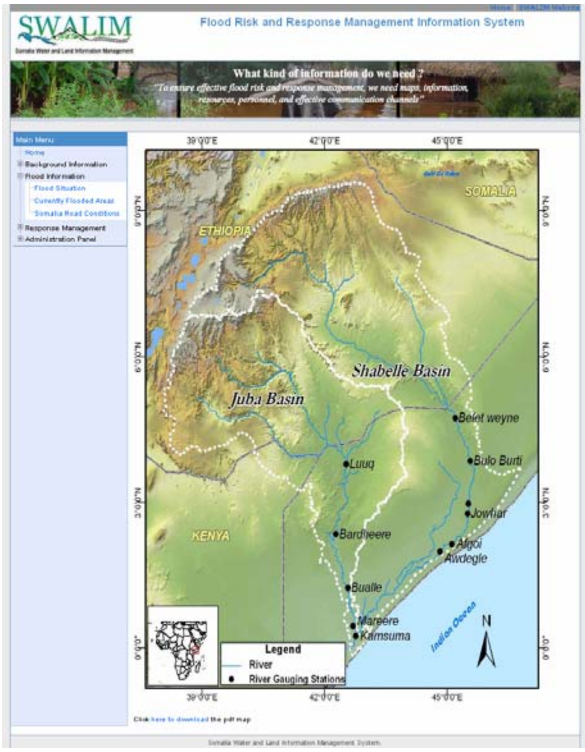
Support to the Sustainable Management of the Shebelle and Juba Rivers in Southern Somalia



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Flood Risk and Response Management

Project Report No. W-15
December 2009

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Executive Summary

Floods regularly cause disasters in Somalia, and in particular along the Juba and Shabelle Rivers in the southern part of the country. The downstream segments of these rivers are marked by an inverse topography, with water courses at some locations on higher elevation than the adjacent land; as a result, the lower parts of the riverine floodplains are highly susceptible to flooding (an attribute widely used in gravity-fed irrigation and *deshek* farming). Arid and semi-arid land further away from the main river courses also experience flash-flood events.

Flood risk management (FRM) has been defined as "a systematic process that produces a range of measures associated with flood hazard mitigation, emergency preparedness, impact response and disaster recovery, and which contributes to the safety of communities and the environment; and at the same time parallels risk management and good management practices". Therefore, it is essential to define, quantify and understand a flood risk before it is possible to manage it effectively.

The report is intended to provide direction and effective coordination possibilities for flood risk and response mechanisms to the international community as providers of assistance in emergencies and development, and most importantly, the local communities who are the victims of calamities such as floods. The study primarily divulges and critically examines on past attempts to put in place an effective coordination system for flood risk and response and lessons learnt from previous flood events.

Detailed reviews, analyses and evaluations of available information, reports and data including the current applicable system of coordination for flood risk and response in southern Somalia was undertaken prior to drafting this report. The present coordination system was examined in details and found to be less effective due to its remote control nature and lack of good quality information from the field emanating from lack of trained personnel. The coordination arrangements proposed here will be underpinned by an easily assessable and useable information system developed by SWALIM in collaboration with main actors in flood risk and response. In addition, the report includes comments and suggestions from the stakeholder workshop held on 12 October 2009 and attended by over seventy people with an objective to share and build consensus on the main features of SWALIM's Flood Risk and Response Management Information System (FRRMIS).

Flood management requires usable and reliable information about produced scenarios and flood history. A flood information system, based on GIS and Web technology, has been developed to bring together the essential information on floods under a single user interface. The system contains base line information and flood hazard maps, river water level and discharge scenarios, historic flood maps, hydrological flood observations and response information including: warehouses and stocks, rescue and other shelter infrastructure locations, health, food and other response material locations. It promotes flood risk assessment, rescue operations and response planning. Evidently, it increases public awareness about flood risk and

improves communication, since information can be delivered in a consistent and understandable form via SWALIM information networks. Moreover, it helps to distribute flood information across administrative boundaries and performs as a knowledge carrier.

The system was tested during the Deyr 2009 flood season. Field flood information sharing and reporting mechanism was established in coordination and cooperation with FSNAU and FEWS NET. A technical group consisting on the three technical agencies, SWALIM, FSNAU and FEWS NET was formed to be responsible for flood data collection, consolidation and vetting, and consequently dissemination through the flood information web site (FRRMIS). Information is updated regularly on daily basis including river levels, forecast levels and flood situation, displaced people by district and flooded areas. Response coordination mechanisms at field and Nairobi levels were established by UN-OCHA. The flood technical group, OCHA and the UN Resident Coordinator's Cluster Leads meet regularly to review flood situation. General coordination meetings for information sharing including all stakeholders were also established.

With the political and security situation in southern Somalia still unpredictable and ever changing, this report presents an objective and the 'best available' view of the current situation with regards to flood risk and response management institutions. However, proposals and recommendations in this report will need to be regularly reviewed and revised against the changing circumstances, and also with the emergence of national institutions and structures which are critical for engagement in flood risk and response management.

The study concluded that, clearly; if appropriate measures and systems are not put in place concerning the management of the two rivers, and flooding as a hazard is viewed in isolation from a holistic water management system and not an integral element in the context of a broader river basin management, the present situation will aggravate year after year with increased occurrence and will lead to catastrophic devastations. This is further complicated by the lack of central government and associated public sector institutions to spearhead inter-regional collaboration and coordination, most importantly, trans-boundary agreements with neighbouring countries who share the basin catchment with Somalia.

It is also concluded that, apart from natural phenomenon, increased devastation from floods in recent times can be attributed to manmade factors such as breakage of river embankments, encroachment of flood plains and the absence of law enforcement institutions. This has been made worse by the inability of the communities to undertake maintenance and rehabilitation of basic infrastructure for flood and irrigation management along the rivers. However, notwithstanding the difficulties encountered in project and programme implementation in Southern Somalia, rehabilitation of the essential infrastructure was supported and quite a number of intervention were undertaken over the past decade.

The present institutional arrangement for flood risk and response management can be considered ineffective and inefficient. Therefore, any structural change in the current set up must be examined and debated against the weakness and merits in terms of flood risk and response delivery. The mandate and defined core functions of major players should also be examined in light of the changing environment in Somalia.

There is need for strategy that will address flood risk management as part of integrated multi-hazard disaster risk management and preparedness.

Glossary of Somali Terms

Deshek	Flood-diversion techniques used for delivering flood water for irrigation purposes
Dyer	Short rain season from October to November
Gu	Major long rain season in Somalia from April to June
Hagaa	Dry and cool season normally from July to September
Jilal	Dry season from December to March
Webi	Perennial stream

List of Abbreviations

ARDOPIS	Agricultural Rehabilitation and Diversification of High Potential Irrigation Schemes in Southern Somalia
CAP	Consolidated Appeal Process
CISS	Coordination of International Support to Somalis
CTA	Chief Technical Adviser
DFO	Dartmouth Flood Observatory
DSS	Decision Support System
EC	European Commission
FAO	Food and Agriculture Organization of the United Nations
FWG	Flood Working Group
FSNAU	Food Security and Nutrition Analysis Unit of FAO
FSEDSC	Food Security and Economic Development Sector Committee of SSS
GIS	Geographic Information System
IASC	Inter Agency Standing Committee
IDP	Internally Displaced Person
INGO	International Non-Governmental Organisation
JNA	Joint Needs Assessment
JOSR	Jowhar Off Stream Reservoir
JSP	Joint Strategy Paper of the EU
LNGO	Local Non Governmental Organisation
LRRD	Linking Relief to Rehabilitation and Development
M & E	Monitoring and Evaluation
MODIS	Moderate Resolution Imaging Spectrometer
MoU	Memorandum of Understanding
NASA	National Aeronautics and Space Agency of USA
NFI	Non Food Items
NGOs	Non-Governmental Organizations
RBM	River Basin Management
SDG	Somali Donor Group
SFFS	Somalia Flood Forecasting System
SSS	Somali Support Secretariat of the CISS
SWALIM	Somalia Water and Land Information Management
ToR	Terms of Reference
TFG	Transitional Federal Government
TNG	Transitional National Government
UN	United Nations
UNCT	United Nations Country Team
UNDP	United Nations Development Programme
UNHR	United Nations Humanitarian Coordinator
UNHCR	United Nations High Commission for Refugees
UNICEF	United Nations Children Education Fund
UNOSAT	United Nations Institute for Training and Research (UNITAR) Operational Satellite Applications Programme
UNRC	United Nations Resident Coordinator
UNTP	United Nations Transition Plan for Somalia 2008 - 2009
WFP	World Food Programme
WHO	World Health Organisation

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1. Introduction
1.1 Background

Somalia is one of the poorest countries in the world. The livelihood of the Somali rural communities is based on pastoralism, agro- pastoralism and crop production either through rain-fed or irrigation. The limited livelihood opportunities for the predominantly rural population have been further eroded by the prevalence of calamities such as drought and floods besides the twenty years of the civil war. Significant opportunities for crop production are found in the irrigated areas along the Shabelle and Juba rivers. Conversely, it is in this low laying areas along the two rivers are the most fertile, irrigable and most flood prone.

This rather bleak economic and production base has been worsened by civil war and the resultant collapse of central government and state institutions. Given that irrigated agriculture contributed immensely to the economy either through export of high value crops such as banana and grapefruits or through import substitution. The infrastructure in support of irrigation which doubled for flood management has fallen into disrepair, hence resulting in increased unemployment, frequent occurrence of floods and above all substantial decrease in crop production leading to chronic food insecurity at national and household level.

Flooding of the Juba and Shabelle rivers are due primarily to climatic and anthropogenic processes. These natural floods are due primarily to drainage from catchment areas located in the Ethiopian highlands, which normally experience heavier than normal and more frequent precipitation than occurs in Somalia. While artificial flooding of agricultural land is largely due to illegal manmade openings on the dikes and high natural embankments to create an outlet for irrigation water in the dry season. Before the Civil war, structural measures to mitigate and control floods included construction of dikes, barrages and flood relief canals. These regulation structures are in disrepair and no longer reliable. In times of higher water level in the river, the water, which would otherwise flow down the river without causing any harm, finds its way out through the manmade openings and inundates large agricultural lands.

For the past two decades Somalia has a weak functioning central administration without national development policies. There is neither a flood management policy nor a public institution responsible for implementing flood mitigation measures and management in the entire Somalia. Nevertheless, there is an interagency working group consist of technical and response agencies for providing for flood forecasting, preparedness and response for the Juba and Shabelle rivers led by UN-OCHA and FAO SWALIM. Other partners include FSNAU, UNICEF, WFP, UNDP and some international NGO's. This inter-agency team is known as the Flood Working Group (FWG). The FWG was established under the Food Security and Economic Development Sector Committee (FSEDSC) of the Somali Support Secretariat (SSS); formerly the Somalia Aid Coordination Body (SACB). The Mandate of the FWG is to reduce the suffering caused by floods through effective Early Warning.

Significant financial resources to sustain the infrastructure in support of irrigation water and flood management has been provided by the European Union over a decade using a variety of financial instruments and implementation arrangements, i.e. international organisations, international non governmental organisations (NGO) and local NGO's. The FAO Somalia Water and Land Information Management Project SWALIM is one of the beneficiaries of EU financial assistance to Somalia and has the mandate to collect and assemble information on the Somali physical resources, particularly on water and land, and amongst others the flood risk and response management . SWALIM is currently the leading institution that houses all relevant information on the two rivers including flood risk and response management.

1.2 Floods in the Juba and Shabelle Rivers

The Shabelle and Juba rivers are the only perennial rivers in Somalia, Figure-1. They are the most critical water source and provide water for crop production, livestock and for domestic use. Floods normally occur during the rainy season of *Gu* (April to June) and *Deyr* (October to December) and it is during this period that the flow of the rivers are highest. This is also the time when heavy rains fall within the catchment area of the rivers in the Ethiopian Highlands. Therefore, optimising water management of the two rivers to include flood management should be a priority for Somalia. However, effective management of floods can best be achieved through management of the entire basin (ideally including that part of the basin in Ethiopia); especially a water management system which will contribute to slow water runoff. At the same time the land resources of the basins within Somalia are reported to be severely degraded either through natural or manmade impacts; activities which improve land management and promote vegetative re-growth will help reduce runoff, and vice versa. The two rivers are subjected to frequent seasonal flooding that cause disastrous impacts and humanitarian crisis. There has been a marked increase in flooding in the low lying areas in the last decade specifically more so after the El Nino of 1997/98 rainy season.

Given that the headwaters of the rivers are outside Somalia, mostly in the southern highlands of Ethiopia, almost all the water; and much of the sediment, originates from Ethiopia, Figure 1.1. While the valley flood plains support (or supported) riverine forests and lush grasslands, much of the basins within Somalia consists of unimproved rangeland. Rangeland degradation is reported as a result of large scale cutting of trees for charcoal production, also in part due to pressures from conversion of the riverine lands to cultivation. This practice will undoubtedly contribute to siltation and increased sediment deposit of the rivers and associated infrastructure, such as canal and water ways, hence leading to frequent devastating floods.

The irrigation system that doubles for flood management has high maintenance requirements as a result of high sediment deposits. Again efforts to improve land and water management will help reduce river sediment loads. However, flood control needs to be managed in such a way to avoid jeopardizing recession farming in the depressions, where successful crop production is found. A positive impact may include seasonal sediment additions (improving soil fertility) and opportunities for recession farming.

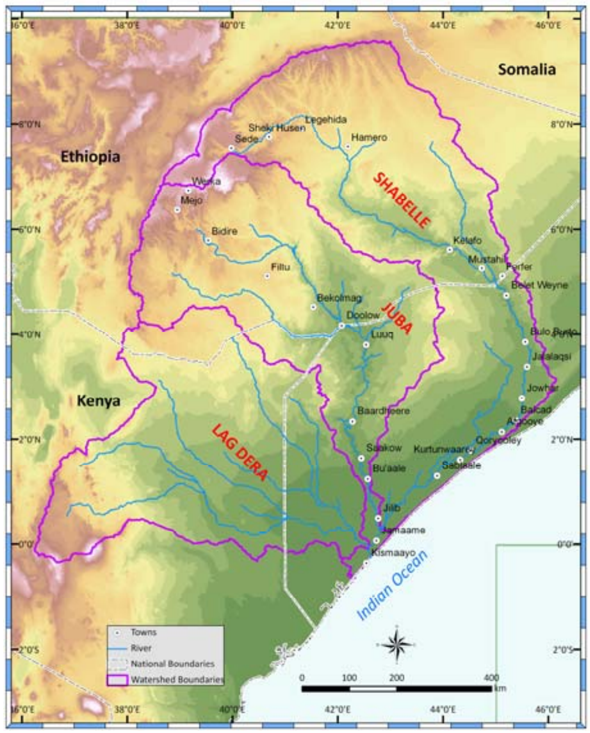

Figure 1.1: Coverage of the Juba and Shabelle River Basin

1.3 Floods and their Impacts

1.3.1 Past Floods

Hydrometric records available on the Juba and Shabelle Rivers in Somalia show that floods occurred on the Rivers in at least eight years since records commenced in 1961. (Floods are here considered as occasions when river stage exceeded at Luuq in the Juba and Belet Weyne in the Shabelle). Data is missing from the record in 12 years 1991 to 2002, so there may have been more floods in the past 50 years.) On two occasions – in 1981 and 2006 – the river stage exceeded the maximum of 9.0 m on the gauge scale on the Juba and 7.0 m on the gauge at Belet Weyne which indicates major floods occurred in those years.

Floods occurred in 1961, 1968, 1981, 1997/98, 2000, 2002, 2005, and 2006. In the time periods that there are observed stream flow data (1961–1990 and 2002 –2008), there were six severe flooding events along the Juba and Shabelle Rivers. The major floods took place in the Deyr of 1961, Deyr of 1977, Gu of 1981, Deyr of 1997, Gu of 2005, and the last one during the Deyr of 2006. Exceptionally heavy and wide-spread rainfall occurred during the Deyr 1961 which caused unusually severe floods in the Juba and Shabelle plains. These floods were reported in many parts of Eastern Africa in general. Flooding of low-lying areas was caused by over bank spills of the rivers. Thousands of people had to abandon their villages, some being evacuated. Inaccessible areas and areas marooned due to disruption of road communications were supplied food and medicines by helicopters. As a result of these operations, loss of human lives was relatively small compared to the flood of El Nino 1997/98 rains. This is mainly due to established government structures during those times.

During the 20 years between 1961 and 1981 there have been three major floods. Evidently, the frequency of floods has thereafter drastically increased particularly after the 1997/98 El Nino. This increase in floods is believed to be due to damages inflicted by El Nino rains at that time and the deterioration of infrastructure in support of flood management and water control on the two rivers, especially along the Shabelle. Although both the Shabelle and Juba rivers are subject to unpredictable periodic floods during high flows, local rains can also contribute to flash flooding. Before the 1997/1998 floods, the worst floods to hit the areas along the upper Shabelle in Somalia were the 1981 Gu floods; along the Juba, the floods of the Deyr of 1977 were the worst. The floods of the Gu in 1981 were the largest floods on record (up to that time) in the Middle Shabelle and the second highest recorded in the upper and middle Juba. It was estimated that a large proportion of the flood water during the 1997/1998 floods came from runoff generated within Somalia.

1.3.2 Recent Floods

In recent years, 2 major flood events in 1997/98 and 2006 were experienced in the Juba and Shabelle basins. Usually, major floods that affect most of the riverine areas are due to heavy rainfall over the Ethiopian highlands. During the floods of 1997/1998, exceptional rain amounts were received throughout the two basins when precipitation was 100 to 300 percent of the normal. The floods had a tremendous impact on the environment and the population. Almost the entire Juba and Shabelle valley was inundated and agricultural crops were completely destroyed. The floods also caused land degradation and increased soil erosion with consequent silting of irrigation barrages. Extensive damage was caused to the rivers due to severe bank erosion. The majority of the irrigation and flood control infrastructure were destroyed. The protective dykes were over topped and suffered breaches at several places. All the settlements along the Juba River in Somalia were flooded, with some villages cut off completely by the water for extended periods of time. For the Shabelle, many villages along the river were under water for a prolonged period. Hundreds of thousands of people were left homeless with the floods affecting negatively the lives of up to 1 million people. The 1997/1998 floods were estimated to have caused about 2,000 deaths and displacement of about one million persons. These floods led to the collapse of virtually all the large irrigation schemes and damaged all major flood relief channels, roads and other major infrastructures.

During the Deyr season of 2006 (October-December), torrential rains that fell in Ethiopia, Kenya, and Somalia led to large scale flooding in many locations along the Juba and Shabelle Rivers in Somalia. In some areas of the two basins, recorded rainfall during the Deyr season of 2006 was estimated to have been more than 200 to 300 percent above the normal rainfall of the area. It was reported in early November of 2006 that the stage of the Shabelle River at Belet Weyne surpassed the mark of the flood stage associated with river flows of the 50-year return period. The river submerged the main bridge of the town, and most of Belet Weyne was under water for several days. For the Juba River, it was estimated that the stage at Luuq reached the 20-year return period flood stage. In early November 2006, it was estimated that 350,000 people living along the rivers were displaced, inundated, or otherwise seriously affected by the floods with the possibility of up to 90,000 people being displaced before the end of the Deyr season.

The floods of 2000, 2002 and 2005 were of shorter duration. These floods were caused due to heavy and concentrated rainfall in the upper catchments of two rivers. The problems in flood plains were aggravated due to breaches in the dykes during the 1997-1998 floods that had not been repaired. The most noticeable was the Gu 2005 flood. During this season, flooding took place in many riverine areas despite that rainfall in southern Somalia for the season was average and below average. The 2005 Gu season floods were mainly due to the heavy rains that had fallen in the Ethiopian highlands on the headwater watersheds of the two basins. SWALIM-recorded river gauge data for the Shabelle Rivers at Belet-Weyne and the Juba River at Luuq indicated that the floods were more severe along the Shabelle than the Juba. Recorded flows of both rivers went over the historical 30-year return period flows. The peak flows of the Shabelle, although of similar magnitude to the flows that were seen during the floods of 1981, were sustained for a far longer period.

1.3.3 Impacts of Floods

Loss of life: A unique feature of floods in the Juba and Shabelle River Basin is that most of the runoff is generated in the upper catchments in Ethiopia which receive much higher rainfall than the plains in downstream reaches. As a result, population living in the plains is often taken unawares. This causes considerable loss of human lives and livestock and often displaces people.

Loss of livelihood: As most of the farming communities live and derive their livelihoods from activities that take place along the banks of the two rivers, flood events cause devastation. In many low lying areas around the rivers the inundation lasts for weeks and sometimes months leading to total loss of crops. Floods frequently coincide with the seasonal cultivation periods i.e. Gu or Deyr seasons. Floods in the low lying areas cause damages to cropped areas. The displacement and loss of whatever meagre resources available is the most devastating impact to communities from floods. Normally, affected communities have the ability to restart cultivation after floods in the water receding lands with crops of short duration, rebuilding and rehabilitation of infrastructure is the most difficult recovery strategy for the flood affected communities. However, flooding can in some regions along the Juba River bring benefits by harnessing to support recession agriculture in depressed areas in the flood plain.

Health and developmental impact: The worst affected are the poor who inhabit the flood plains and riverine lands to eke out a meagre living from agriculture, livestock farming and fisheries. Because of poverty, lack of education and poor rural infrastructure, they are the most vulnerable to floods and post-flood consequences. The floods severely limit and hamper the developmental process, further increasing the vulnerability of the rural society and thereby perpetuating and increasing the incidence of poverty. Stagnant floodwater also causes vector borne diseases, which result in high incidence of morbidity with consequent loss of alternative employment opportunities.

People from the inundated areas move to makeshift relief camps where they cluster together. Such makeshift homes soon become slums creating social problems and unhygienic conditions which are conducive for the spread of contagious diseases and sexually transmitted diseases. Often women and young girls are the worst sufferers.

Infrastructure impact: Effective operation and maintenance of the irrigation infrastructure significantly contributed to flood reduction, as huge quantities of water were taken away by the canals into the irrigation lands, many of which operated effectively during high river flows. Prior to the collapse of government, communities were able to put in place coping strategies using traditional methods of reinforcing of embankments and rehabilitating canals. The deliberate breakage of embankments to flood the depressions for recession cropping can sometimes lead to uncontrolled flooding and conflicts with those whose livelihoods (rain fed cultivation) and property are damaged, e.g. roads, house and settlements, public infrastructure, canals, bridges and even barrages.

Environmental impact: Pollution of drinking water sources like wells and tube wells, bank erosion, silting of river beds and consequent lateral shifting of river channels, displacement of animals and cutting down of trees for firewood around relief camps are some of the adverse environmental impacts of floods in the Juba and Shabelle Basin.

Financial impact: There are no estimates of financial impacts from floods nor average annual damage is estimated due to lack of a legal and institutional framework in Somalia for the past 20 years. However, according to the Somali inter-agency response group huge amounts of money are spent every year on relief and rehabilitation of flood displaced people.

1.4 Flood Management and Control Structure

The land reforms in 1975 which transferred all lands to state ownership has also introduced the creation of large to medium scale commercial farms, state run farms and irrigation schemes, mainly on the Shabelle basin. Prior to the land reforms, the customary irrigation and associated flood management systems were community based. Management entailed well established locally organised distinct responsibilities in water and land management. Flood management in particular, involved building and regular maintenance of infrastructure for flood alleviation which comprised of strengthening and re-enforcement of embankments and diversion canals. Apart from preparedness, communities used traditional methods to alert and organise themselves against floods. Alert normally would start once the colour of water change and an increased water flow is witnessed. Warning messages through word of mouth were sent to communities downstream about the potential hazard. As a result of the land reform, early warning systems, maintenance of river infrastructure moved away from the traditional structures to state responsibility. Although some elements of the community based flood management systems were incorporated into the institutionalised and centralised planning system, this has ushered in a period of government led maintenance and repair of all infrastructure, resulting direct community involvement to be minimal hence increasing dependency on state interventions,

In 1969, a study was undertaken to consider the construction of flood relief canals to reduce the risk by transferring water from the upper reaches of the Shabelle valley particularly around Jowhar. Also studies were carried out to investigate the possibility of storing transferred water from the river. The result of these studies was not only the construction in 1983 of what became known as the Duduble Flood Relief Canal but also in parallel the construction of the Duduble Reservoir located 40 Km north of Jowhar town and some 25 km from Mahaday Weyne. The latter site for the reservoir was considered the most suitable being a natural spillage area, Figure 1.2.

In the Middle Shabelle, the Duduble or Chinese canal and the Jowhar Off-stream Storage Reservoir (JOSR) and most of the primary canals along the Shabelle were developed to divert water from the river during periods of high flow. The other purpose of the JOSR was to store excess water for later irrigation use downstream in lower Shabelle. Major primary canals also feed a number of secondary canals serving irrigated areas. Due to lack of regular maintenance, most of the canal systems are frequently silted up conveying excess water at reduced capacity.

The Sabuun barrage north of Jowhar and the JOSR were constructed with a dual purpose of (i) regulating flood flows by diverting excess river flows into the storage reservoir south of Jowhar and (ii) at times of low river flows, augmenting the flows by controlled releases from the reservoir for irrigation purposes downstream.

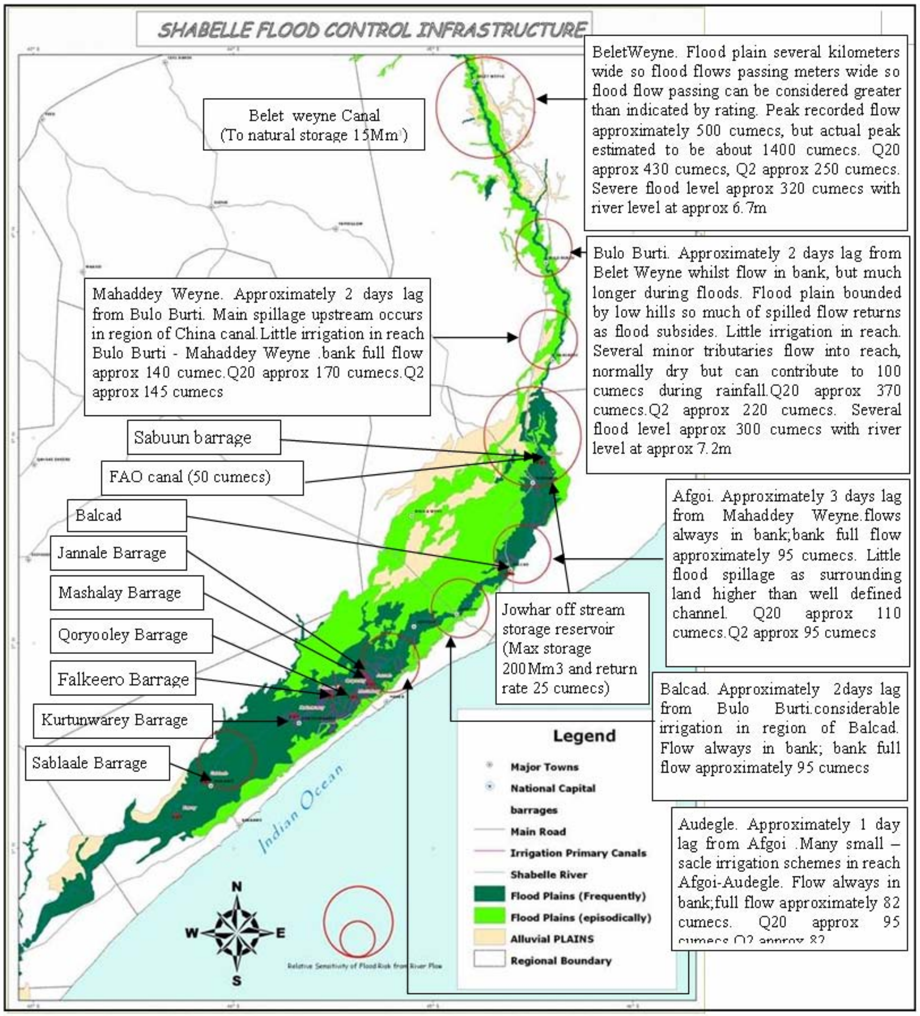

Figure 1.2: Flood control infrastructure in Shabelle River

The JOSR was conceived in the late 1960s, planned in the mid-1970s and implemented and made operational in 1983 to contribute to regulation and control of the flow of water in the Shabelle River. The result was the construction of a reservoir covering an area of approximately 100 Km^2; with a design gross storage capacity of 200 million cubic meters. It was built at the site of a natural depression directly downstream of the Jowhar Sugar Estate on the left bank of the Shabelle River. The reservoir consists of the following:

- A 35m barrage across the river at Sabuun with seven 4-m wide radial gates;
- A 25m wide head regulator for the supply canal (FAO Canal) with 4m wide vertical lifting gate;
- A 24Km long supply canal with a design capacity of 50 m^3/s;
- A storage reservoir with a capacity of 200 million m^3 enclosed by low earth embankments;

- An outlet regulator from the reservoir with four 4m wide vertical gates and;
- An outlet canal of about 3.4Km and 25 m^3/s capacity.

A number of barrages and primary canals were built along the Shabelle River to divert water for irrigation and flood relief purposes with the Janaale and Qoryoole being the oldest and biggest ones. There are another four barrages downstream Janaale including Qoryoole built for irrigation and flood control purposes. These are Mashalaye, Falkeero and Kurtunwaary.

Due to its morphology and high embankments, the Juba River has no significant flood control structure. The Fanoole dam is the only dam located on the Juba River, north of Jilib town in the Middle Juba Region. The barrage was designed to divert 33.4 m^3/s of water for irrigation purposes. Fanoole has not been in operation since the beginning of the civil war in Somalia in 1991.

According to recent assessments carried out by FAO SWALIM and partners indicates that the canal feeding the JOSR is completely silted up and overgrown by trees. In addition the reservoir is covered with thick layer of sediment and contains no water, inhabited by communities and transformed into small subsistence farms, and the outlet canal situated at the lowest point and is damaged and non functional. The rest of the infrastructure are in state of disrepair and can not provide any flood defence and management unless they are properly rehabilitated.

2. Study Approach and Activities
2.1 Introduction

The flood risk and response management study for the Juba and Shabelle rivers was undertaken by a team comprised of a consultant hired for the purpose and specialists from SWALIM; namely from the water resources theme group. The team was supported by specialists from the information management theme group during the development of the flood information web site. The core team was:

- Ahmed Jama, Consultant
- Hussein Gadain, Water Resources / River Management Coordinator,
- Stephen Waswa, Data Management Officer,

The study followed an institutional participatory approach and was undertaken in two stages. The first stage mainly comprised of desk-based assessment of numerous literature, primarily reports; both recent and old, various maps on the rivers and flood areas, interview with key informants and individuals from agencies and institutions active in flood response and emergencies. While, the second stage primarily dealt with development of a *web-based* flood information sharing platform (web site).

For purposes of consulting with main stakeholders involved in flood risk and response management, a half day workshop was organized with the objective of soliciting comments and building consensus on the flood information management system developed by SWALIM. The team also attended a number of inter-cluster and agencies flood preparedness meetings for purposes of providing flood situation update and gathering other information. The team spent two months conducting the assessment, tapping on various sources of information as described below.

2.2 Document Review

The team reviewed numerous reports which provide detailed account on floods in southern Somalia. The reports reviewed included the interagency 2004 action plan for flood forecasting, preparedness and response for the Juba and Shabelle Rivers in Somalia, experience of the inter-agency on flood response during the 1997/98 El Nino floods. In addition, SWALIM and other reports describing the extent of problems relating to implementation arrangement and management of flood water and flood including irrigation infrastructure, and background information on the water resources sector in Somalia were also reviewed. Relevant technical reports reviewed included SWALIM feasibility study for improving flood forecasting in Somalia (2007), summaries of flood activities from FAO and SWALIM library and archives, selected international literature on flood risk management in order to provide a broader prospective of definitions of terms and terminologies, and the EU guide on preparation of flood risk management schemes.

Throughout the research and review period, the team was able to gather valuable information on historical floods that necessitated massive humanitarian response and donor appeals during the El Nino of 1997/98 including the present set-up of the humanitarian framework in Somalia. The team carried out an analysis of flood preparedness and flood response coordination and management system in place, historical floods patterns, physical and socio-economic impacts of floods, and flood control and management structure, current situation and problem identification. The document review stage further examined the current flood risk and response situation and the system for flood management prior to the ensuing conflict in South Somalia. Comparison of current data with SWALIM and other data sourced from agencies were also undertaken.

A list of key references is shown in the bibliography/documents consulted section of this report.

2.3 Key contact interviews

Selected key informants were visited and interviewed by the Consultant, Data Management Officer, and the Water Coordinator during the course of the study. Consultations were conducted with agencies active in flood risk and response in southern Somalia in order to understand their perspectives on flood preparedness and response interventions, roles and planned activities as well as established operational modalities during flood events.

Key informants consulted included over 30 representatives from the donor community, international agencies and organisation, International and Local NGO's. The most relevant informants were from UN-OCHA, WFP, UNICEF, UNHCR, UN Resident Humanitarian Coordinator's (RHC) cluster system heads, SSS sector system chairs and working groups, including FSNAU, SWALIM, and FEWS NET projects staff, other NGOs, UN agencies (UNDP) and other donors. The list of persons and institutions interviewed is presented in Annex-1. Unfortunately, field visits and consultations with affected communities were not possible due to the prevailing security situation and accessibility during preparation of this study.

Apart from agencies and organization involvement directly in flood related activities, interviews were conducted with other agencies and organizations involved in rehabilitation and maintenance of irrigation and flood control infrastructure. NGO's who provide emergency-based interventions during and after flood events provided very valuable information. Additionally, interviews were held with organizations mandated to supply logistics in order to ascertain levels of preparedness and availability of stores and warehouse, stocks, materials and equipments.

2.4 Web-based information platform

The approach adopted in developing the Flood Risk and Response Management Information System (FRRMIS) is based on SWALIM experiences in providing the Somali interagency response group with necessary information for flood preparedness and response as co-chair of the Flood Working Group (FWG) under the Somali Support Secretariat (SSS). This was strengthened by the 2006 floods management experiences undertaken in collaboration with UN-OCHA and FSNAU.

The web-based approach was mainly designed to provide information sharing platform or Decision Support System (DSS) to assist in guiding lead agencies and cluster responses to plan and embark on interventions. Most of the baseline information needed for preparedness and real-time update on floods were either available within SWALIM archives or generated for this purpose and some from past activities of the hydro-meteorological monitoring network.

This stage of the study was carried out purely by SWALIM staff and the main objective was to establish comprehensive information system on floods in the Juba and Shabelle rivers in Somalia. The data generated established the historical floods and their inundation extents, flood prone areas and flood control infrastructure (flood diversion canals, barrages, and irrigation canals), infrastructure needed during rescue and response, daily update on flood situation using measured river levels and their comparison with flood levels, flooded areas based on FSNAU and other NGO's field reports and, communication of information using dedicated e-mail for further vetting by the technical group (FSNAU, FEWS NET and SWALIM) and sharing with interagency through the web platform.

2.5 Stakeholder Consultative Workshop

The workshop was organized by SWALIM with principal objective to share and familiarize stakeholders on the build-up of FRRMIS and to obtain further stakeholder contribution prior to completion of the study. The other objective was also to use the workshop as verification platform for the information collected by SWALIM and the consultant. The workshop was held in September 2009 in Nairobi. Participants (besides the consultant and SWALIM team) were senior experts from UN and NGOs, and UNDP and EC staff. More than 70 people participated in the workshop.

The current study:

- Identified, accessed, and reviewed relevant documents, to the degree possible within the timeframe. Documents reviewed are identified in the bibliography section.
- Met with a wide range of stakeholders, in international and local organisations working in different projects in Somalia. This included Somali government officials.
- Synthesized and critically analysed the information obtained, and developed preliminary ideas. This was largely undertaken with the water theme staff.
- Made presentations in stakeholder workshops to review the collated information and tentative proposals for moving forward.
- Comments and ideas from that stakeholder workshop were incorporated in this report.
- Prepared the current report following discussions with the CTA of SWALIM and other staff members

3. Flooding – Key Concepts, Terms and, Common Definitions

3.1 Introduction

Ideally flood risk and response management deals with a wide array of issues and tasks ranging from the prediction of flood hazards, preparedness and response, through their societal consequences to measures and instruments for risk reduction. Due to this variety of aspects, management of flood risks needs systemisation and integration. This part of the report provides definitions of central terms of a basic framework for flood risk management, in order to provide SWALIM users with the terms and common definitions that are in use within the flood and scientific research community.

3.2 Flooding

Flooding is a natural process and can happen at any time in a wide variety of locations and may not be classified as a threat in natural flood plains. Flooding can be defined as temporary covering of land by water outside its confines and constitute a risk only when people and human assets are present in the area which floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and the environmental and cultural heritage. Normally, flooding is caused by prolonged and/or intense rainfall. The most common type of floods in Somalia is inland flooding. There are a number of different types of inland flooding in Somalia.

1) Overland flow occurs when the amount of rainfall exceeds the infiltration capacity of the ground to absorb it. This excess water flow overland, ponding in natural hollows and low-lying areas or behind obstructions.
2) River flooding occurs when the capacity of a watercourse is exceeded to an elevation such that the river overflows its natural banks or breaks levees/dykes or the channel is blocked or restricted, and excess water spills out from the channel onto adjacent low-lying areas (the floodplain).
3) Flash flooding develops very quickly on streams and river tributaries or as a result of failure of infrastructure designed to store or carry water (e.g. the breach of a dam, a leaking canal, or a burst water main). Because of the sudden onset, the impacts of this form of flooding can be severe.

Flash floods are highly dynamic with very fast catchment response and allows very short lead times (< 12hrs). In river flooding, catchment response affords long lead times. Each flood event can be characterized by features such as water depth, flow velocity, and temporal and spatial dynamics.

Floods in intensively used catchments are often influenced by man through land use, river training, etc. This is a common practice in the Juba and Shabelle rivers. There have been no regulations on land use and irrigation since the collapse of government in 1991 and the catchments are highly exploited, e.g. overgrazing, tree cutting and settlement inside flood path, resulting into large scale flooding at normal river flow conditions.

3.3 Flood Hazard

The term 'Flood hazard' is a measure of the susceptibility/threat to a region due to its physical environment. It frequently encompasses hydrological and hydraulic analyses and the mapping of flood plains. The probability of occurrence of potentially damaging flood events is called flood hazard. Potentially damaging means that there are elements exposed to floods which could, but need not necessarily be harmful. This information can be translated into maps showing the borders of the terrain at risk as well as depths of inundation and related velocities. The flood hazard encompasses events with different features. The flood hazard covers events with various features. For instance a 50-year flood and 100-year flood have varying impacts on population and infrastructure at risk. Moreover, these events may be associated with different transport capabilities regarding sediment and other substance with varying impacts on human and the environment.

3.4 Flood Vulnerability

Defining vulnerability can help to understand the best ways to reduce it. The notion to vulnerability has changed over the last 20 years. Presently, various definitions of this parameter are applied depending on the needs. One of these concerns the susceptibility of a region to flood losses, which is defined via the geophysical, economic and societal attributes of a region. 'Flood vulnerability' is defined as a measure of a regions' or population susceptibility to damages. Vulnerability is considered in this study as the extent of harm, which can be expected under certain conditions of exposure, susceptibility and resilience (equation below). A clear distinction between exposure to hazard and vulnerability is considered essential to analyse the flood problem, clearly distinguishing between strategies that can be adopted from an engineering perspective from those that require consideration of social issues.

Vulnerability = Exposure + Susceptibility - Resilience

The main objective to understand and assess vulnerability is to inform decision-makers or specific stakeholders about options for adapting to the impact of flooding hazards. The need for vulnerability analysis is noted in scientific literature, and the concept includes *natural vulnerability, social vulnerability and economic vulnerability.*

The aim of vulnerability studies is to recognize correct actions that can be taken to reduce vulnerability before the possible harm is realized. Identifying areas with high flood vulnerability may guide the decision-making process towards a better way of dealing with floods by societies.

3.5 Flood Risk

'Flood risk' can be defined as a descriptor of total losses due to a flood event occurring in a specific area. Flood risk is often expressed as the convolution (combination) of flood hazard and flood vulnerability (equation below). It is defined as the probability (or hazard) of negative consequences (impacts) due to floods and depends on the exposure of elements at risk to flood hazard. The probability expresses the likelihood of damaging flood level or flows being reached, whilst the consequences can be expressed in terms of indicators such as the numbers of properties affected, loss of life, direct or indirect economic losses, and pollution of water, soils and ecological systems with their ecosystem (biota).

*Risk = Vulnerability * Hazard*

Proper understanding of flood risk is explained through a casual chain linking meteorological and hydrological events (sources) through the discharge and inundation (pathways), and the physical impacts on elements at risk (receptors) to the assessment of effects (consequences). The *'Source'*, '*Pathway'*, and '*Receptor'* refer to the physical processes, whereas the assessment of the *'(*negative*) consequences'* is a matter of societal values. Source and pathway represent the flood hazard. Source is determined by the probability of flood events with a certain magnitude and other features. Receptor and (negative) consequences state the vulnerability.

3.6 Flood Risk Management

Flood risk management (FRM) has been defined as "a systematic process that produces a range of measures associated with flood hazard mitigation, emergency preparedness, impact response and disaster recovery, and which contributes to the safety of communities and the environment; and at the same time parallels risk management and good management practices". Therefore, it is essential to define, quantify and understand a flood risk before it is possible to manage it effectively.

Flood risk management is a fundamental activity geared to the evaluation of schemes for reducing but not necessarily eliminating the overall risk, as in many cases risk cannot be entirely eliminated. The term management is used in at least two different ways in the literature on floods, either excluding or including risk analysis. The first understanding is based on the hydrological reliability of existing flood defence structures. Management is interpreted, therefore, as decisions and actions undertaken to mitigate the remaining risk above flood protection design standards. Dealing with flood risks in this case means carrying out flood risk analysis and then risk management. The second understanding defines management as decisions and actions undertaken to analyse, assess and (try to) reduce flood risks. In this case flood risk management covers the risk analysis, risk assessment and risk reduction. Both concepts are real alternatives and can hardly be combined.

In general, flood risk management aims to minimise the risks arising from flooding to people, property and the environment. This can be achieved through structural measures that block or restrict the pathways of river floodwaters, or non-structural measures that are often aimed at reducing the vulnerability of people and communities, such as flood warning, effective flood emergency response, or resilience measures (e.g. public preparedness for flood events for communities or individual properties).

In the flood management process three modes of management are recognised: *pre-flood*, the *flood event* respectively management and, *post flood* modes. The *pre-flood mode* is determined by the aim of reducing flood risks in the long term. It can be characterised by the availability of time and resources and, flood risk can be investigated in details with some pre-decision, alternative developments of preventive or preparatory interventions may be intensively discussed. In contrast, the *event management mode* is influenced by the nature of the flood event. Response times are short and the resources are limited to prepare actions in comparison with pre-flood phase. The dynamic course of flood risk has to be estimated in short-term. Decisions need to be taken immediately and strongly formalised. The *post-flood mode* is dedicated to recovery and the avoidance o further negative consequences.

3.7 Components of Flood Risk Management

Three tasks and components are used in structuring flood management activities. These are risk analysis, risk assessment and, risk reduction. To achieve the aims of each task certain components are required. They range from hazard determination to the specification of post flood interventions.

Risk analysis: provides information on previous, current and future flood risks. It is based on the determination of the flood hazard, flood vulnerability and the flood risk itself. Meteorological, hydrological, hydraulic, economic, social science and ecological methods should be included in flood risk analysis. However, the challenge is how to integrate the knowledge from all these fields. In general probabilistic approaches are used to quantify the flood hazard. As far as the socio-economic field is concerned some approaches deal with economic losses. Knowledge and methods on indirect consequences as well as on social and ecological impacts are still in their infancy.

The main results from flood risk analysis are risk maps and real time flood forecasting and warning systems as operational procedures. Risk maps generally provide information on the flood probability, the water level, flow velocity, sediment transport, etc. Interactive web based approaches do exist and are becoming most popular in the flood risk analyses results nowadays. Real time flood forecasting and warning systems provide information on ongoing flood events in order to enhance the lead time for preparatory activities, like reservoir control, evacuation, etc. They mainly consist of meteorological and hydrological modelling.

Risk assessment: deals with their perception and evaluation. Flood risk assessment shall identify, quantify and communicate to decision-makers and other stakeholders the risk of flooding to land, property and people. The purpose is to provide sufficient information to determine whether particular actions (such as zoning of land for development, approving applications for proposed development, the construction of a flood protection scheme or the installation of a flood warning scheme) are appropriate. This should establish the areas that are liable to flooding for events with selected probabilities and the characteristics of that flooding in terms of depth of flooding and flow velocities. This can be based on historic data or on some form of modelling.

Assessment of flood risk requires hydrological data and methods (models) that can be used. Modelling requires detailed topographic and bathymetric data. Modelling can be used to determine, for example: flood prone areas, potential depth of flooding, duration of flooding and, speed of rise of flood waters.

Risk reduction: is dedicated to interventions with potential to decrease the risks. In accordance to the modes of flood risk management they can be systematised as pre-flood, flood event and post flood interventions. Pre-flood interventions cover *prevention*: to decrease the magnitude of floods and vulnerable elements in flood prone areas, *protection*: structural protection of existing vulnerable elements and *preparedness*: behavioural preparation for probable flood events. Flood event management consists of forecasting and *warning* of an ongoing event as a basis for flood defence and providing information to people at risk, *flood control* by operative management of the discharge and water level, flood defence based on flood protection structures and *emergency response* as mitigation of damages and harm by evacuation and rescue. Post flood interventions encompass *recovery* as relief and reconstruction.

4. Situational and Problem Analysis
4.1 Physical and Climatic Conditions

The two rivers are the main source of livelihood for the riverine communities and also environmentally the most important habitats in Somalia, in particular the swamps of the lower Shabelle and Juba, where various wildlife and birds are found. Apart from some few slightly higher areas, generally, between the Shabelle and Juba valleys, the landscape is low lying and relatively level, and this more visible in the Shabelle river basin. The low lying plains put the population and infrastructure surrounding them under high flood risk and vulnerability.

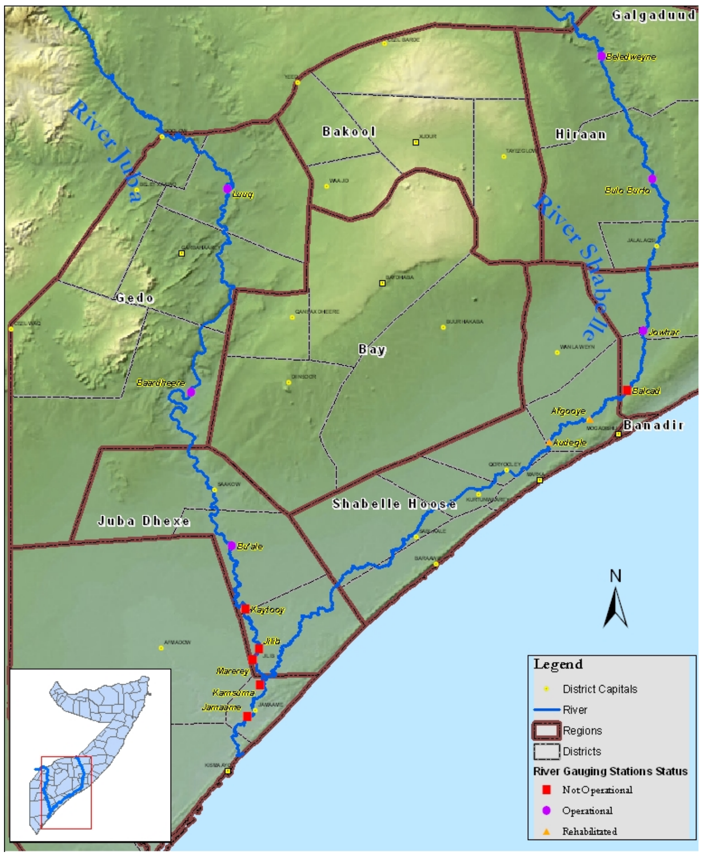

Figure 4.1: Coverage of the Juba and Shabelle in southern Somalia

The climate of the river basin is tropical arid to dry and sub-humid, and there are four distinct seasons, with two rainy seasons alternating with two dry seasons;

- *Gu*: April to June, the main rainy season
- *Xagaa*: July to September, light showers,
- *Deyr*: October to December, second rainy season
- *Jilaal*: January to March, dry season with no precipitation

The rainfall in the river basin vary, with the total mean annual rainfall in the range from 200 - 400 mm in areas bordering Ethiopia in Hiiraan, Gedo and Bakool regions, and to 400 - 500 mm in the central Bay area and northern parts of the Middle and Lower Shabelle regions. The highest rainfall of more than 600 mm is recorded in the Middle Juba region, around Jilib in the southern catchment of the basin.

The basin drainages of the two rivers within Somalia 108,295 km^2 for Shabelle and 64,744 km^2 for Juba respectively and mainly constitute in the regions of Hiran, Middle Shabelle, Lower Shabelle, Middle Juba, Lower Juba, and some parts of Bay, Bakool and Gedo.

The flow pattern of the two rivers is similar, Figure 4.2 and 4.3. They both have two flood seasons, the Gu and the Deyr, reflecting the intensity of rainfall in the Ethiopian highlands. The long term hydrographs data indicate that peak flows take place over 2 – 3 weeks in early to mid April (Gu season) and early to mid December (Deyr season).

Morphologically, the Shabelle flows within almost a flat valley due to the sediment loads deposit led the river bed to be elevated above the plain in the areas downstream of Bulo Burti towards the swampy area before Sablale making it more vulnerable to flooding. Irrigation is widely practiced any breakage of the river embankments can lead to extensive devastating flooding.

The morphology of the Juba River is such that, water is below the level of the surrounding plain, hence requiring pumps for irrigation. The flow a is about twice of that of the Shabelle as can be seen in Table-1 and this is largely due to the higher average rainfall on the upper catchments of the Juba basin. The flow of the two rivers decrease downstream due to little contribution within Somalia minimal and the increase of water spilling over the embankments, river diversions for irrigation, and losses due to evaporation and infiltration / recharge of the groundwater.

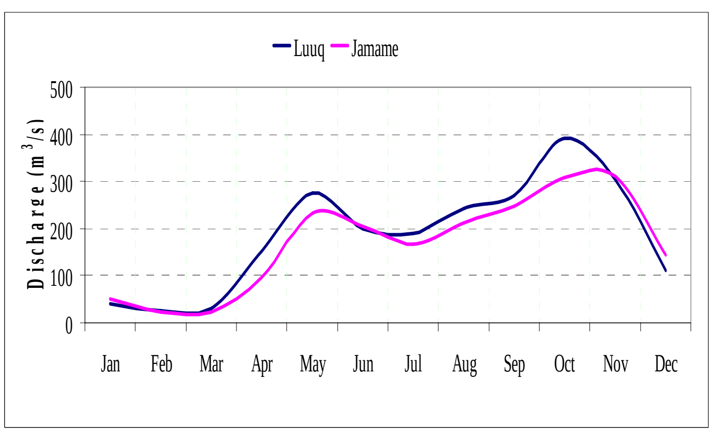

Figure 4.2: Long-term average flows in the Juba

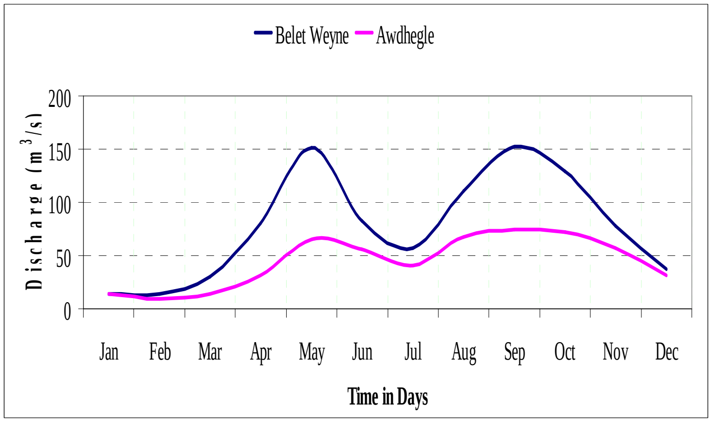

Figure 4.3: Long-term average flows in Shebelle

Table 4.1: Flow data in probability of exceeding[1]

River	Location	Exceeding 50% of the time (m3/sec)	Exceeding 90% of the time (m3/sec)
Juba	Luuq	521.0	12.0
	Jamaame	144.0	10.3
Shabelle	Belet Weyne	61.0	7.4
	Awdegle	45.7	0.26

Both the Juba and Shabelle rivers are vulnerable to flooding. More regular floods, though some smaller in magnitude, have placed riparian communities to a cycle of poverty on both rivers. The continuing deterioration of the flood control and river regulation infrastructure, coupled with unregulated settlement in flood plains and the recent practice of breaching river embankments to access water for wild flood irrigation during the low flow have increased the vulnerability of these communities to progressively smaller peak flows.

These rivers and the associated basins have been studied by SWALIM, and most of the information in this report is derived data/information, report and maps form SWALIM.

4.1 Information and Data Availability

Recognising the collapse of government and the lack national institutions responsible for information archiving and storage, this has led to the loss of data and information including those on physical and natural resources. The international community, namely the E.C has taken a decision in 2001 to finance a number of projects and programme geared to reinvigorate information collection and archiving. The Somalia Water and Land Information Management system (SWALIM) is one of them, with

[1] Source: SWALIM Technical report N° W-11

the main objective of collecting and assembling information on the land and water resources of Somalia, as a decision support function. FAO was contracted to execute the project and the core funding from the EC.

Since inception SWALIM collected numerous reports, maps and generated new maps using topographic maps, satellite images and aerial photographs. This has contributed significantly to rebuilding basic data collection systems in Somalia, such as the meteorological and hydrometric networks. Data has also been collected together into a series of (23) reports, including several dealing specifically with the Shabelle and Juba valleys. Many reports are available on CD. SWALIM also produces predictive advisory services (storm and flood watch). In addition, SWALIM from funding from the E.C has been implementing the River Basin Management Project.

SWALIM is now the principal source of land and water information for Somalia, much of which is available on the SWALIM GIS. While SWALIM fulfilled its role in archiving and making available existing data and information to all stakeholders, SWALIM will in the future phase provide information for the strategic management and use.

This study utilised information available with SWALIM and other projects within FAO, other UN agencies and data from the extensive Somalia support network resident in Nairobi. However, good quality technical data/information on floods and related issues were readily available with SWALIM while non technical data/ information were scattered and less structured. Data sources included:

Map data: maps and digital data are housed by SWALIM (and some housed by FSNAU and FEWS-NET). Maps, and other associated products are available within SWALIM, and even to generate any map for purposes of this study and for other multi dimensional use was not difficult. SWALIM's ability to manipulate data and information for mapping has been immensely boosted by the acquisition of aerial photos.

Reports: Most of the reports reviewed referred to specific projects or studies, and were prepared by project staff or consultants hired for specific studies. There are numbers of reports, dating back to the early seventies and some of them, particularly those on irrigation and agriculture development contained some aspects of flood and flood management.

Numerical data: Most of the data on the rivers and water are with SWALIM, therefore, making SWALIM the lead institution for water in Somalia. Although, FSNAU and FEWS-NET collect some limited data most of their data is geared to food security and livelihoods. Other limited data can be obtained from other organisations, such as, OCHA, UNICEF, WFP and WHO.

4.2 Review of Aid Framework for Somalia

Since the collapse of government, Somalia has received considerable support from the international community. Major part of the International Community assistance to Somalia has been primarily in humanitarian assistance but also in livelihood support interventions. However, effective assistance has been hampered by the lack of security and peace including the absence or effective stable governance system at national and local levels, particularly in the Southern Regions.

International support to Somalia is channelled through the UN system and coordinated theoretically through the Somalia Support Secretariat (SSS) while UN-OCHA coordinates and manages the Consolidated Appeal Process (CAP). The SSS is also a project funded by contributions from donors. The European Union and the United States are the primary donors in both humanitarian and livelihood interventions in Somalia. Additionally, donors also fund some limited interventions directly, outside of the UN framework by contracting INGOs and LNGOs for both humanitarian and livelihood interventions. The Somalia Support Secretariat strives to provide an enabling environment for common policy development, effective collaboration and synergies through the established working groups under various sectoral themes i.e. Health; Water and sanitation; Food security and economic development and Education.

The Coordination for International Support to Somalis (CISS) is theoretically the apex body for aid operations in Somalia (Figure 4.4). Under this set-up, there are various stakeholder groups including: the Somali Donor Group (SDG), the UN has a Country Team (UNCT), Inter Agency Standing Committee (IASC), NGO Consortium, and the Sector Chairs; these all link into the Somali Support Secretariat. The Flood Working Group (FWG) attends to the issues of the floods under the rubric of the Food Security and Economic Development Sector Committee (FSEDSC) which falls under the SSS.

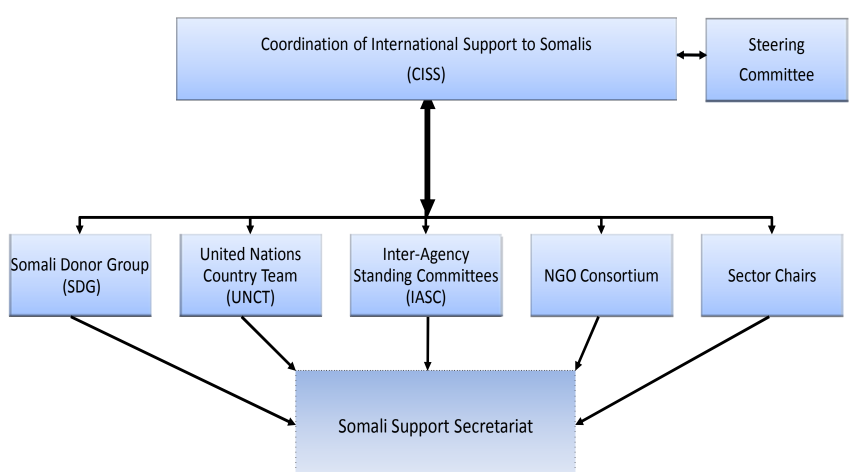

Figure 4.4: Structure of Coordination of International Support to Somalis

4.3 Systems of Preparedness and Early Warning

As there are no national and regional authorities to contain and deal effectively with disasters including flood, communities in the low laying areas along the two rivers are increasingly becoming vulnerable to calamities. Given the difficulties related to accessibility and smooth implementation of humanitarian operations, the humanitarian agencies have taken the role and responsibility to maintain some capacities to monitor and embark on unravelling emergency and respond effectively when floods take place using International and local non-governmental organisations. However, under the present set up, where coordination and lack of resources are the major constraints to most agencies, the system of preparedness for emergency is generally weak to deal effectively with natural disasters such as floods.

There are two stages for preparedness to deal with crisis, the first being collection and assembling of information for planning purposes using a variety of sources by mainly through contacts of agencies on the ground, and secondly establishing the extent of the disaster and emergency including sourcing of funds to undertake response operations.

4.4 Flood Response Co-ordination and Management

The present set-up which is largely coordinated through OCHA is the best possible option under the prevailing condition in support of humanitarian aid and emergencies including floods. The current set up prefers to use the inter cluster system rather than the original sectoral approach, i.e. Flood Working Group. The inter cluster system reports to the UN Resident Coordinator / Humanitarian Coordinator (UNRC/UNHR) and spearhead by UNOCHA and brings together all major players active in response to emergencies, namely international agencies and NGO's. The inter cluster system brings those agencies who are responsible for providing up to date information of technical nature such SWALIM and those whose mandated is to provide material supplies and logistical services. Although access to reliable information and verification from the field is sometimes difficult and tedious, however, the response system has been more effective and quality information can be made available by local stakeholders,

4.4.1 Government Role (past and present)

In the pre-1991 Government set-up, levels of centralised control were very high and the state was the provider of all services and goods including emergency humanitarian operation with the assistance of donors and agencies who mainly provided materials and resources. The government created a department under the Ministry of Agriculture who provided machinery and equipment to maintain all infrastructures in support of flood management and provided communication systems to vulnerable communities for use for early warning. Community participation in emergency operations was generally low as their capacities were non-existent but were very active in early warning and mobilisation. This has, among others, undermined the traditional protection systems and contributed to a strong dependency culture that exists amongst the general public and affected communities even at present, whereby it is expected that local emergencies should be taken care of by “the State”. Since the collapse of central government and in particular from 1994 after the pull of the international forces, this perceived role has in part been taken over by (or rather: assigned to) international donors as caretaker role and implementing partners as executers of development and humanitarian processes. However, under the present institutional set-up both from TFG and the international community prospective the actual performance of the water resources management system is below expectations. In practice, the centralised organisational structures of the previous government were generally weak but were effective in flood emergencies.

4.4.2 Inter-agency Coordination Structure

The current Inter-agency coordination structure is a two prone system based primarily on the SSS sector model and the cluster system based on humanitarian coordination spearheaded by OCHA. Under the sector system, the flood working group is embedded under the flagship of the food security and economic development sector committee which is the most visible forum that deals with issues related to floods amongst others. The group conducts ad-hoc meeting mainly during rainy seasons. The FWG is chaired by OCHA and co-chaired by SWALIM as technical support programme. During floods and for coordination and information sharing purposes the group merges with the inter-cluster working group.

4.5 Experience and Lessons Learnt from El Nino 1997/98 Floods

In recent past, the most devastating floods in South Somalia were experienced during the 1997/98 El Nino rainy season. These floods inflicted devastation and damage, destruction of public and private property, loss of lives, famine and outbreaks of waterborne diseases. This was due to the convergence of three huge quantities of rain water from the Ethiopian Highlands, Kenyan catchment and heavy rains in South Somalia. This was the time in recent history that the waters of two rivers were reported to have joined in Lower Juba. The El Nino floods provided a platform for testing the effectiveness of early warning and preparedness system on the part of the international community and the ability of the local communities to deal with such calamities. The El Nino was catastrophic given the inadequate preparedness from international community to swiftly and promptly react to provide appropriate response in terms of both material and financial resources. The situation was exasperated and constrained by insecurity and lack of access to affected communities. Notwithstanding all the challenges, response was made through the participation of over 20 organisations with the contribution of about 13 million dollars. Most of the work on the field was undertaken by Local NGO’s. It is believed that the flood damage would have been less severe had there been a common and regularized approaches, in terms of preparedness, mitigation and response. Therefore, learning from past experiences and the possibilities for frequent floods to occur, there is need to develop a common approach of flood management and response system.

Although less devastating, heavy floods also occurred towards the end of 2006, necessitating an emergency intervention by the international community and various UN agencies.

4.6 River Basin Management and Institutional Issues

The adoption of River Basin Management system in Somalia will inevitably require some international, regional and national level legal framework and institutional arrangement to streamline the move from previous fragmented approach for managing the two perennial rivers.

Delivering River Basin Management as a management model requires initial consideration of how constitute river basin management organisations with the necessary legal authority to operate across regional, district and local level administrations.

Experience worldwide indicate that River Basin Management model operates effectively when the established management system promotes some sort of centralised structure at the highest level with a various degree of decentralisation of roles and responsibilities at lower levels all encapsulated under a system of management which represents state and stakeholder involvement at appropriate settings. Therefore, for the management system to be operationally effective and efficient there is need to put in place a basin level management structure which will act as an umbrella body (national level) that will delegate specific management roles and responsibilities to lower (regional) and district or local levels.

Many countries in the world are adopting water policies and legislative instruments for water management in conformance to the "Agenda 21"[2]. According to this Agenda, the use and protection of surface water and groundwater are best coordinated at a river basin level. The success of river basin management systems relies upon coordinated actions, including provision of and access to information as well as the capability to correctly interpret and use this information.

River basin organisations all over the world face constrains in enforcing basin plans and establishing effective collaboration among riparian governments. Other challenges include the lack of effective local participation, the absence of formal agreements on international water allocations, the limits on pollution, and the economic and military power imbalance between upstream and downstream countries.

In the Somali context, management of flooding can be best achieved through management of the entire basin including that part of the basin in Ethiopia. The

[2] Agenda 21 contains some of the major principles, policies, legislations and recommendations for sustainable use and development of water resources and was adopted in1992 by the United Nations conference on environment and development in Rio de Janeiro.

following would be proposed institutional arrangements to kick start the operation of a river basin management system for Somalia.

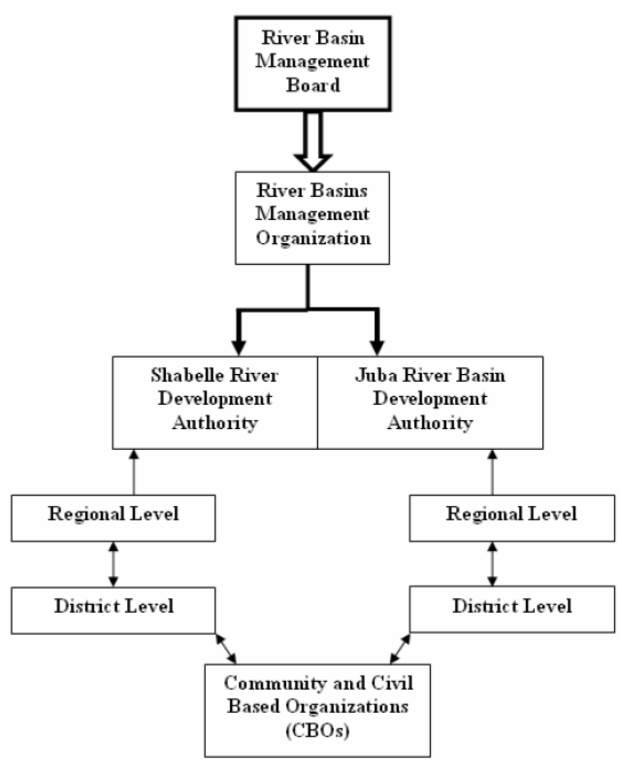

Figure 4.5: Proposed River Basin Management Structure for Somalia

The successful implementation of River Basin Management as a management model is believe to largely hinge on the level of involvement and participation of stakeholder and their ability to work closely within the structures of the management system. It is therefore, paramount to institutionalise participation and empowerment of the society and communities in order to achieve sustainability

5. Flood Response Management
5.1 Somalia Inter-agency Structure and Capacities, Roles and Responsibilities

The deterioration of infrastructure along the two rivers which is almost dysfunctional and lack of clearly defined strategies and policies for flood management in Southern Somalia has contributed to increased flood disasters causing socio-economic and environmental devastations. This is further complicated by the absence of meaningful local authorities and structures on the group where floods occur. Although some information is collected and assemble under the present conditions by a number of agencies who use a variety of sources, nevertheless, the availability of accurate and timely meteorological and hydrologic monitoring and forecast data is paramount to flood warning and alert system. Equally important, is the dissemination of appropriate information to organisations and stakeholders involved risk and response, and to communities affected by disaster.

The ever changing political environment in South Somalia in recent times also contributes to ineffectiveness of response systems that are put in place, namely as accessibility due to security reasons can be difficult and impossible sometimes. It is absolutely difficult to respond effectively to disasters when all operations have to be undertaken by remote control and management. Additionally, there is generally the lack of well-trained people in the field to contribute to effective flood risk and response management.

The follow are the broad roles and responsibilities of the most important agencies in flood risk and response management in the context of Somali Aid System.

Table 5.1: Roles and responsibilities of major actors in flood risk and response management

Agency	Role and Responsibilities
UNOCHA	Regular, timely update, planning and operations of flood emergency within the inter-cluster committee. Incorporating UNDP and UNDSS security bulletins into updates. Donor update and resource mobilization. Dissemination of planning, response and operational information
UNICEF	Maintain up to date procurement information based on the standard relief packages. Support to interagency field preparedness and response plans
WFP	Update and support in Logistics and security situation
SWALIM	Update of Early Warning Section to reflect changes in models or methodologies. Provision of hydro, meteorological data Technical support to UNOCHA, FWG and WFP.
FSAU	Update on vulnerability analysis.
FWG	Facilitating contingency planning and response. Regular and timely updates of operational Plans

5.1 Flood Working Group

The extent of the 1997/98 El-Nino devastations has demonstrated the vulnerability of local communities and the infrastructure to flood events. This has also demonstrated the weakness in planning and effective response to floods from the perspective of the international aid organizations and donor community. The role of national and local structures in flood management has been non existent since the collapse of government.

The flood working group is enshrined under the Somali Support Secretariat structure and its core mandate is to contribute to reducing suffering caused by floods through primarily enacting a plan system for effective early warning. More specifically, the FWG is mandated to prepare specific contingency plans for humanitarian emergency concerning preparedness and response for flood situations in southern Somalia.

It is becoming increasing evident that there is need to institutionalise effective flood preparedness and response mechanism within the support structures for Somalia as flood events occur more frequently than before. Therefore institutionalisation of the mechanism would require a rearrangement of the present set-up to more a regular feature and not on ah hoc bases. For this to be successful there is need to mandate agencies with extensive presence and experience in Somalia and significant in-country decision making capacities to lead in flood preparedness and response

5.2 Other Partners outside the framework of the United Nations system

This study evaluated the respective roles and responsibilities of the non UN agencies, namely national organisation and local bodies who play part in the flood early warning and response systems. Under the present governance arrangement applicable in Somali aid and emergency, the increasing role played by both International and local non-governmental organisation cannot be under underestimated. In particular, the role of LNGO's is becoming prominent partly due to the absence of national government representation at local levels and the desire of the international community to use their services as conduit for assistance to local communities. Experience over the years with local administration has revealed that of weak efficiency and poor accountability are the most compelling reasons for the international community to seek alternative way of providing assistance to the Somali community. Although this system undermines the build up of local administrative systems, the question of whether there is an alternative in the case of Somalia is debatable. This study found out that almost all the information related to flood is derived from LNGO's with some limited verification by employees of agencies stationed in the field.

However, there are a number of constraints to the efforts of all players, but most notably to local organisation in the field are the lack resources to undertake any meaningful activities in flood risk and response. Most of the activities undertaken during flood response are funded under projects or from agency contingency resources which are inadequate in most of the times. The under funding of local organisation has adversely affected their involvement in flood early warning system.

6. The Flood Risk and Response Management Information System

6.1 Introduction

Flood management requires usable and reliable information about produced scenarios and flood history. A flood information system, based on GIS and Web technology, has been developed to bring together the essential information on floods under a single user interface. The system contains flood hazard maps, water level and discharge scenarios, historic flood maps, hydrological flood observations, and recommended building levels. It promotes flood risk assessment, flood-oriented land use, and rescue operation planning. Evidently, it increases public awareness about flood risk and improves communication, since information can be delivered in a consistent and understandable form via our information networks. Moreover, it helps to distribute flood information across administrative boundaries and performs as a knowledge carrier.

A prerequisite for effective and efficient flood management is the in-depth knowledge of the prevailing hazards and risks. This includes information about the type of floods (static, dynamic, etc.), the probability of a particular flood event, the flood magnitude, expressed as flood extent, water depth or flow velocity, and finally, the probable magnitude of damage. Flood maps are indispensable tools to provide information about hazards, vulnerabilities and risks, and to implement the necessary preventive and preparedness measures. The exchange of information, knowledge and experience in this field in Somalia is facilitated by a web site developed by SWALIM and other partners.

6.2 Development of the FRRMIS

The flood information system has been developed using web technology concept and freeware web object-oriented programming languages (MySql, php, etc.), and it contains an online web interface for users that is accessible via SWALIM web site. A significant advantage of these concepts is that, advanced systems are available without anything else but a web browser being installed on user's workstation. The data content of the system, i.e. flood information types, can be in a form of maps (polygon data or point data). The maps were generated using ESRI GIS software and later converted to an easy to handle format. The maps have no attribute data attached to them, but rather legend and symbols. In the case of a searchable database like the stocks and NFIs, the flood database has been designed to allow the users to search by attribute and meet diverse demands of the flood information users. For example, stocks can be linked to district/region boundary or a point location, e.g. district capital.

6.3 System Overview

The Flood Risk and Response Management Information System (FRRMIS) is web-based information dissemination and sharing platform developed by SWALIM in collaboration with partners and brings together the essential information on floods under a single user interface. The system is based on GIS and web technology and contains various types of flood information. It promotes flood preparedness and contingency planning, rescue and response operations planning. Interactivity with other information systems and GIS datasets eases the maintenance and provides a basis for further needs, such as development of flood risk maps. The FRRMIS features three distinct broad areas:

1. Background information: is meant to provide baseline and historical information to facilitate flood preparedness.
2. Information on current forecast and flood situation module: areas and settlements at risk, recent inundation maps, and estimated populations affected are found under the flood management module with a list of agencies involved in emergency response.
3. Resources to respond to floods information: are provided under the flood response resources section, including rescue and food and non-food item resources.
4. Communication panel: communicate to and request information on floods from partners; there is a form to fill and submit.

Figure 6.1 shows an example of the user interface of the flood information and Annex 2 presents a brief user manual for the system

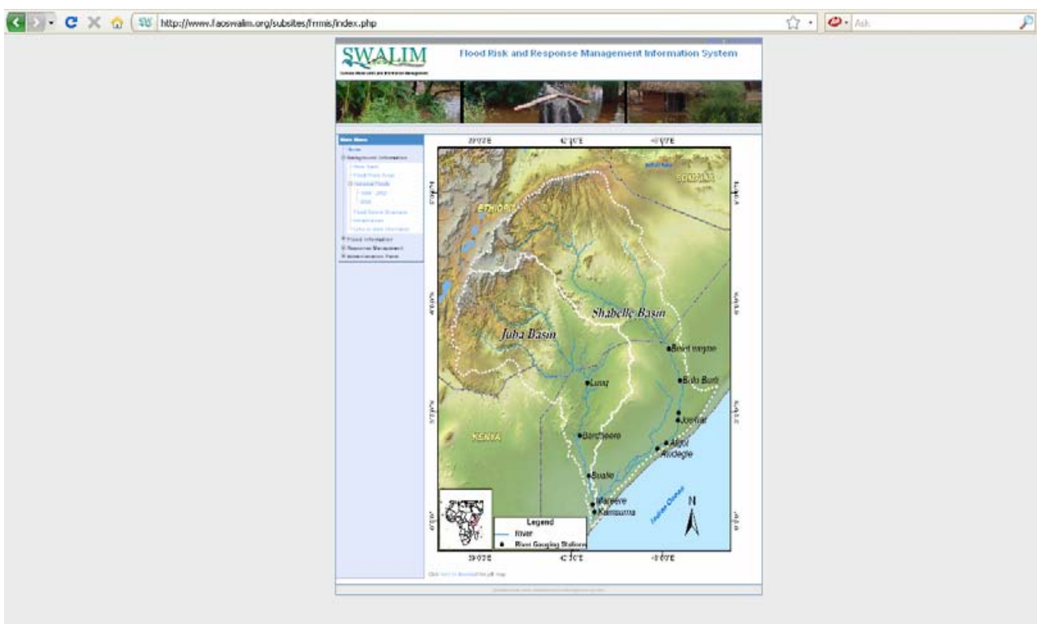

Figure 6.1: Overview of the FRRMIS

6.4 Background Information / Preparedness Module

Experience from the 2006 floods showed that maps and information on floods are critical for pre, during and post flood use. Unlike the 1997/98 flood, information on floods during the 2006 flood received more attention due to advances in information and mapping technologies and presence of FAO SWALIM as the major mapping unit for the Somali interagency and government institutions. During those floods SWALIM disseminated more than 1,000 maps in digital form through SWALIM GeoNetwork and through hard copies. This necessitated tailoring and availing such maps on line and at predefined formats (pdf) for the users to download and print. The majority of the information provided under this module is meant as a decision support tool for flood managers and response agencies to enable them develop flood contingency and preparedness plans for flood emergency response and for flood risk mapping and delineation. The flood information types in this module consist of:

6.4.1 Rivers and their catchments

The catchments extent and the rivers are essential element in flood risk mapping. It is from this information flood prone areas are established, location of vulnerable population and infrastructure determined and levels of vulnerability determined. They provide the general overview of the flood risk modelling domain, land use types, social and economic information. Integrated flood management adopts river basin as holistic approach to the management of water and land, community involvement, best mix of structural and non structural measures, etc. Figure 6.2 presents the catchments of the two rivers as presented for download under FRRMIS.

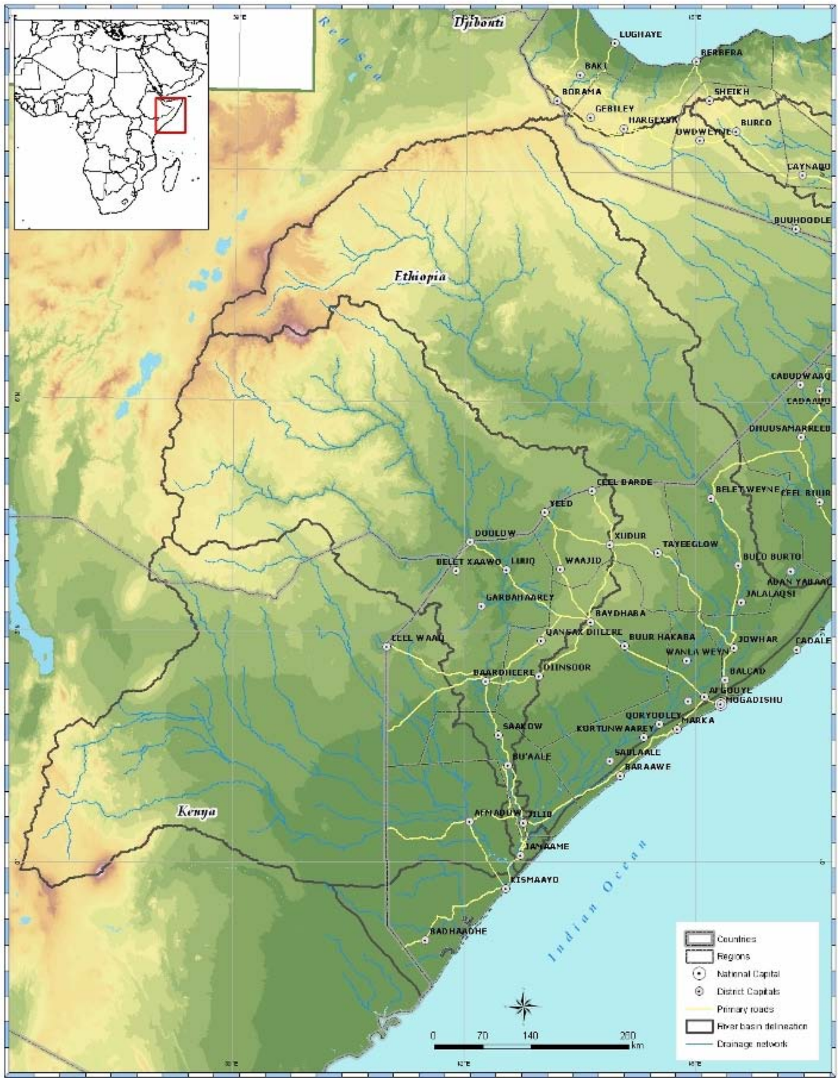

Figure 6.2: Map of Juba and Shabelle river basin

6.4.2 Flood prone areas

One element of risk level involved in certain decisions and actions is the likelihood of flood, which can be expressed by return period. *Simulated water levels and discharges* corresponding to given return periods can be calculated by using statistical methods or runoff models. In surveys on extreme floods values corresponding to the 100-year and 250-year, and sometimes even 1000-year flood have commonly been used. As for more frequent floods, return periods of 20 and 50 years are the main interests.

Flood hazard map is defined as a map showing the areas where floods must be taken into account including the probability of flooding and the degree of danger (e.g. water depth and flow velocity). Flood hazard maps are modelled for a scenario of water level or discharge which usually corresponds to some statistical frequency interval (e.g. 100-year-flood and 250-year-flood). Flood hazard maps can be made in different scales:

- Detailed scales using the best possible accuracy covering only the most critical flood risk areas
- Coarse scales in a cost-effective way using the accuracy proportional to the supposed damages or loss covering the potential flood risk areas. Coarse scale mapping can also be used to make a general estimate which areas are prone to flooding.

Flood hazard mapping requires very detailed information on elevation in order to accurately map potential flood areas. The digital elevation model (DEM) used in modelling flood prone areas was developed using information on contours, spot heights, rivers and water bodies digitised from topographic maps of 1:100,000 scale. The DEM was further processed, filled and the sinks removed. This has resulted into a hydrological corrected DEM for use in hydrological modelling and flood mapping for the two basins.

The extents of inundation along the channel for floods of certain return periods were determined. Areas prone to flooding in the riverine areas mapped based on the final DEM and a hydrological model (refer to the Somalia Flood Forecasting System report produced by SWALIM). The areas were categorised based on flood risk probabilities of low, medium and high risks as shown in Figure 6.3. It is essential to appreciate that a mathematical model is only a component of the total warning system.

6.4.3 Historical flood maps

Another flood information type that document occurred floods is *historical flood maps*. Inundated areas could also be derived from remote sensing data (aerial photographs or satellite images) or it can be interpreted from field markings. The former of the methods can be used to produce near-real time flood maps. Afterwards, a flood level can be measured from the historical flood maps with the help of digital elevation model. The final flooded area images of flood inundation could be overlaid with infrastructure and settlement data for use in a comprehensive flood warning and preparedness system for the floodplains.

The information presented under this section comes from different sources. The Juba and Shabelle basin has been exposed to devastating floods that are documented by the Somali government with the help of development partners, e.g. Institute of Hydrology (now Centre for Ecology and Hydrology - CEH), FAO, and other contracted international companies, e.g. Sir MacDonald. The majority of the flood risk and inundation data presented under this section was digitised by SWALIM from published reports by these agencies and transformed into geo-referenced maps useable for flood risk and response planning purposes. Historical floods digitised and assembled from DFO and other sources are presented in Figure 6.4.

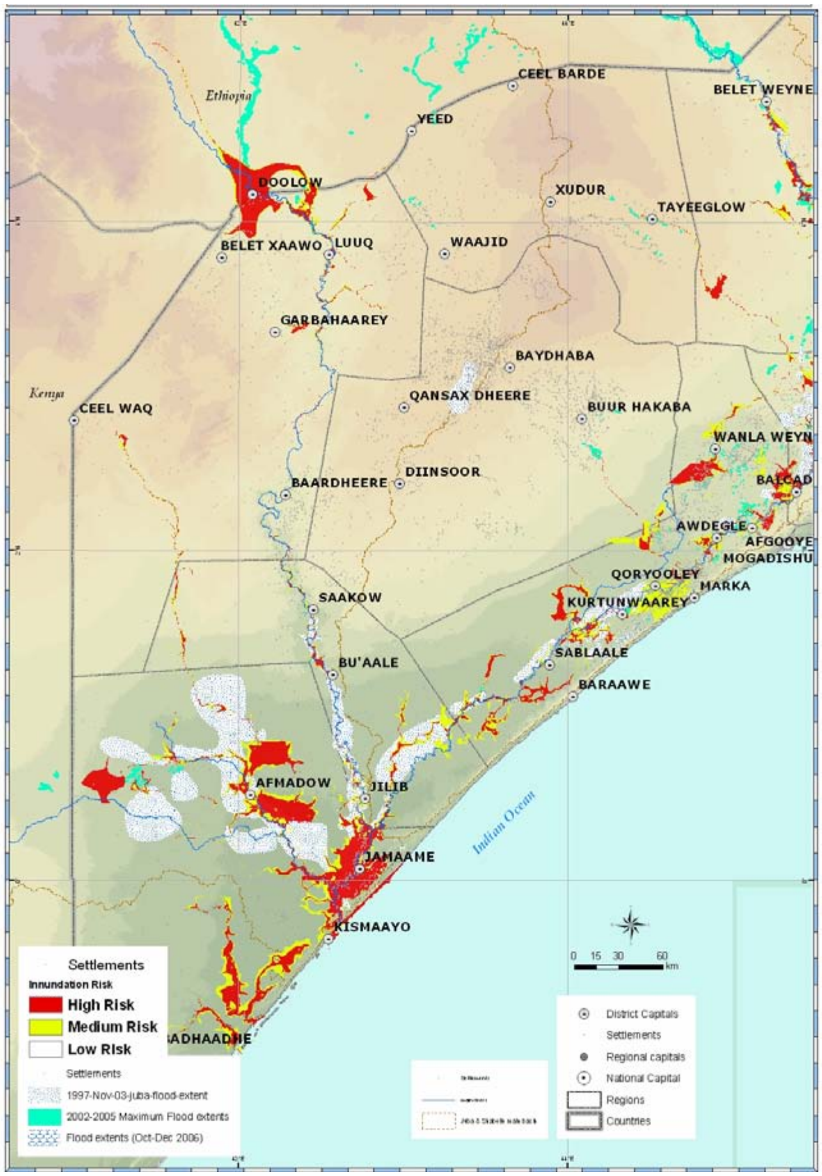

Figure 6.3: Flood prone areas in the Juba and Shabelle rivers

It is until recently when satellite data have become available, facilitating delineation of inundated areas using visible and infrared channels. The recent floods of 2000 and on wards were obtained from Dartmouth Flood Observatory3 (DFO) flood archives. DFO is supported by NASA to facilitate practical use of space-based information for flood detection, flood response, future risk assessment, and water resources research. DFO make use of different satellite sensors to generate flood information for flood hazard mitigation and flood response. The Moderate Resolution Imaging Spectrometer (MODIS) hosted by NASA's Terra and Aqua satellites is the most widely used satellite in producing flood information. Initially inundated areas were

[3] http://www.dartmouth.edu/~floods/

distributed as graphics. It is since 2009 when DFO started distributing this data as GIS compatible layers easing data processing and compilation. A lot of effort was spent by SWALIM GIS team in digitising the graphic flood polygons and transforming them into user friendly formats.

Being recent in memory and exceptional in magnitude and level of damage after the 1997/98 flood, the Deyr 2006 floods received more attention in terms of mapping. The map for the flood is presented in Figure 6.5. The majority of the data for this flood came from the disaster shuttle activated by UN-OCHA, SWALIM and others for purpose of obtaining regional flood inundation extent due to the wide coverage of these floods in Somalia and east Africa in general. UNOSAT provides maps and information to the humanitarian community from the disaster shuttle in order to facilitate and assist emergency response operations. Throughout the 2006 flood season, SWALIM have collaborated with UNOSAT in tailoring maps for Somalia emergency operation. Radars can penetrate clouds, vegetation and other objects and discriminate water and land in a given area. Major problems of radars they have no revisit times, thus could easily fail to see major events.

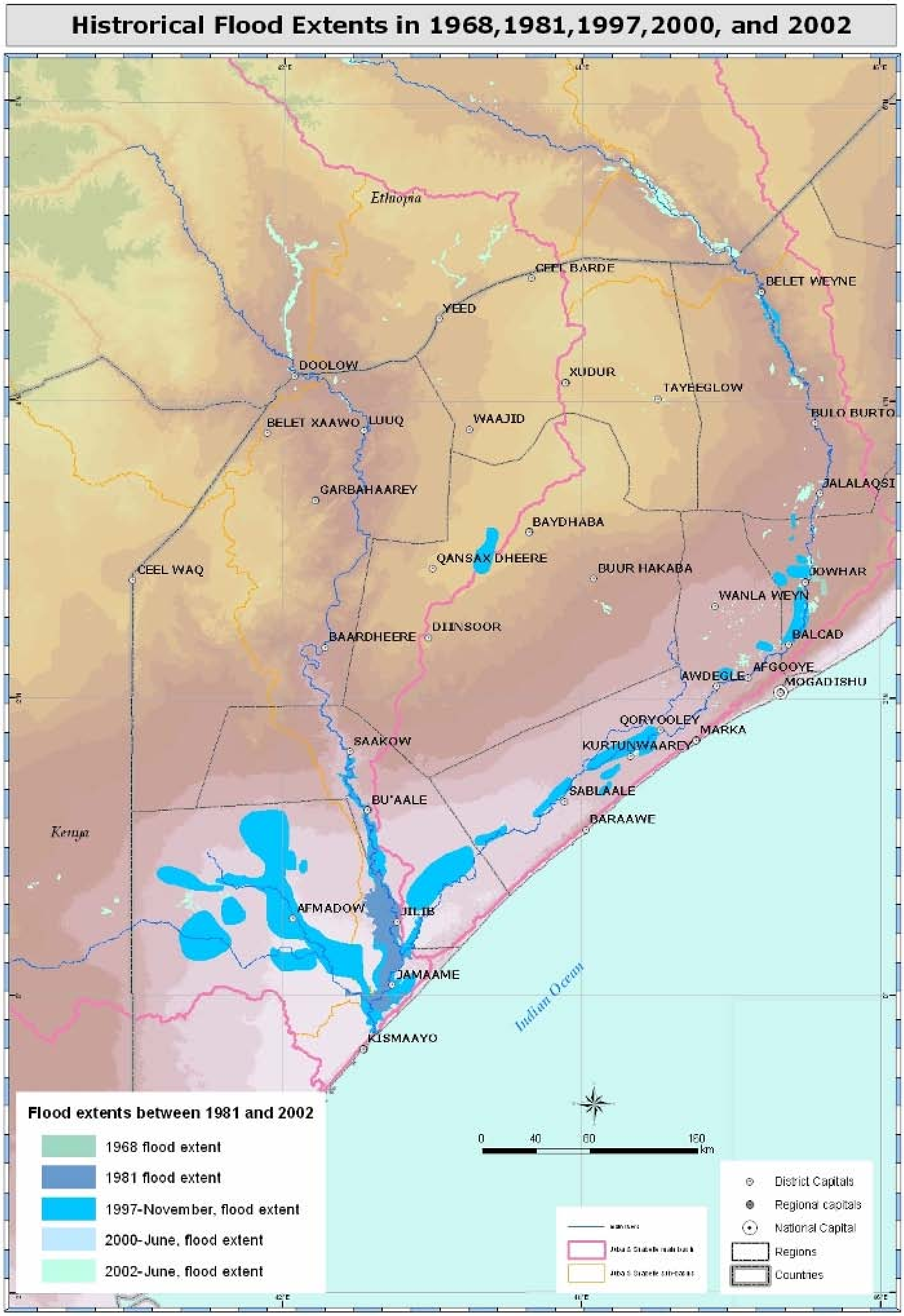

Figure 6.4: Map of historical flood extents in the Juba and Shabelle basin

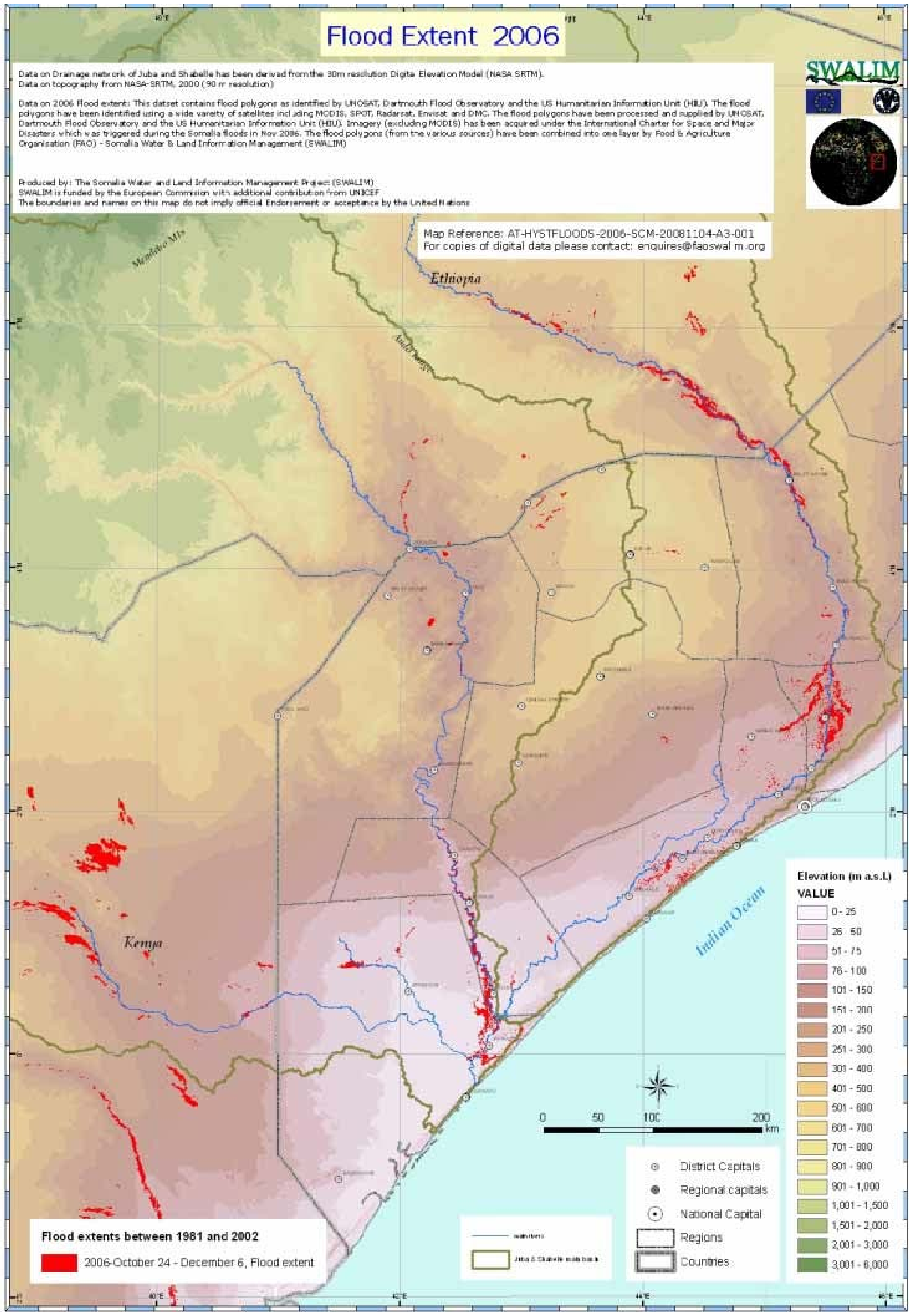

Figure 6.5: Map of year 2006 flood extent

6.4.4 Flood risk information on control infrastructure

Exhaustive description of the flood control infrastructure along the Juba and Shabelle rivers was presented in chapter one and location of the infrastructure for the Shabelle river are given in Figure 1.2. The elements of the infrastructure and their capacities are presented below:

Belet Weyne Canal: At Belet Weyne the flood plain extends several kilometres wide so flood flows passing can be considered greater than indicated by rating. Peak recorded flow is approximately 500 m^3/s, but actual peak estimated to be about 1,400 m^3/s. Q_{20} is approximately 430 m^3/s, Q_2 is approximately 250 m^3/s. Severe flood level approximately 320 m^3/s with river level at approximately at 7.0m. Figure 6.6 shows the canal opened recently for flood relief. The head regulator has 7 gates and the canal drains into a natural depression that has a capacity of 15 MM^3. The canal and head regulator were rehabilitated recently by UNDP. Since the collapse of the government operation of flood control structure is done by local communities which are trained by international agencies.

Figure 6.6: Photo of Belet Weyne Canal and Regulator

Reach between Belet Weyne and Bulo Burti: The flood wave takes approximately 2 days from Belet Weyne to Bulo Burti whilst flow is in bank, but much longer during floods.

Flood plain bounded by low hills so much of spilled flow returns as flood subsides. There is little irrigation water withdrawal in this reach. Several minor tributaries flow into reach, normally dry but can contribute $100m^3/s$ during rainfall. At Bulo Burti, Q_{20} is approximately $370m^3/s$ and Q_2 is $220m^3/s$. Several flood level approx $300m^3/s$ with river level at approx 7.2m. There is no flood control infrastructure in this reach.

Reach between Bulo Burti and Mahaddey Weyne: Approximately 2 days lag from Bulo Burti. Main spillage upstream occurs in region of China canal. There is little irrigation in reach Bulo Burti-Mahaddey Weyne. The bank full flow is approximated at $140m^3/s$; Q_{20} is approximately $170m^3/s$ and Q_2 approximately $145m^3/s$.

At Balcad the flood wave is takes 2days from Mahadadey Wyene. There is considerable irrigation in region of Balcad. Flow always in bank; bank full flow approximately $95m^3/s$. Afgoi is approximately 3 days lag from Mahaddey Weyne, flows always in bank; bank full flow approximately $95m^3/s$. There is little flood spillage as surrounding land higher than well defined channel. The Q_{20} is approximated at $110m^3/s$ and Q_2 is at $95m^3/s$.

The risk of flooding reduces significantly ay Audegle which is approximately 1 day lag from Afgoi. There are many small – scale irrigation schemes in reach between Afgoi and Audegle. Flow always in bank-full at $82m^3/s$, Q_{20} is approximated at $95m^3/s$ and Q_2 at $82m^3/s$.

Other useful infrastructure for flood response includes schools, health centres and roads as presented in Figure 6.8.

6.4 Flood Information

Real-time flood information is provided under this section. During a flood event the water level and discharge observations not only at fixed stations of the hydrological information system but also at any location in the inundated area are of interest. It is important to document flood observations, because they are extremely valuable information when establishing flood scenarios.

6.4.1 Flood situation

Daily flood observations (water level) are provided under this section and compared to moderate and high risk flood levels for the major six locations (Belet Weyne, bulo Burti and Jowhar on the Shabelle, Luuq, Bardheere and Buale on the Juba) where water level observations and discharge measurements are currently taken as shown in Table 6.1.

Table 6.1: River gauging stations in Shabelle and Juba Rivers with example levels for a particular day and associated risk levels

River	Station	Observed River Level (m)	Moderate Risk Level (m)	High Risk Level (m)
Shabelle	Belet Weyne	**2.54**	**6.50**	**7.30**
	Bulo Burti	**0.92**	**6.50**	**7.20**
	Jowhar	**1.98**	**5.00**	**5.25**
Juba	Luuq	**2.00**	**5.50**	**6.20**
	Bardhere	**3.98**	**7.42**	**8.02**
	Bualle	missing	**9.00**	**10.00**

Results of the flood forecasting model for the next 3 days lead time should have been posted in this table, but by the time of operation of the flood information web site the Somalia Flood Forecasting System (SFFS) results were not ready. Such information will be incorporated during the next flood season. A separate report detailing the methodology of the SFFS is produced by SWALIM.

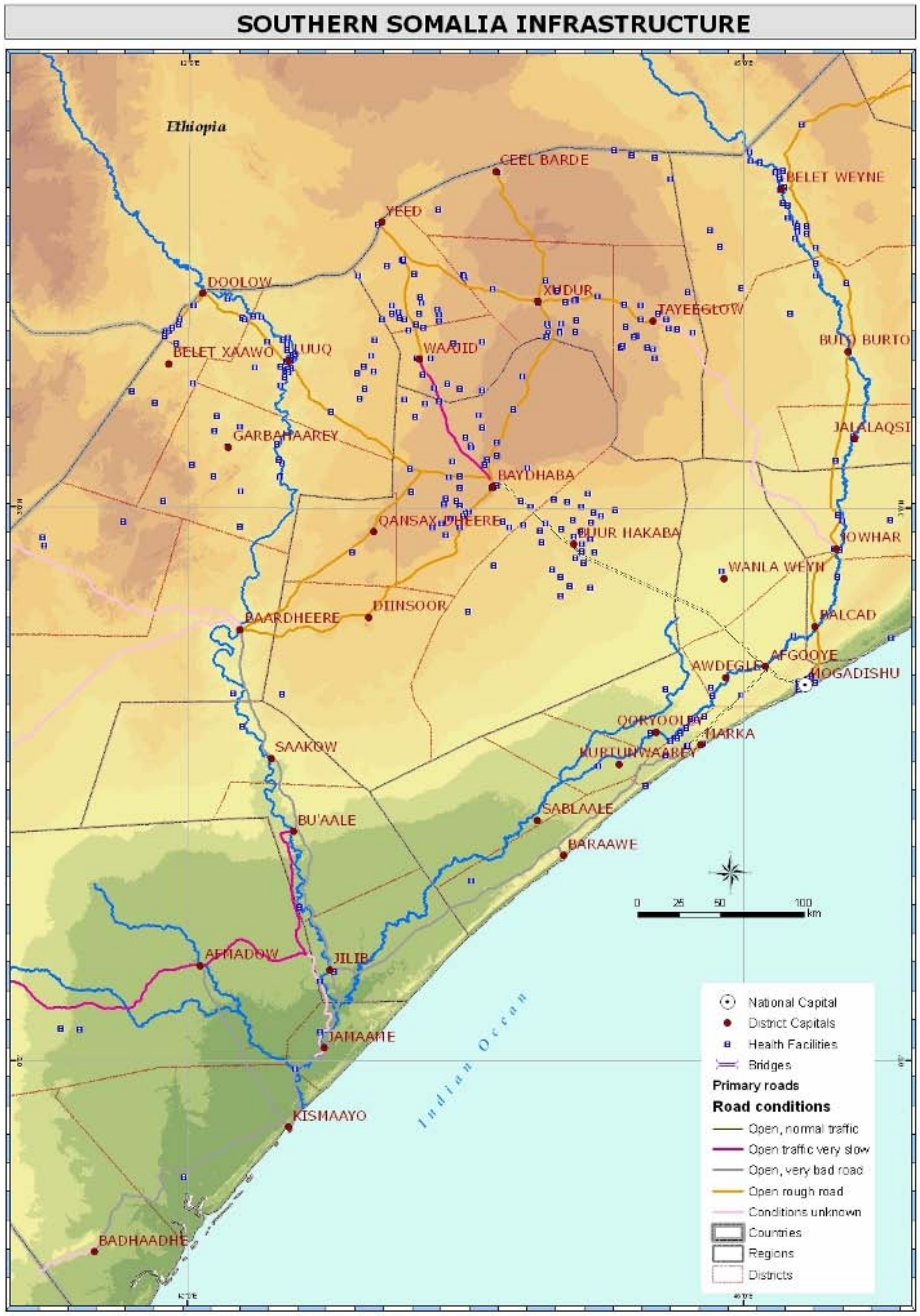

Figure 6.7: Map showing flood infrastructure in southern Somalia

6.4.2 Currently flooded areas

Real-time flooded areas are useful during emergency response operation. They provide information on extent of inundation and if overlaid with the infrastructure, e.g. roads, health facilities, settlements, etc. they could provide estimates for population affected and consequently the level of emergency and estimates for response. Such information could be obtained through UNOSAT after activation of the disaster shuttle depending on the size of the flood emergency. The current system utilise information from the field based on a reporting format developed by the technical group (see annex 3). Flood information from the field is gathered and mapped according to the verification results. A map is uploaded to the web site on daily basis showing indicative areas that have flooded in the previous day. A table listing population affected based on estimates obtained from the field reports by district.

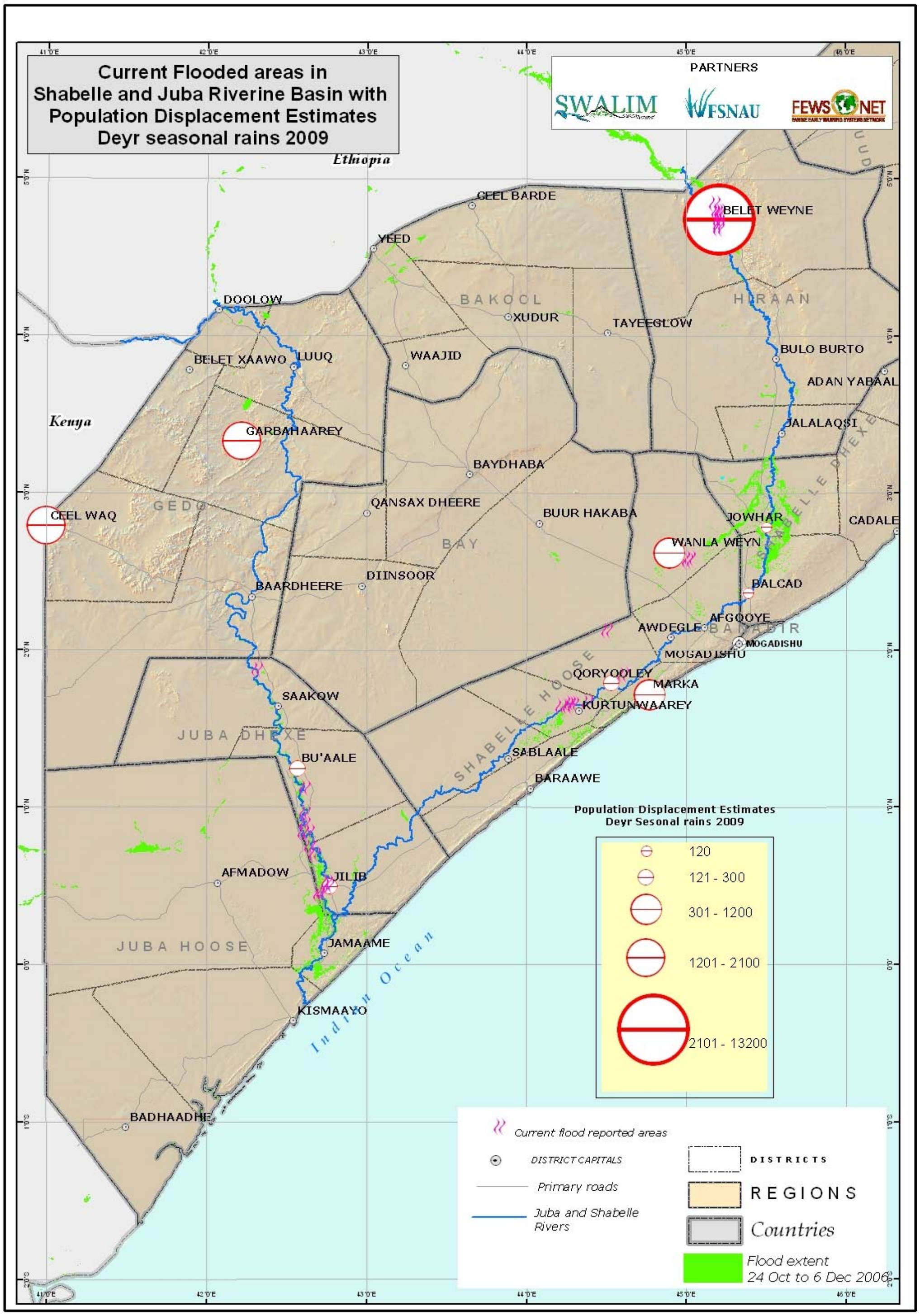

Figure 6.8: Example map showing flooded areas based in field information fro the 2009 floods

6.4.3 Information on Road Status

Road status is updated every 10 days and sometime every week through the logistics cluster. The map provide information on all roads, ports, air fields, etc. and their status. Roads are classified according to surface and whether wet or dry. The map also provides location for stores and warehouses for WFP. It is worth mentioning here that this data was difficult to obtain and its availability on line was questionable by some of the agencies due to security reasons.

6.5 Flood Management Module

Due to difficulties in agreeing among partners on type of information for public sharing, the information under this section is limited to the telephone and e-mail contacts of the cluster leads, sector chairs and the FWG members. The contingency plans developed by the clusters for Deyr 2009 rainy season were also made available under this section. Well prepared contingency plans are important for flood preparedness and response. Depending on the planning scenario the plans should be flexible for change at any time during the flood management process.

6.5.1 Flood Coordination Mechanisms in Nairobi

The flood response, as with the broader humanitarian response in Somalia, is coordinated through the cluster system. This involves three types of meetings.

Cluster Meetings

Each cluster is responsible for holding the discussions necessary to facilitate an effective, coordinated and rapid response to flooding. Each cluster maintains a Who What Where report on the activities of cluster members. During the flood response, changing activities are reflected in the cluster report. Under this module a list of Cluster Chairs is provided. Terms of reference for the clusters are available on the OCHA website http://ochaonline.un.org/Somalia and more information about the Cluster System is available here: http://www.humanitarianreform.org.

Inter-cluster Working Group

The Cluster Chairs meet together in the Inter-cluster Working Group. This is a small, invitation only meeting where cross cluster coordination issues are addressed. For Inter-cluster Working Group Meetings dedicated to floods, technical resources persons invited as required (FSNAU, SWALIM, FEWS NET, WFP and UNICEF).

General Flood Coordination Meetings

OCHA and SWALIM host General Flood Coordination Meetings as necessary. These meetings are open to anyone interested in flood developments. Given that information sharing is done via emails and the SWALIM flood website as much as possible, and response planning and coordination occur through the Clusters and the Inter-cluster Working Group, these General Flood Coordination Meetings are held only at key moments in order to not overwhelm responding agencies with too many meetings.

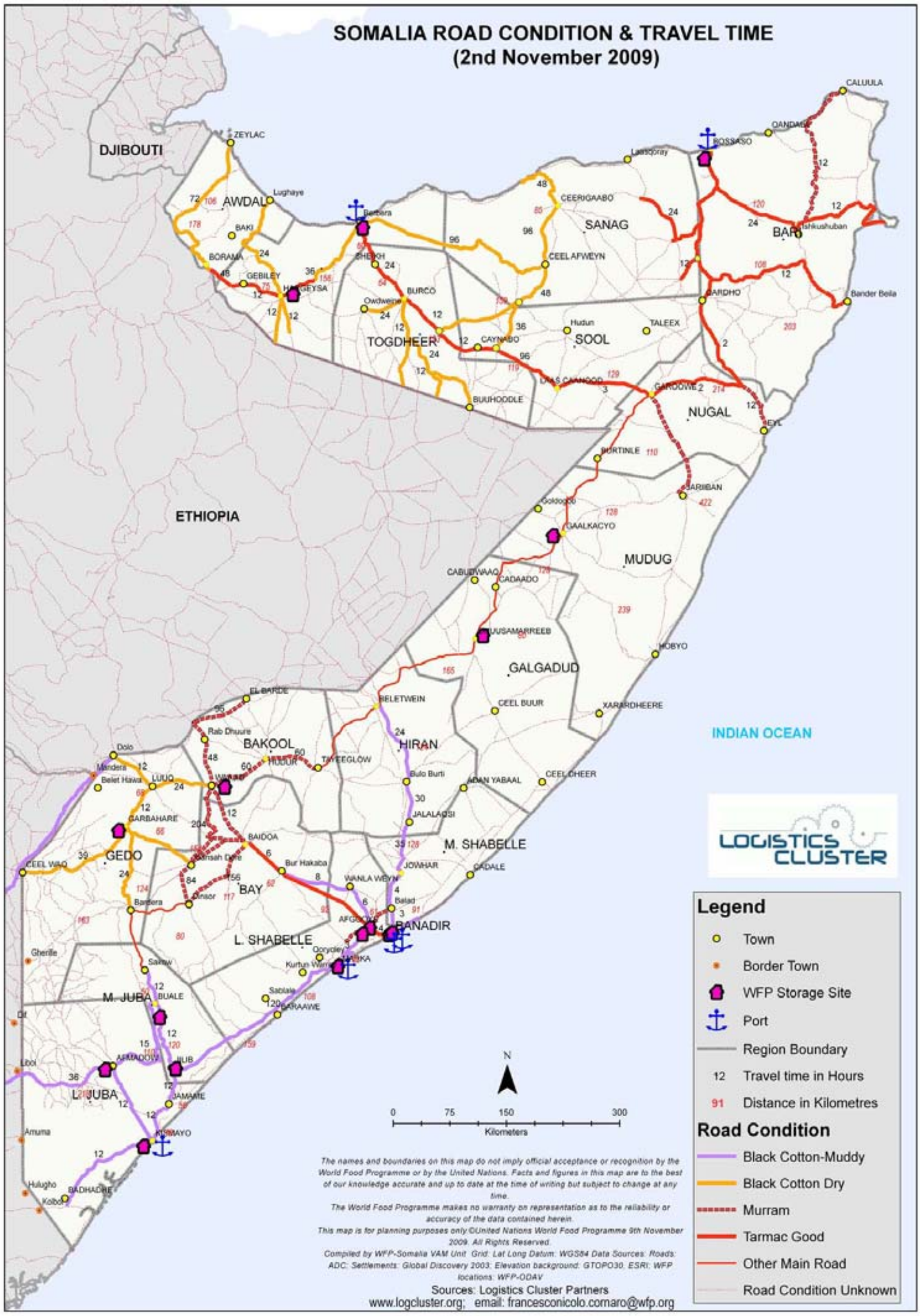

Figure 6.9: Example road status map

A calendar of all Somalia Coordination meetings based in Nairobi and many of those in the field can be found here:
http://ochaonline.un.org/somalia/Meetings/tabid/2718/language/en-US/Default.aspx

Flood Coordination Structures in the Field

Field coordination structures are flexible to reflect the varied coordination needs. It is agreed that, agencies should contact OCHA field staff for further details according to this matrix:

Region	**OCHA Field Staff**	**Contact Email**
Hiraan	Abdullahi Warsame	warsame@un.org
Middle Shabelle	Abdullahi Warsame	warsame@un.org
Lower Shabelle	Ahmed Farah Roble	roblea@un.org
Gedo	Abdullahi Hersi	Hersi1@un.org
Middle Juba	Mumin Ali Mumin	Ali78@un.org
Lower Juba	Mumin Ali Mumin	Ali78@un.org

6.6 Communication and Dissemination Module

The website has a function where you may register for email alerts of any updates. This is a simple way to keep informed of the developing situation. However, OCHA also forward significant flood updates posted to the website to our widest mailing list. More than 72 registries were made during the 2009 flood season. SWALIM together with OCHA and FSNAU approaches more than 800 users through e-mail.

Users could also submit flood information as per the format in Annex 3. However, this is limited to people who have been assigned administrative access rights to avoid confusion of sending multiple and contracting information.

7. Conclusions and Recommendations

The major conclusions arrived at from this study are summarised below:

Data and information on flood risk identification (climatological, hydrological and societal) and response management (logistics) are prerequisite for successful risk and response information systems. From the analyses conducted in southern Somalia, it is concluded that flood risk and response management should contribute to safety of the communities and the environment and requires multi-disciplinary efforts that include flood mapping, hazard mitigation, emergency preparedness, and impact response and disaster recovery to achieve its objectives.

Apart from natural flooding, increased devastation from floods in the Juba and Shabelle in recent times is attributed to manmade factors such as breakage of river embankments for irrigation purposes, encroachment on flood plains and the absence of institutions for law enforcement. Rehabilitation of essential irrigation and flood control infrastructures was supported by the EU and other donors with quite a number of interventions undertaken over the past decade, however, the capacity of the communities to undertake maintenance and rehabilitation of basic infrastructure for flood and irrigation management have been very weak due to problems beyond their capacity.

During the study the mandate and defined core functions of major players in flood risk and response have been examined taking into account the changing environment in Somalia. It is found that, the current system is geared towards response rather than preparedness, additionally; the present practice does not provide sufficient time and resources for response. Even from the resource allocation perspective, there aren't any specific allocations for such devastations in any agency budget, even though emergency activities feature prominently in the agenda of most agencies. Hence, the present coordination system is less effective due to its remote control nature, lack of good quality information from the field emanating from lack of trained personnel and, lack of budget allocation for flood management activities.

The present institutional arrangement for flood risk and response is unclear and confusing and can be considered less efficient. There are a number of organizations involved, some by the virtue of their mandate and some by their ability to provide some services and materials. It appears that lessons have not been learnt from previous flood devastations in Somalia. One of the weaknesses of the current arrangement is the lack of sufficient credible information to plan and undertake efficient response. This largely emanates from disengagement of the agencies and the affected communities by floods.

Although the major part of the assistance to Somalia has been primarily in humanitarian interventions, there are no funds that are primarily committed to flood preparedness and response. The major two mechanisms that feature the aid framework in Somalia are the Coordination of International Support to Somalis (CISS) and the UN Humanitarian Resident Coordinator (HRC). The CISS is channelled through the UN system and coordinated theoretically through the Somalia Support Secretariat (SSS) while UN-OCHA under the leadership of the HRC coordinates and manages the Consolidated Appeal Process (CAP) intended for emergency interventions that are coordinated through sector clusters. Additionally, donors also fund some limited interventions directly, outside of the UN framework by contracting INGOs and LNGOs for both humanitarian and livelihood interventions. However, effective assistance has been hampered by the lack of security and peace including the absence or effective stable governance system at national and local levels, particularly in the southern regions of which the Juba and Shabelle rivers are part.

The study recommends the following:

1. Flood risk maps have become to play a significant role in flood preparedness and risk management. It is highly recommended to carry out hydrological risk analysis for key locations along the two rivers using available historical river flow data for determination of extreme flood magnitudes and their associated depths and velocities, delineation of areas that are likely to be inundated, overlay with infrastructure and settlement and identify and estimate settlements and populations at risk.
2. Dissemination of information to all stakeholders is paramount, most importantly to field level stakeholders and if possible in their mother tongue language. This has to be underpinned by the flood risk and response management information system developed as part of this study. Information on flood forecast from the flood forecasting model developed by SWALIM under a separate study shall be tested and evaluated and incorporated into the flood web site.
3. The possibilities to operationalise and reinvigorating community-based flood warning systems should be seriously investigated with view of establishment of local early warning communication systems. This necessitates community level training in the flood prone areas that could be achieved through strengthening and increasing the role of local non-governmental organizations.
4. There is also need for strengthening local flood response mechanisms which were in place prior to the civil war. Evidently, re-establishing the whole system under the present circumstance is impossible, but establishing the most critical early warning system will eliminate the current information gap. This should be complemented by engaging local non-governmental organizations operating in flood prone areas.
5. The role of Local NGO’s is very critical in flood preparedness systems through information collection. This has been reflected during the Deyr of 2009, however; credible information was questionable and reports on flooding were conflicting. Therefore, it is recommended to train and institutionalize the local NGO’s that operate in flood prone areas in the flood information collection and mapping to facilitate the risk and response management process.
6. At the UN level, OCHA is universally mandated to coordinate emergency response and continues to do that under the present fragmented emergency coordination system in Somalia. OCHA should take leading role and work closely with the Somali inter-agency in developing preparedness and contingency plans before the start of the rainy seasons in Somalia and make available the

necessary information on logistics and response needs including location and duties of all actors, warehouses and store and other information deemed necessary for improving the flood information web site.

7. All activities related to preparedness and response for drought and flood emergencies be combined and housed under one agency. The best agency would be the one that has the capability to collect, assemble and analyse and effectively disseminate the information to all stakeholders. This agency must have adequate personnel and strong working relationship with local organizations on the ground. It might be argued that there are agencies specialized in coordination of emergencies and should be allowed to exercise their mandate. Somalia is not a classical country where some of the rules and regulations governing emergencies have been effective. The most critical issue in the emergency response is the availability of quality information to plan and respond to emergencies. Some of this information is presently available with FAO SWALIM and FSNAU.

8. This will lead to a multi hazard strategy that shall address all types of hazards and that could be integrated into a Disaster Risk Management (DRM) for Somalia. This requires multidisciplinary efforts and a methodology which can collate and organize the knowledge in an effective, transparent manner in order to identify and compare risk reduction strategies, and preparedness and mitigation measures, for different types of hazards in Somalia.

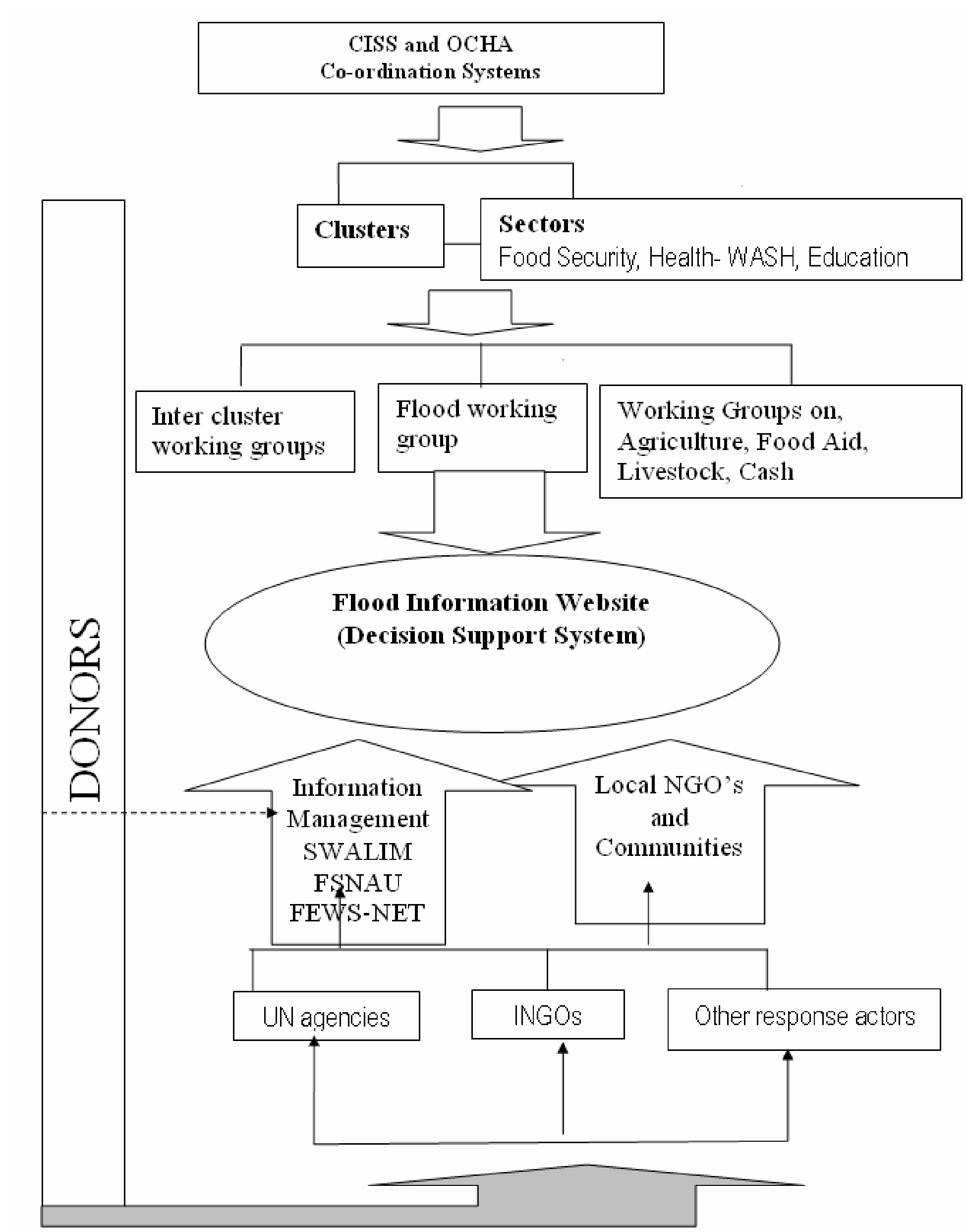

Figure 7.1: Somalia Support Network for Floods

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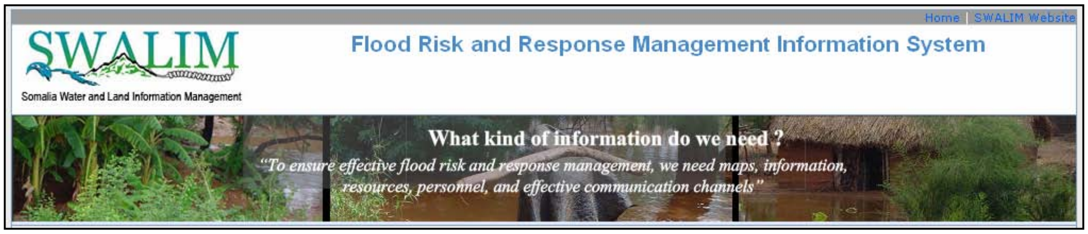
Annexes

Annex 1: List of Persons and Organizations Consulted

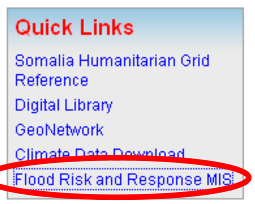
Agency	**Contact**
European Union, Nairobi	Luciano Moselle,
FAO (RRRRL project)	Sergio Innocente
FAO - FSNAU	Cindy Hollerman Tamara Nanikashvilu Ahmed Mohamed (Dheere) Mohammed Jazira (Lower Shabelle field agent) Mohammed Asser (Middle Shabelle field agent)
FAO – ARDOPIS project	Renato Marai
UNICEF, Somalia	Mr Jason Snuggs WASH Specialist and WASH Cluster Chair
WFP	Keith Ursel, Head of Programme and Food Aid Cluster Chair Francesco Francesco Nicolo Cornaro, Logistics Officer and Logistic Cluster Chair Genevieve Chicoine, Programme Officer Mr. Mahamud Hasan, Information Officer, Somalia Programme
GTZ	Aden Mohammed
DFID	Jonathan Hargreaves
African Rescue Committee (AFREC)	Abdi Raghe, Director
WOCCA middle Shabelle	Daud Nor, Director
River Shabelle Development	Mohamed Sidow Hassan
ApptoDev	Mohamud Ugas
Concern World Wide	Subarao Amarnath
CEFA	Edwards Baars
Agrosphere	Gesualdo Marcinno Paul Nderitu Githumbi
Terra Nuova	Lucy Wood
CARE	John Miskal
ADRA	John A. Ndezwa John Ogege Dominic Mwenda
CACTUS	Peter Muthigani
OXFAM NOVIB	Geriie Breukers Austin Beebe

Annex 2: FRRMIS short user manual



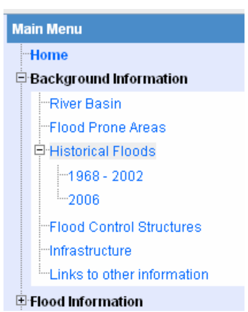
The Flood Risk and Response Management Information System was developed by SWALIM in collaboration with its partners in order to help effectively share information on floods, FRRMIS has three main modules and an administrative panel for managing the site.

The first module provides flood related background information, the second module provides information on the current flood situation and the third module provides information on flood response.



The FRRMIS is accessed through the FAO SWALIM website under the quick links pane as shown in the image on the left or directly from the link http://www.faoswalim.org/subsites/frrmis/

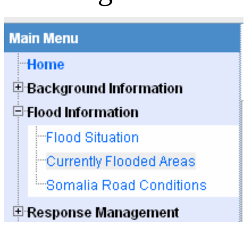
Background information module: This module provides background information on the Somalia floods, it contains maps covering:



- Basin and sub basin boundaries
- Flood prone areas from the topographic maps
- Extent of historical floods
- Flood control structures
- Infrastructure including roads and health facilities
- Link to other information that includes reports, forms for used for reporting floods and other useful maps

On each of the maps there is a link at the bottom that opens a PDF format of the map.

Flood information module: Provides information on the current flood conditions including

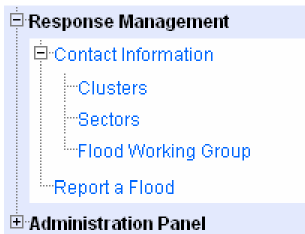


- Flood situation: This covers the current river levels at various locations along the Juba and Shabelle rivers with indications of risk levels; it also includes links to download the current storm watch, flood watch and decadal rainfall bulletins.
- Currently flooded areas: Table with estimates of

population displacements by region and district including confirmed flooded areas, it also has links to pdf documents with a detailed analysis of the affected populations and maps of affected areas

- Somalia road conditions: Map showing all the roads and their conditions, it also has a pdf document showing the status of air fields

Response management module: Provides facilities to support response to floods



- Cluster and flood working group contact persons and their email addresses
- Facility to report floods from the field

Administration panel: for managing of the site

Annex 3: Field flood information data collection format

Report Date:

	Enter your information below
Agency/Organization reporting	
Person Reporting	
Contact telephone number(s)	
Contact email	
River flooding (yes/no) *	☐ Yes ☐ No
Flash flooding (yes/no) **	☐ Yes ☐ No
Date of river flooding	
Region / District(s)	
Name of Towns/Villages flooded	
Location of the area according to Reference Grid provided	
Planted crop fields flooded (yes/no)	
Number of households in flooded area	
Number of households displaced	
If households displaced, where are they?	
Livestock deaths (yes/no), If yes number?	
Any other relevant information?	

Submit

*** River flooding definition: The rise of a river to an elevation such that the river overflows its natural banks**
**** Flash flooding definition: Flooding that develops very quickly on streams and river tributaries**