development aspirations of the people of South Sudan in an equitable manner.

In terms of flood forecasting and early warning services, it is supposed to develop plans for risk and disaster prevention measures with a clear term of reference for the required capacity on all levels of government at an annual base. But this has not happened due to lack of political will as well as lack of resources and technical staff with the necessary skills and expertise.

The Ministry through the Directorate of Hydrology and Survey is supposed to generates information and send it to the Ministry of Communication particularly to South Sudan Radio and Television network and other media houses for dissemination, Ministry of Disaster Management for humanitarian intervention, Department of Civil Defence for evacuation purposes and other important stakeholders for their various uses but this does not happen because of lack of facilities, equipment and systems of collecting and communicating information to the key stakeholders.

Ministry of Environment and Forestry

After reviewing the Environmental Policy, Environmental Bill and having some discussions with the Director General of Directorate of Planning and Sustainable Development and other officials of the Ministry, it was found that, the Ministry of Environment and Forestry has the responsibility to protect, preserve and manage the environment as well as ensure the sustainable utilization of natural resources of Republic of South Sudan. In regard to flood forecasting and early warning, it was also found out from the policy, legal documents and from the discussions with the senior officials of the ministry that the Ministry of Environment and Forestry is supposed to work jointly with the South Sudan Meteorological Authority to generate weather and rainfall data.

At the same time the MEF is supposed to complement the Ministry of Water Resources and Irrigation to generate data on flood forecasting and early warning for the country. But this does not happen because the department of flood forecast and early warning has never been established and no staffs were employed for the assignment. Because there are no institutional arrangements and technical staff for flood forecasting and early warning in the Ministry, it becomes very difficult to tell exactly the type of activities it plays in generating the data the Ministry is supposed to collect whether rain, weather or river in this particular activity.

Ministry of Roads and Transport

From the Policy, it was found that The Mandate of the Ministry of Roads and Bridges is to develop and maintain roads, airports and bridges network, and for the efficient and safe provision of road and air services in all the states of the Republic of South Sudan through the co-ordination and management of all activities of the Ministry.

In regards to flood forecasting and early warning systems, the data on rain and weather is collected by the South Sudan Meteorological Authority which is a subsidiary institution of the Ministry whose mandate is to monitor weather and rain in the country. About the mandate of monitoring the water level of the rivers in the country, this is done by the Ministry of Water Resources and Irrigation. The Ministry of Transport which is key stakeholder in water uses needs this information on daily bases for management of river transport in the country.

Ministry of Energy and Dams

In my conversation with the Director General of Planning and Projects in the Ministry of Energy and Dams about the mandates of the Ministry of Energy and Dams the following information were identified;

The mandate of the Ministry is to develop policies and laws for the generation and supply of electricity to all the people of South Suda. This can be done by building dams over the rivers and through installation of solar panels for the rural population. But in regard to flood management, it is supposed to be responsible for flood prevention and control and at the same time it is supposed to be responsible for early warning for down streams vulnerable population. But up to this time the Ministry has never even built a single dam in the country for it to use for preventing and early warning for floods downstream. The Ministry has not even developed a policy and law for electricity supply and construction of dams. Therefore its activities of flood management and early warning are not yet been active.

South Sudan Meteorological Authority (SSMA)

I visited the Head Office of South Sudan Meteorological Authority at Juba International Airport and I interviewed the Director General of South Sudan Meteorological Authority and other forecasters, I was told that, The Mandate of South Sudan Meteorological Authority is to collect data on weather and rainfall on daily bases. After analysing the data, the information is sent to all stake holders countrywide for their various uses.

In regard to early warning and forecasting, it uses to communicate the information to the users such as national radio and television network and other media houses for communication and dissemination to the public. The SSMA also communicates the information on rain to the Ministry of Water Resources and Irrigation for storage and

dissemination to the wider audience through the data base or through the Water and Information Management Systems.

Ministry of Humanitarian Affairs and Disaster Management

The Mandate of Ministry of Humanitarian Affairs and Disaster Management is to establish early warning system, emergency preparedness and response mechanism. The mission of MHADM is to formulate policies, coordination humanitarian assistance that ensure saving of lives, restoration of dignity and sustaining hope for the vulnerable group.

In regards to flood forecast and early warning systems managements, it is to achieve a paradigm shift in national disaster management strategies from conventional response and recovery to more comprehensive risk reduction culture and to promote comprehensive disaster management as an important factor in ensuring the resilience of communities to hazards.

In regard to early warning activities, it receives warning information from its key stakeholders and coordinates it with the relevant authorities in providing disaster response to the victims of flood and other disasters.

Non-Governmental Organization.

In the survey, mapping and discussion with the key people in the country about the role of nongovernmental organizations in data collection on flood forecast and early warning systems management, it was discovered that there are no national and foreign nongovernmental organizations working in the field of data collection and provider for flood forecasting and early warning messages. The mandate of data collection of early warning belongs to the government.

But on rare cases, the International Committee of the Red Cross (ICRC) and other International Organizations and UN Agencies in agreement with the government do collect data on flood forecast and early warning for their own uses especially on humanitarian basis. They do this to fill the gaps created by the challenges the government is facing in the area of data collection in order that they can save lives and properties of the people of South Sudan.

United Nations Agencies.

During the survey, mapping and discussions with the key people in the countries about the role of UN Agencies in data and information collection process, it was discovered that foreign agencies are not supposed to collect data for the country. But if they do for their specific purposes, this cannot be used for reference purposes. But when the abnormal and sudden floods happened in the country five UNA and one international organization took part in data and information collection processes. These are as follows

International Organization for Migration (IOM)

This IOM came into the data collection process during the sudden and unpredicted flood which happened during the month of July and November 2019. This agency came in because of the call of the government for humanitarian organization to support the country in addressing this disaster. It sent some flood forecast experts to assess the situation of the affected people in the flood affected counties of the country

United Nations Children Educational Fund (UNICEF)

UNICEF is one of the UN agencies which responded to the call of the President when he declared a State of emergency when the flood struck some counties in the north of the country. The main aim of UNICEF in the data information collection was the lack of data and information about the issues of children and mothers who are the main victims of the floods.

United Nations Office of Coordination of Humanitarian Affairs (UNOCHA)

This UNOCHA agency is supposed to be a data and information user in the area of flood forecasting and early warning services but it became a data and information provider because of the seriousness of the situation in the field. For this reason, it has to get involved in data and information collection from the flood affected counties in north of the country.

International Committee of Red Cross (ICRC)

This international organization is not supposed to be a data and information provider. But it played this role because of the urgency and seriousness of the situation. Without data and information, it would not be possible to render humanitarian services and assistance to the flood affected population in the counties and states of Republic of South Sudan.

International Federation of Red Cross and Red Crescent Societies (IFRCRCS)

IFRCRCS is in the same way is supposed not to be an agency of data and information provider but because of the urgency and seriousness of the situation, The specific reason that brought ICRCRCS was the need for WASH and flood mitigation conditions of the affected population. Due to absence of this data, it has to come in to assess the gravity of the situation. And this led it to be a data and information provider.

And because of the financial and logistical capacities those UN Agencies possess, they were able to collect enough emergency data and information for supporting and assisting the flood affected population in north of the country. This sudden and abnormal flood in the north of the country has created a situation where the data and information providers become both data and information providers and users at the same time.

2.2. Forecast Warning Users

National Government.

In the survey made by the consultant during the mapping and survey processes, eight national flood forecast and early warning related institutions which are using early warning information on behalf of the government were identified. These are the following:-

Ministry of Information, Communication and Postal Services.

This institution is supposed to use the information for informing the public about the incoming floods which will have some negative impact on the lives of the people. The Council of Ministers which meets once a week usual makes media briefing and if floods and early warning messages are brought to the council of Ministers by the concern authorities for discussions, their decision can be communicated to the journalist through the government Spokesperson.

Ministry of Livestock and Fisheries

In my discussion with some officials of the ministry, they told me that their ministry is supposed to use the information to inform and warn the pastoralists and fishermen who are grazing their animals and those who are fishing in the flood prone areas about the incoming floods. The purpose is to enable them to save their lives and their animals. But this is not happening because the system of receiving and communicating the early warning messages to the pastoralists and fishermen is not established. Further to this, the pastoralists and fishermen are not mobilized and are not aware about the danger of sudden floods

Ministry of Roads and Transport

The Ministry uses this information to inform the travellers about the possibilities of overflowing of water over some of the bridges that might have some implications on travellers. The Ministry also informs the airline companies through the South Sudan Civil Aviation Authority (SSCAA) about the danger of flooding at the airports across the country as it used to happen sometimes. And the ministry also uses the information for planning and managing river transport on daily bases.

Ministry of Humanitarian and Disaster Management

In my discussion with some officials and after reviewing some policy documents, I learnt that the ministry use this information in collaboration and cooperation with relevant authorities in warning the vulnerable communities at risk at the various flood prone areas in the country and at the same time it uses the information for mobilizing and coordinating humanitarian relief assistances with the relief and humanitarian agencies in providing assistance to flood victims during disasters.

Ministry of Agricultural and Food Security

In my conversation with one of the Inspectors in the Directorate of mechanization, I learnt that the Ministry is supposed to use this information for informing the farmers about the incoming floods which might destroy their crops and their livelihoods especially those who are cultivating in the flood prone areas. And for that matter the need for preparation for famine in the days to come. But this is not happening because of lack of systems and programme for early warning management.

Ministry of Water Resources and Irrigation

This institution is supposed to uses the information and data for informing the Council of Ministers and the National Legislative Assembly for emergencies responses during times of flood. The Ministry also uses the information for informing other stakeholders in the country who want to carry humanitarian activities in country as stated by some officials from the ministry.

Ministry of Energy and Dams

In my discussion with officials from the ministry, I was told that this institution is supposed to use the data and information for informing downstream countries in case of floods. But this arrangements are not yet made due to fact that the Ministry is not well established to carry out this function.

Department of Civil Defence (Fire Brigade in particular)

I interviewed some former and present employees of the department of Fire Bridge (Civil Defence), they told me that there is a programme for evacuation and rescue in this department

during the time of floods. It is supposed to use this information for planning purposes but due to presence of some challenges these programmes are not very active and much work need to be done on this particular area. But as of now there is no activity for flood evacuation management by this department in Republic of South Sudan

State and Local Government

The State Government

In the survey made by the consultant during the mapping and survey processes, two State forecast warning users who were supposed to use this information for informing the vulnerable communities are identified. These are the following:-

The first is the Directorate of Water Affairs in all the states in general and in the flood prone areas States in particular. They are supposed to use the information to warn the counties about the coming floods. But they cannot do it because this programme and the unit to implement these processes have never been established in their respective Directorates across the states of the country.

The second is the National Technical Task Team. In my discussion with the Acting Director General of Early Warning Systems in the Ministry of Humanitarian Affairs and Disaster Management in regard to early warning systems operations in the Ministry; she told me that the Ministry of Humanitarian Affairs and Disaster Management has established a National Technical Task Team Focal Points. National Technical Focal Point who is deployed to all the states. The members of this are drawn from stakeholders of the ministry. They use the information for informing the vulnerable communities about the incoming disasters in the counties and down to Payams and Bomas where they are deployed.

The Local Government

There is one institution in the county which is supposed to play a key role in flood forecasting and early warning system management by the local government. This is the Office of the Assistant Commissioner for Water Affairs in the Counties. It is headed by the Assistant Commissioner of Water. This office is supposed to use this information to inform the Payam and Boma Administrators about the any incoming floods. But the unit for early warning has never been established due to a number of factors and challenges.

UN and other Humanitarian Organizations

As stated above, UN Agencies and other humanitarian agencies are supposed to be the early warning data and information users. But because of the urgency and seriousness of the situation created by the abnormal and sudden flooding, they become both providers and users. Since their roles and responsibilities have been mentioned above, it is not discussed here to avoid repetition.

Non-Governmental Organizations (NGOs)

In the survey made by the consultant during the mapping and survey processes, it is found out that there are many non-governmental organizations working in the country in the field of data users. Most of them are registered with South Sudan Relief and Rehabilitation Commission, a subsidiary of MHADM. Most of them get their information from UN Water

Cluster. But normally they work with MHADM to provide relief and humanitarian assistance during the time of floods or any other disaster.

South Sudan Red Cross (SSRC).

The consultant interviewed the Director of Administration of this organization and he indicated that South Sudan Red Cross is a National Society for Red Cross and Red Crescent and its partners. The mandate of this organization is to support the government in the areas of disasters such as drought, floods and diseases. This organization is supposed to get flood early warning from the Ministry of Water Resources and Irrigation but due to lack of this information, they get their information directly from the field. It was stated that SSRC operates in partnership with MHADM

Community Initiative for Sustainable Peace Organization (CISPO)

The Mandate of this local community based organization states that CISPO is to move to all parts of South Sudan and beyond to create awareness about those things that brings conflict and those that brings peace so that it is able to build sustainable peace among the communities.

In regard to early warning systems, CISPO creates awareness among the local communities about any situation such as floods, drought, disease, conflict and many others that has the potential of bringing disaster to the communities.

Local Communities

The local communities who are supposed to use the early warning information are those living or working in the flood prone areas in the country. These communities include the following:-

The first group of communities are the Nuer and Anyuak and those in the surrounding areas. These communities are found in Akobo and Nasir areas. They practice both farming and fishing along River Sobat. They are both pastoralist and farmers.

The second group of communities who are supposed to be the users of information and data are the Bari, Dinka Bor, Nuer and Chollo. These communities are living along Bahr el Jebel basin before and after the Sudd. These communities also practise farming, fishing and rearing of livestock.

The third are the town dwellers that live in the city of Wau. The most vulnerable population are those who live in Hai Khor Mudir in the West Bank of river Jur, Hai Dinka and the Soldiers who work and live in the Military Barracks which is built near the flood prone areas of the city.

The fourth are the citizens of Juba city. The vulnerable communities are residents of Airport road, Gudele Blocks Five and Four and Juba West Kapuri area.

The fifth are the Dinka and Jur Bel and other residents. The vulnerable people are those who live in Aweil town and the outskirts of the city.

The sixth are the Toposa, Didinga, Buya and other dwellers. The vulnerable are those who live in Kapoeta and the surrounding areas.

The seventh are the Lotuko and other residents who live in the city of Torit and in the outskirts of the city and other villages in the county. The vulnerable communities are those who live in Ilgum, Gumbo and other surrounding areas.

The eight are the Chollo, Dinka, Nuer and Burun, Koma. The vulnerable population are those who live along the Nile. In terms of livelihoods, the vulnerable groups are they practise farming, fishing, agro-pastoralists who are rearing animals, and other pettytraders.

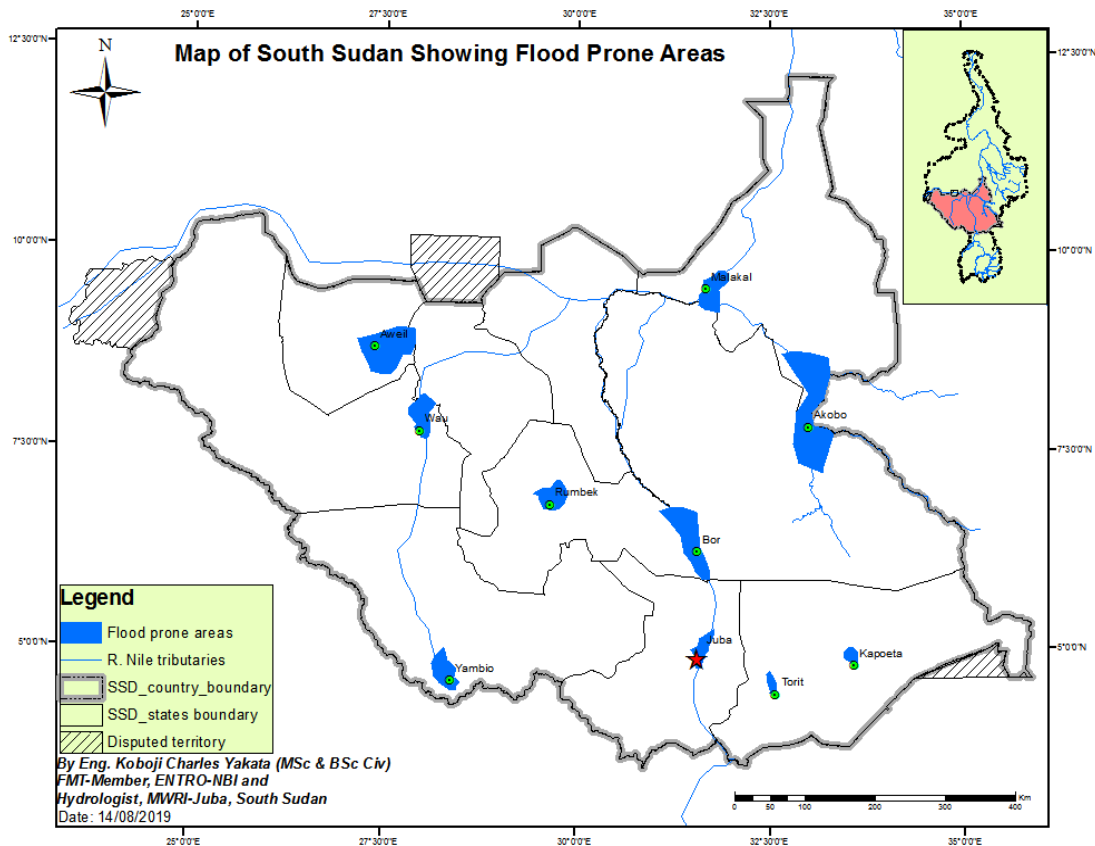


Figure 1The Map of South Sudan Flood Prone Areas and the corresponding Vulnerable Communities and their Villages.

2.3. The Vulnerability Mapping for Settlements on Flood Prone areas

There are many and various vulnerable groups of communities who live and work in the flood prone areas of the country. These groups range from towns up to villages dwellers. The report about them is arranged according to their areas as defined by the findings of the consultant. The main vulnerable areas of settlement are the following:-

Akobo: The vulnerable population who settle in flood prone areas are the Anyak and Lou Nuer in Akobo town and the surrounding areas and Jikany Nuer in Nadir town and the surrounding areas. They are affected by flash and river floods.

Wau: The flood prone areas are Khor Mudir in the West Bank of river Jur, Hai Dinka and Military Barracks. The people are mostly affected by river and flash floods.

Juba: The flood prone areas are Juba Na Bari Residential area including the airport road, Gudele Blocks Five and Block Four and Juba West Kapuriarea. In Northern Juba the population affected by floods are the Bari in Mangala County of former Central Equatorial State.

Bor: The vulnerable people who settled in flood prone area is the Dinka Bor and the Nuer. They are normally affected by river and flash floods.

Aweil: The vulnerable population who settle in flood prone area and they are vulnerable are the Dinka and Jur Bel including the population at the cities.

Kapoeta: The vulnerable population who settle in the flood prone area are the Toposa, Dindiga, Buya and others.

Torit: The vulnerable people who settled in the flood prone areas are the Lotuko and other people of different nationalities who work and live in Torit Town.

Malakal: The vulnerable flood prone area, the vulnerable communities are the Shilluk, Dinka, Nuer and Burun, Koma and other small communities that may be living in those areas. The detail and the exact locations of these places can be seen from above map of flood prone areas of South Sudan.

3. THE ANALYSIS OF STAKEHOLDERS GAPS IN EARLY WARNING

3.1. Forecast Providers

Eastern Nile Technical Regional Office (ENTRO)

Eastern Nile Technical Regional Office is supposed to lead flood forecasting and early warning processes in the entire Eastern Nile countries according to its mandates. ENTRO has made some significant progress in establishing flood forecasting institutional mechanism for these processes in the countries. It has established national offices in Ethiopia and Sudan but it has not done so in South Sudan.

The Flood forecast and early warning programme which is being done by ENTRO during the flood seasons does not cover the whole of South Sudan but it only covers Bara-Akobo-Sobat Sub-basin. Secondly there are some complaints that the internet in the office is not constant and there are a lot of power failures. Thirdly ENTRO also suffered from constant cuts in power supply which can disrupt information and communication flow as was described by the senior consultant

It was also discovered in the study that ENTRO is only supplier of warning information in the eastern part of River Nile. And the western part of River Nile is to be done by NELSAP. I have not got any documentation to this respect. But the most serious impact of the floods in South Sudan is happening in the western part of River Nile. I think South Sudan may need to make effort to make sure that this part of the country is attended to so that flood issues in the country are wholly addressed by one single entity.

The other issue is that the Nile Basin Initiative where ENTRO is a part is still a transitional Organization. The Cooperative CFA Framework Agreement has never been signed by all the countries. This makes it difficult to establish permanent river basin organization. The absence of this organization affects the countries in establishing country wide offices for water and water related issues.

The Ministry of Water Resources and Irrigation (MWRI)

In the discussion I had with the Director General of Hydrology and Survey, he highlighted the following gaps in the Ministry in discharging flood Early Warning:-

- There is no sub-sector policy and institutional framework which defines the roles and responsibilities of the staff and units in the Directorate in general and in early warning in particular.
- The systems for collecting data from the rivers and stations are malfunctioned and they cannot provide data for flood forecasting and early warning systems during flood season.
- It has no specific unit for data collection and dissemination in the country.

- There are few specialised trained staffs in communication technology in the Ministry who can offer this services as it should do so. As a matter of fact there are no official programme of training of staff on this particular programme and assignment in the Ministry. There are some courses sponsored by development partners and other bilateral arrangements but not specifically for early warning.

The Ministry of Environment and Forestry (MEF)

The Ministry of Environment and Forestry has a major role in flood forecasting according to its policy and legal framework but unfortunately, it has no institutional arrangement in its administrative set up for flood forecast and early warning systems. In my discussion with the Senior Staff in the Ministry, I was told that there are no employees who are recruited for responsibilities of flood early warning in the Ministry. As a matter of fact there are no activities going on in the area.

Ministry Agriculture and Food Security (MAFS)

Official from the Department of mechanization which is responsible for flood control in the ministry, indicated that, The Ministry of Agriculture and Food Security is supposed to receive data on rainfall from both South Sudan Meteorological Authority and Ministry of Water Resources and Irrigation so that it can send the data to the states and down to counties but this department or unit has not been established and there are no specialised staff employed to deal with this kind of activity.

South Sudan Meteorological Authority (SSMA)

The gaps of South Sudan Meteorological Authority in flood forecast and early warning includes the following:-

- There is inadequate capacity for collecting and sending data and information on early warning systems on daily bases to its users as more and more equipment are being manufactured for complex forecasting and early warning processes.
- There is no coordination unit for cooperation with other stakeholders in flood forecasting and early warning management.

The Ministry of Humanitarian Affairs and Disaster Management

The Ministry of Humanitarian Affairs and Disaster Management has established the Directorate of Disaster Risk Management. But there are many gaps which affect the ministry. These includes the following:-

- There is no communication infrastructure technology which can be used for data and information sharing among the key stakeholders at the national levels and with the states and counties.
- There are few or no technical staff at all who could be engaged in the communication and dissemination process during the time of flood or during disaster,
- There is no flood forecasting and early warning system in the Ministry as it is struggling with a number of issues which includes lack of infrastructure for communication and engagement among various stakeholders.
- There is no coordination mechanism between national and state stakeholders in the issues of disaster in general and flood forecast and early warning in particular.

The Ministry of Livestock and Fisheries

This ministry is discovered to be a key stakeholder in early warning systems but it has no department of flood forecast and early warning systems. Because of this absence there are no staff who could be engaged in early warning discussions and consultations. As a result there are no activities for flood early warning.

Non-Governmental Organization (NGO)

There are no nongovernmental organizations working in flood forecasting and early warning systems in the country. There was a project managed by a certain organization called Niras which was working in Eastern Equatorial and Lakes States but it is implementing the programmes of the government. There was no data about gaps available.

And for the community Initiative for Sustainable Peace Organization, it is still at infancy stage (although it is able to make awareness) but cannot carry out big tasks of awareness about flood forecast and early warning but the most challenge gap of this organization is that it lacks office space and qualified staff to run some of its programmes but is trying very hard to come up with some few people to carry out its core activities.

In other countries both at the global and regional levels, there are many independent researchers and writers on various issues which affect humanity. But in South Sudan we do not have these groups of people such that the only people who see the early warning issues are the government institutions and the development partners.

3.2. Forecast Warning Users

National Government

There is no Flood Coordination unit in the Ministry of Water Resources and Irrigation for coordinating, disseminating and communicating of flood forecasting and early warning messages to various stakeholders in the country.

The Key Stakeholders are the following, Ministries of Environment and Forestry, Ministry of Humanitarian Affairs and Disaster Management and Ministry of Livestock and Fisheries have no communication and dissemination units to receive and use the messages.

Most of these flood forecast warning users have no programme for flood forecasting and early warning management in terms of policy, legal and institutional framework. There is need for the training of local communities for the use of appropriate technologies in flood forecasting and early warning messages communication and dissemination to other vulnerable people.

The flood forecast warning users have no programme for flood forecasting and early warning management in terms of policy and legal and institutional framework in the country.

State and Local Government

In our governing structure that is to say National, State and Local Governments, the followings are the gaps in flood forecasting and early warning systems management:

- There are no policy and legal instruments for flood forecasting and early warning systems management in the states and counties.
- There are no departments or units in the Directorate of Water Resources Management dedicated entirely for flood forecasting and early warning systems management.
- There are no technical and administrative staff trained or employed to manage floods despite the fact that floods are occurring on yearly bases with devastating impacts on people and their properties.

Non-Governmental Organization (NGO)

Most of the Non-Governmental Organizations working in South Sudan are of foreign origin and they are supported by the International Organizations and UN Agencies in the operation of their activities. They therefore have no flood forecasting and early warning management arrangements or mandates.

Secondly the area of their operations is defined by the government but not on their own arrangements but they do support the victims of flood in any part of the country if it happens. Their activities and programmes are defined and determined by their sponsors in their country of origin. For that matter their activities are flexible.

The Local Communities

As we mentioned earlier, there are many local communities some with strong social structures in their localities. But they cannot carry out flood forecasting and early warning systems management because of the following gaps:-

The idea of flood forecasting and early warning systems management is a foreign idea and they therefore have no arrangements for this process.

Their social structures have never been mapped and understood and therefore it is difficult at this point to know and tell what their methods of administration these communities are using. The location and the degree of vulnerability are yet to be mapped and understood within these project arrangements.

4. THE METHODOLOGY OF COMMUNICATION FOR EARLY WARNING

4.1. The Best Practices of Global Communication Methods in Early Warning

In the survey and mapping that was carried out by the consultant, it was discovered that the followings are the common methods for communication globally. They includes the following

- Radio and Television Broadcasting Services. Channels such as British Broadcasting Corporation (BBC) and Cable News Network (CNN) do report on issues of early warning or any issue including flood. At the National level we also have national radios and Television networks. The government is using them for all types of messages.
- Email address which is use for sending and receiving early warning messages across the globe.
- Issuing of press release on emergent flood early warning events by policy and decision makers whenever there is threats of floods.
- Telephone whether mobile and landline phones which people can use in case of floods and other disasters.
- I talked to journalists of some newspapers and they told me they can publish early warning messages. Even one newspaper called Juba Monitor gave the Ministry of Water Resources and Irrigation a complete page for publishing water and water related issues including floods and its impacts on the lives of people and their properties.

4.2. The Current Early Warning Communication Method in South Sudan

In the survey, mapping and in discussions with junior and senior members of the government, the following are the current methods of communication which can be used for early warning. Since there are is no active flood forecast in the country, the same methods that are used for other events are the same that could be used for floods. These include the following:-

- Email communication with the key stakeholders such as the focal points, ENSAPT members and any other Stakeholders working in flood forecasting and early warning systems
- Daily, weekly and monthly bulletin which are produced on periodic frequencies to explain and predict floods and its impact. The Director General of Early Warning in the MHADM told me that they are using bulleting for early warning communication with their stakeholders
- Local radios, television broadcasts bulletin and newspapers both print and online versions. The examples of these are Sudan Tribune and many others operating in South Sudan

I went to the Office of South Sudan Meteorological Authority at Juba International Airport and the Director General and one forecaster told me that they are sending the early warning message of weather and rain information to the National Radio and Television and other

stakeholders using templates. I also asked the people of Hydrology and told me that they receive rain information from the SSMA through filled forms in form of templates.

The Officials of SSMA also told me that they use narratives in bullet points for sending Early Warning messages to South Sudan Radio and Television for broadcasting to the general public and to other stakeholders of the South Sudan.

Because there are gaps at the national level, there are corresponding gaps at both State and county levels which can result to communication breakdown.

4.3. Gaps in Existing Communication Methodology in South Sudan

In my conversation with Director General of Meteorology and some of the forecasters in the Directorate, Director General of Early Warning in the Ministry of Humanitarian Affairs and Disaster Management and Director General of Hydrology and Survey including his staff about gaps in existing Communication Methodology in the country, the following are the findings I received. The most serious ones include the following:-

- In the Ministry of Water Resources and Irrigation, specifically in the Directorate of Hydrology, there is no core unit in the ministry which is responsible for generating and communicating early warning data and information at the national level to all other stakeholders in the country.
- There is also no communication infrastructure or communication technology in the country which controls communication processes such as sending and receiving early warning messages.

I talked to the Acting Director General of Early Warning in The Ministry of Humanitarian Affairs and Disaster Management and she told me that the mandate of the Ministry as stated earlier is responsible for coordinating disaster early warning messages among the key stakeholders at the national level. The gap is that it does not have communication infrastructure for connecting the stakeholders both horizontally and vertically.

The official also stated that due to lack of electric power in the country, this has made it difficult to constantly use telephones and emails and other means of communication for early warning.

The Director General and forecasters of South Sudan Meteorological Authority indicated that, they use to send early warning information to South Sudan Broadcasting Corporation through the internet so that they can download and broadcast it to the nation. This makes it difficult to communicate.

Officials from the Ministry of Agriculture and Food Security which is supposed to be an early warning data user at the national level and they told me that one of the gaps which affect communication in the ministry is the breakdown of the database. Database is a key facility for communication because of its storage of information and data.

The other critical issue in early warning communication is the inadequate capacity to plan and organize data communication from one level to the other between the national and counties.

The same is true at the State and local levels. Since there are gaps at the national levels in terms of providers and users; there is the corresponding gap at the states and counties levels. There is lack of constant power for charging batteries and even maintaining and operating internets.

In general for all the Ministries at the national level which are the producers of data and information, do not have active systems of communication which connect the headquarters, states and the counties. Therefore data and information can be generated at the national offices from the regional organizations such as ENTRO but to communicate it to the state and county level becomes difficult.

The early warning users both at the national, state and local level have no coordination unit in the Ministry of Water Resources and Irrigation which can plan and organize communication systems both for national, state and local levels.

One of the major challenges in the communication methodology is the inadequacy in capacity building action plans, programmes, resources mobilization arrangements and policy and institutional arrangement from national through the states and down to counties.

4.4. The Proposed Early Warning Communication Method and Technology

Following my discussion with the key stakeholders, the following are the proposed communication methods which can be applied for early warning messages. These include the following:-

- Creation of communication unit and equipping it with modern equipments in the Ministry of Water Resources and Irrigation for assembling all data and information from all other stakeholders and disseminate it to all users country wide.
- Designing or improving a reporting template which is available in many ministries for disseminating the characteristics of floods such as water level, speed and depth of the water, duration of the rainfall so that the stakeholders can act accordingly.
- Supply of radio sets to the chiefs or another key actor among the vulnerable communities so that he or she can tune to it especially during flood season and once he or hears this information, he can disseminate it to the communities using indigenous method. This is done in other parts of the world and has succeeded.
- Development of series of television, radio and news programmes on early warning on reasonable frequencies to inform the decision and policy makers as well as the vulnerable groups about the likelihood of floods and its impacts on the lives and properties of the people.
- Create a network of professional staffs and interested individuals in flood forecasting and early warning systems management in the country such that whenever flood message is received by one member, he or she can alert the other members to inform the other communities.

4.5. Existing Indigenous Flood Early Practices

In the survey and review exercise in regard to indigenous (knowledge) practices on early warning around the world in general and in Africa in particular, I reviewed six references and

talked to some other people and reviving my own experiences about this issue, the following indigenous practices were discovered:-

Definition of indigenous (knowledge) practices as outline below:-

According to Shaw, Noralene, and Baumwoll (2008) stated that indigenous (knowledge) practice is a method and a practice produced by community with keen understanding of their local environment. These skills can take generations to have a command on these. The knowledge regarding the changes in the local environment has important characteristics. These include originating within the community, maintaining a non-formal means of dissemination, collectively owned, developed over several generations and subject to adaptation, and imbedded in a community's way of life as a means of survival.

Indigenous practices can be deduced from the behaviours of plants.

It is observed that, a good amount of well distributed rainfall is signaled by the presence of higher than normal flowering intensity of certain trees; the immature dropping of fruits by certain tree species, the shedding of leaves of the sycamore fig during August to October and the exuding of water from the leaves *before* the onset of rains. In our community, there is also a plant which grows green during the dry season but it becomes dry when rainy seasons about to come.

Indigenous practices can be deduced from the behaviours of animals.

It has been observed that certain animals both wild and domestic have some degree of predicting rain. The report cited particularly goats, sheep and cattle. That these animals when they smelled rain, they would make repeated shouts continuously which means that they want to be taken away from where they are. For cattle it has been observed that if they smell rain, they do not want to be driven to graze areas. I have confirmed these because of my own experience with our cattle before the war.

Indigenous practices can be deduced from behaviours of birds.

It has been observe in the villages that birds like kits and others, come during the dry season. But when rain is near, they disappear from the villages. Other birds begin to migrate during the approaching rainy season. One elder told me that there are some birds which make distinctive sounds when rain is about to come. I proved this to be true because these days especially this year in Juba, these types of birds are many as floods are extraordinary.

Indigenous practices can be deduced from behaviours of insects.

It has been observed that some insects especially the black ants tend to migrate from wet to dry places. Therefore when these insects are seen moving from one place to other carrying food, their young ones and even eggs; this means that after short time rain would come. The same is true for the red ants. When they move from one place to another in groups, this shows that rain is about to fall.

Indigenous practices can be deduced from behaviours of winds and clouds.

It has been observed that when rain is about to come the clouds always look thick and it seems to covers all parts of the sky, there would be presence of heavy lightning and thunder, the temperature of the day will either rise or fall, the changes of the direction of the wind depending on where the area is located.

Indigenous practices can be deduced from behaviours of celestial bodies.

It has been observed that when colour of moon is surrounded by a circle and it looks dim, or when the colour of the sun changes from white to red on certain days or it is covered with clouds and the intensity of the light becomes weak, there is a possibility of a rain.

Indigenous practices can be deduced from the behaviours of frogs and crabs. Frogs and crabs are considered as the announcers of coming rainfall. It has been observed that they always make some distinctive sounds repeatedly at a certain time of either the day or the night especially when the rainy season delays. It has been observed that these shouts are signs of informing people that rain is about to come.

5. CURRENT RESPONSE ACTIVITIES TO FLOOD EARLY WARNING

5.1. Performance of Current Response to Flood Early Warning

In my discussion with the Director General of Meteorology and some of the Flood Forecasters, the Director of Administration of South Sudan National Society of Red Crescent and Red Cross, the former and current Staff of Department of Civil Defence (Fire Brigade) and the staff of the Ministry of Water Resources and Irrigation, about current response activities to flood early warning, the following information about how responses are to be acted upon were obtained from the discussion.

The Department of Civil Defence (Fire Brigade) is supposed to put contingency plans of how evacuation and rescue is to be carried out in response to early warning messages about flood disasters in the flood prone areas of the country. But since there is no early warning programme in the country, this means that there are responses in regard to evacuation.

The Ministry of Humanitarian Affairs and Disaster Management has established the National Technical Task Team at the national level and National Task Focal Point at the state level to monitor disaster cases country wide. In case of any outbreak of disaster, the members of task team can report the issue to the headquarters for response.

MHADM has also put some emergency preparedness programmes for coordinating relief operations with the UN and other Humanitarian organization to rush food and non-food items to those who are affected by flood or any other kind of disaster.

The Ministry of Water Resources and Irrigation is supposed to prepare a task team headed by the Directorate of Rural Water Supply to supply clean and safe drinking water to those who are affected by floods so that cholera or any other water borne diseases can be prevented and controlled. But this does not happen because of lack of resources.

The National Society of Red Crescent and Red Cross told me that, since there is no early warning message from the Ministry of Water Resources and Irrigation and Meteorological Authority, the Administration of this organization has established two disaster responses programmes. One is called Disaster Emergency Fund (DREF). This programme is in every state except where there are conflicts. Whenever flood happens, they make an immediate assessment to establish the level of the damage. As a result an immediate intervention to rescue the victims is made.

The second is called Appeal Fund (AF). This is big and it takes long time to respond. The reason is because there are factors that are connected with this programme. These include the magnitude and levels of fear about the disaster. He said they do not apply this in the times of floods but on the issue of diseases such as Ebola, coronavirus and among many others.

The National Non-Governmental Organizations, Foreign Non-Governmental Organizations have some plans for responses when flood disaster happens. Their responses to early warning programmes are coordinated by the Ministry of Humanitarian Affairs and Disaster Management and United Nations Office of Coordinating Humanitarian Affairs (UNOCHA). What they do normally is to supplying humanitarian and relief assistance to

victims in form of food, medicine, shelters and cloths when they hear the news of any disaster which has affected people in any part of the country.

The local communities have their traditional way of responding to the early warning. They normally prepare to store their food in their houses to be used when flood happens. They also did local drainages systems to drive away water that enter their houses whenever flood happens.

5.2. The Proposal on how to improve the response to early warning

There are many plans which can be put in place for the improvement of response to early warning in the Eastern Nile Countries. These include the following:-

- Increase awareness creation among the local communities in countries about the importance of flood forecasting early warning systems in saving lives and properties.
- Increase the time of training on emergency responses mechanisms and framework so that the level of intervention can be easier and effective especially for the national staff in the Ministry of Water Resources and Irrigation and its key stakeholders.
- Involve the civil society and community based organization in the flood forecast and early warning processes especially in planning and implementation of projects, programmes and action plans such that whenever early warning message is received, the degree of community response involvement can be higher.
- Commission more studies into deeper and wider understanding of the nature and status of response to flood early warning systems so that knowledge and skills of response can be deepened improve and sharpened among the key stake holders.
- Develop a strong strategy for mobilization of more resources for flood forecasting and early warning responses activities so that countries are on the same page in this process.
- There is need for the training of local communities and other vulnerable communities and groups facilitating in comprehensive early warning responses.

But we also need to underscore that the challenges of flood forecast in the country are huge and though ENTRO may need to support the country to identify the most important priorities and national process to this effect can be initiated.

6. INSTITUTIONAL ARRANGEMENT

6.1. Gaps in the Current Institutional Setup at Regional and National Level

From the interview with the Director General of South Sudan Meteorological Authority, Director General of Directorate of Hydrology and Survey in the Ministry of Water Resources and Irrigation and Director General of Directorate of Early Warning System in the Ministry of Humanitarian Affairs and Disaster Management including my own experience as a Technical Advisory Committee member for NBI about current institutional set up at Regional and National levels, the following are the findings:-

- There are indeed many gaps in institutional setup at Regional and National Level in the Republic of South Sudan. As a matter of fact there are supposed to be five regional institutions which are supposed to have national and local offices for flood early warning system in the country. These include the following.
 - ENTRO has not established flood forecasting and early warning country office in South Sudan as it did in Ethiopia and Sudan. For this reason it is very difficult for South Sudan to get data and information on time from this regional centre. Because there is no country office for ENTRO, it also becomes difficult for the Country to plan and established country activities country wide.
 - I was informed that the Nile Equatorial Lakes is responsible for the other three sub-basins of Bahr el Jebel, Bahr al Ghazal and white in terms of flood forecasting. But its local or country office for this particular activity is missing. For this reason the country could not establish local offices at the state and county levels.
 - Nile Secretariat has a national office called National Desk Office. This office is responsible for organizing national activities including flood early right from national down to the communities. But this office is not established at the county and local levels due to many factors.
 - Inter-Governmental Authority for Development has an office for early warning in Nairobi called IGAD Climate Prediction and Application Centre(ICPAC).This regional Institution has a national office in South Sudan but it has no unit for early warning systems in the country. And because this is not here, it becomes difficult for the country to establish some offices in the states and counties.
 - The World Metrological Organization has a Regional Office for Eastern and Southern Africa in Nairobi. The Regional Office has country Office in Juba where the Country Director for Meteorology is the focal point. He told me that they have some offices in two states but the offices in the other states have been closed down because of the conflicts. In the same way they are supposed to have some offices in counties but this is not possible at this moment because of the conflicts in the country.

6.2. The Proposed setup for an effective Early Warning Systems Level.

In my discussion with the members of Ministry of Water Resources and Irrigation and the Focal Points of various Regional Institutions, the following are what they thought should be done.

- ENTRO may need to establish country office for flood forecasting and early warning systems management as it did in Ethiopia and Sudan. Once this is done, the country office may be able to create small units in the states department of water affairs and up to the counties so that issues of flood can reach everybody at every level.
- ENTRO through the ENSAPT Leaders may need to propose to Eastern Nile Council of Ministers the developing of a trans-boundary policy and legal framework for data sharing and exchange between the EN countries.
- NELSAP may also need to establish a country office or small unit through which its activities can be taken to the lowest communities at the states and at the counties. This is because the arrangements to do have been in discussion since South Sudan became a member.
- IGAD may need to establish early warning unit in the country office so that the office in the country can plan country activities from states to the counties.
- The Nile Secretariat may support the National Office in resources mobilization such that the country may be able to established units at the states and counties to ensure that the messages of flood forecasting and early warning are extended to the local communities.
- The most important thing is that there is need to established a coordination office for early warning systems management at the national level preferably at the Ministry of Water Resources and Irrigation .Once this office is fully functioning, it can then plan nationwide programs and action plans for flood forecasting and early warning system in the country.
- The government should try to create a temporary institution even in the form of focal point or group which can be tasked with the organizing national and regional communication and networking with regional organizations.

7. CONCLUSION AND RECOMMENDATION

7.1. Conclusion.

Following the extensive analysis and discussion of the findings of the survey and mapping, the following conclusion has been reached about the nature and status of flood forecasting and early warning in South Sudan.

- South Sudan is a flood prone country which experiences some devastating floods on annual bases with some significant loss of lives and destruction of properties.
- It has also been noted that the challenges of flood forecasting and early warning systems in the country are huge. This requires collaborative and cooperative approach both by the government and other development partners for the successful management of early warning system in the country.
- It has been recognised that there are inadequate policy, legal and institutional framework related for flood forecast and early warning systems in the country which hampers early warning and flood forecasting programmes and action plans difficult to implement.
- Capacity limitation in the country is widespread both at the technical and decision and policy makers level. Therefore training of technical, decision and policy makers seems to be the viable method of improving flood forecasting and early warning system in the country.
- The budgetary and financial constraint in the government and in the development partners remains a challenge to this programme.
- Flood forecasting and early warning systems requires relevant and vibrant communication and dissemination infrastructure both at the national and local levels to ensure better exchange and sharing of data and information across the country.
- Flood early warning systems management requires well connected infrastructure that deliver information to the threatened communities in the shortest time possible to alert the vulnerable population so that they can avoid huge loss of lives and properties.
- This project is very important to be encouraged and promoted so that the challenges, inconsistency and capacity limitations which hamper flood forecasting and early warning in the EN countries can be addressed.
- Most of the main stakeholders in the country are not fully informed about flood forecasting and early warning processes. Awareness creation and sensitization of this activity should may need to be encouraged and improved.
- The recent flood in the country has been the most destructive and most extensive in history. Even many elderly people who were consulted said that such as a flood has never happened during their lifetime. This flood is different and is special. There is need to have a special treatment for its impacts and causes

7.2. Recommendation

After making this conclusive remark about the nature and status of flood forecasting and early warning systems in the country, and in consultation with ENSAPT leaders, I would like to make these recommendations.

- ENTRO need to expand the coverage of the Eastern Nile Seasonal Flood Forecast and Early Warning Systems to other parts of Eastern Equatorial State in particular and to

the entire parts of South Sudan in general to ensure a comprehensive and complete flood early warning in the country.

- ENTRO with the support of the country may need to create awareness among the local communities particularly the vulnerable population and among the decision and policy makers. The issue of awareness creation has been the popular demand of the people of South Sudan from ENTRO.
- ENTRO and the Ministry of Ministry of Water Resources and Irrigation of South Sudan may need to build the capacities of the decision makers and continue with middle and junior cadres to ensure that there is efficient and effective flood forecasting processes in the country.
- ENTRO may need to facilitate the establishment of the country office of flood forecasting and early warning system in South Sudan as it did in Ethiopia and Sudan so that some of local issues can be dealt with at the local level without reaching ENTRO in Addis Ababa.
- It is therefore necessary that ENTRO may include building of capacity of communication officers and other journalist in the areas of flood forecasting and early warning to ensure completeness of this programme.
- The occurrence of the recent floods in South Sudan has created fear and anxiety in the minds and hearts of South Sudanese leaders and communities especially in the flood affected areas or counties. For that matter, there is need for further studies to be done in regard to the sudden and abnormal flooding that happened in South Sudan outside the normal flood seasons.
- ENTRO may also need to a special focus and improve its communication with future consultancies in regard to South Sudan. This country is different from the rest. Many things are missing and requiring information with a limited period of time can lead to counterproductive.

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