International Organization for Migration (IOM)
The UN Migration Agency

TERMS OF REFERENCE

Hydrological, environmental, and socio-economic study for flood resilience investments in the prioritized Payams

South Sudan Enhancing Community Resilience and Local Governance Project Phase II

Background

South Sudan is among the most vulnerable countries in the world to climate-related risks which is primarily due to high vulnerability and low coping capacity of the communities particularly for rural communities. The Global Climate Risk Index ranked the country 125 out of 171 between 1998 and 2018. With a strong reliance on subsistence farming and pastoralism, rural communities are particularly affected by extreme weather events and natural disasters. Historical records show a large year-to-year variability in precipitation, but droughts have become more frequent and widespread since the 1960s. As witnessed in the last four years, the seasonality and intensity of the rainy season is also changing, resulting in more frequent and extreme flooding in many parts of the country. An estimated two third of the country is affected by the floods, over 900,000 individuals directly affected every year and over 450,000 individuals forced into displacement.

South Sudan's humanitarian and development crises, the outcome of the compounded shocks of conflict, climate change, and disasters, need to be addressed holistically through interventions that foster resilience among vulnerable communities in the face of these risks. Climate change has made floods more frequent and severe, destroying crops, disrupting markets, and forcing people to flee in search of food and shelter. The movement of flood-displaced people, which also often entails mass movement of livestock, can exacerbate contestation over scarce natural resources, such as water sources or grazing grounds, with host communities. This contestation often maps onto existing ethnic, communal, cultural, inter-generational, and political tensions and can be instrumentalized by political and security elites to advance personal interests by fomenting violence. Communities across the country have leveraged traditional and customary institutions and innovative local peacebuilding initiatives[1] to manage conflict risks borne out of the climate-disaster nexus. However, political, governance and legal institutions adequate to addressing such conflicts over scarce resources without violence are lacking. As climate-related disasters in South Sudan increase in frequency and intensity, there is an urgent need not only for interventions providing physical infrastructure to help communities withstand shocks but also for institutions at appropriate levels that can effectively mediate the resulting social and political tensions.

South Sudan faces structural vulnerability to flooding and climate-related disasters. Despite recent advances in establishing institutional and regulatory frameworks for disaster risk management (DRM) across line ministries,[2] government entities at the federal, state, and local level lack the resources and expertise to adequately prepare for, respond to, and recover from disasters.[3] The recurrent floods have shown that government agencies are not able to fulfill their mandates and responsibilities and that there is strong dependency on humanitarians and development partners to provide food assistance, shelter and other support to respond to the immediate needs of

[1] For example, the International Organization for Migration (IOM) staff note reports that the Marial Bai Agreement helps cattle-keeper and farming communities in Western Bahr el Ghazal and Warrap States prevent, manage, and resolve conflicts that had repeatedly occurred during the January–April dry season through IOM-supported dialogues and sensitization exercises that provide a safe space for these communities to discuss challenges and identify local solutions.
[2] South Sudan. 2021. National Disaster Risk Management Policy.
[3] World Bank/GFDRR (Global Facility for Disaster Reduction and Recovery). 2021. *Flood Damage and Needs Assessment. South Sudan Floods 2020*.

flood-affected people. Beyond alleviating the humanitarian needs, however, it is critical to address the root causes of climate vulnerability and disaster risk in South Sudan by providing physical infrastructure (levees,

embankments, stormwater drainage, and integrating green infrastructure solutions in riverine flood management) to protect people and exposed assets against flooding and improving government's institutional and technical capacities for flood and disaster risk management.

The South Sudan Enhancing Community Resilience and Local Governance Project Phase II (ECRP-II) aims to improve access to services, strengthen flood resilience, and enhance institutional capacity for local service delivery and integrated disaster risk management at the national and sub-national levels. The project is Managed by the Ministry of Finance & Planning with Local Government Board on behalf of the Government of South Sudan (GoSS) and implemented by the International Organization for Migration (IOM), the project contributes to advancing the humanitarian-development-peace nexus by filling a critical gap between emergency response and resilient recovery. It does so by addressing immediate service needs in vulnerable areas while strengthening institutions to help make communities more resilient. ECRP-II can address immediate development needs while laying the foundation for longer-term solutions to conflict onset and recurrence, DRM, and poverty reduction. This project provides short-term services in vulnerable areas with a surge in demand due to the presence of refugees, IDPs, and returnees while building resilience by strengthening local institutions to manage social tensions and resources more sustainably. ECRP-II will also help the national government oversee and manage local governments better. Furthermore, ECRP-II aims to promote a longer-term objective of strengthening the capacity of public institutions to facilitate the shift from humanitarian aid to a government-led development approach.

ECRP-II aims to enhance flood resilience through (i) physical investments in flood risk reduction (Component 1), and (ii) institutional strengthening and capacity building for flood and disaster risk management (Component 2). Under Component 1, it will finance physical infrastructure for flood risk reduction and related technical assessments including feasibility studies, detailed engineering designs, and safeguards assessments. Investments will be identified in consultation with vulnerable communities in the target counties. The appropriate solutions, exact locations and physical investments for flood risk reduction will be determined based on further hydraulic/hydrological and technical analyses on flood hazard, exposure of people and assets, as well the vulnerabilities of at-risk communities in the target counties. Eligible investments include flood protection infrastructure such as levees, dikes, polders, or stormwater drainage; combined flood/drought reduction measures such as small water reservoirs or hafirs; and infrastructure for river and flow monitoring, such as gauging stations. Large-scale investments in flood risk reduction and water management infrastructure (such as dams or river diversion channels), river dredging, or investments entailing large-scale land acquisition will not be financed. Five target counties have been identified for Component 1 in consultation with the Government: (i) Fangak (Jonglei), (ii) Twic East (Jonglei), (iii) Pibor (Pibor AA), (iv) Fashoda (Upper Nile), and (v) Rubkona (Unity). Under Component 2, ECRP-II includes activities for DRM capacity building and institutional strengthening at the community, county, and national/state level. In alignment with the priorities set out in South Sudan's National Disaster Risk Management Policy[4], the activities aim to strengthen DRM governance structures and enhance coordination across levels of government and policy domains in four key domains: (i) emergency preparedness and response (EP&R); (ii) operation and maintenance (O&M) of physical investments in flood risk reduction; (iii) climate and disaster risk assessment; and (iv) flood early warning (FEW). The capacity building activities will be aligned with the investments in flood risk reduction under Component 1, to support (i) communities in the target locations (Payams), (ii) the five county governments, (iii) the corresponding state governments in Jonglei, Upper

[4] Republic of South Sudan. 2021. *National Disaster Risk Management Policy*.

Nile, and Unity, and (iii) the national government, specifically the Ministry of Humanitarian Affairs and Disaster Management (MHADM) and Ministry of Water Resources and Irrigation.

The hydrological, environmental, and socio-economic study to be done in the prioritized Payams, as set out in these Terms of References is based on prioritization of Payams that have high risk of flooding. Remote sensing and geodata were used to develop the longlist of Payam based on the flood affectedness and flood exposure, considering the population affected, building, public infrastructure (schools, health facilities, government structures, and concentration of economics activities). Furthermore, the conflict analysis, accessibility and operational and logistics consideration are taken into account in developing the long list Payams. IOM conducted a field validation exercise to the longlist of the Payams and to have a better understanding of the governance arrangements, roles, and responsibilities for disaster risk management (DRM) and flood risk management (FRM) at the national, state county and Payam level in pilot areas in South Sudan and help identification and prioritization of locations in selected counties.

1. Objectives

The overall objective is to conduct a hydrological, environmental, and socio-economic feasibility study for the emergency flood response sub-project in targeted areas that will include an assessment of potential hydrological, environmental, and social risks, impacts, and benefits.

The consultant is expected to fulfil the following:

1. Collect hydrological, environmental, and socio-economic features primary and secondary data of targeted areas to inform flood reduction interventions and flood models for identified areas.
2. Plan, evaluate and – together with local stakeholders - rank possible flood risk reduction activities including flood management interventions outlining short-, medium- and long-term interventions.
3. Prepare an outline engineering design with consideration of design options, provide cost estimates, and evaluate priority interventions based on environmental and social assessments.
4. Prepare detailed engineering design with environmental and social safeguards study of prioritized flood reduction infrastructure according to World Bank framework.

2. Timeframe and geographic scope of work

The study is expected to be completed within nine (9) months. Geographically, the scope of work of the consultant will be the Payams shortlisted upon completion of the field validation exercise. To ensure that flood resilient subprojects are sequenced and timely informed, the study will be conducted in phases, based on already available and accessible data of targeted Counties/Payams (e.g., Rubkona County).

3. Tasks and Methodology

This study will be carried out through primary and secondary data collection. Primary data collection will include field surveys and stakeholder consultation, while secondary data will be obtained and triangulated from available satellite resources, LIDAR and DTM data provided by IOM.

A. Desk-based assessment[5]

- Conduct a thorough review of relevant documents, including project documents, hydrological study reports, environmental and social impact assessments, and relevant E&S policies, regulations, guidelines, and standards at national and international levels.
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[5] For the desk review, the consultant will be able to draw on preliminary analyses (see Annex)

- Collect rainfall dataset derived from available satellite-based estimates and/or compiled from different wet-season records or from local rainfall stations. Where station data are limited, assess at least three different satellite-based rainfall data sets for their suitability to estimate return periods for extreme/high (including daily) rainfall events.
- Map channels conditions (upstream and downstream), historical/timeseries river flow/discharge (upstream and downstream), and dimensions of the main discharges channel (river cross section) in the focused area
- Provide an indication of possible projected future return periods (10, 50, 100 years) of extremely high rainfall events under climate change.
- Provide an overview of historic flood events in the target area (use available satellite-based assessments for recent years).
- Map ecological valuable and protected areas within and downstream of the target area identified through analysis of existing maps, reports (UNEP 2018 *South Sudan: first state of environment and outlook report 2018*) and satellite images.
- Map the area large concentration of economic activities in the targeted locations derived from the available satellite images.
- Sketch of larger 'natural' areas and areas important for farming and/or cattle grazing.
- Project ancillary activities and facilities, including access road, raw materials, and storage facilities.
- Consult existing IOM database in targeted areas and ECRP II available data collection/reports.

B. Field survey and stakeholder consultation

Field survey proposed to collect the following data/information:

1. Field data collection on existing physical infrastructure and hydrological characteristics of targeted areas to inform flood resilient measures, such as:
    - Overview of historic flood mitigation measures undertaken in the area (drainage, dikes) - mapping location of dikes with special attention to the broken/weak points of the dikes.
    - Existing drainage networks including the location and condition of the existing water channels (width, depth, blockages, flow capacity, etc.) with special attention to drainage outflow points.
    - Existing road network and their elevation as flood prevention measure, mapping of location, estimated date of construction, and road condition including potential damages.
    - Dimension of the main discharge channels (river cross section).
    - Develop/update/ground truthing existing land use map to identify the farmlands, grazing area and main settlements.
    - Map frequently flooded areas based on maximum flood extents from remote sensed data and in discussions with local population.
    - Soil infiltration tests in dry season with a focus on areas where flood water accumulates.

2. Field data collection on flood exposure of population, environment, and social infrastructure in targeted areas:

    Collect available information initially relevant for flood resilient measures and cross-check with data obtained from desk-based assessment. Collected data will be used for the Environmental and Social Impact Assessment including:
    - Vulnerability Assessment: of the affected communities and infrastructure to flood hazards, including exposure, sensitivity, and community response and adaptive capacity. This may include demographic data, socio-economic characteristics, livelihood patterns, cattle routes, presence of vulnerable population and economic activities, data on any potential occurrence of

violence and conflict in relation to (i) the occurrence of past flood events and (ii) past attempts at controlling floods

- Map existing social/community infrastructure: schools, health centers, boreholes, water distribution networks, human settlements, perimeter of large graveyards, waste-dumps, cultural heritage sites, including protected areas, national parks, any critical habitats, endangered or threatened species.
- Environmental Baseline Data: Collection of baseline data on the local environment, including water quality, air quality, soil quality, biodiversity, ecosystems, and natural resources.
- Social Baseline Data: Collection of baseline data on social aspects, including demographics, community structure, social systems, cultural heritage, and gender considerations, including status of land ownership. This will include data collection on a security risk or any security concern.

3. Develop hydrological and flood exposure knowledge preliminaries of targeted areas

This activity intended to develop a water related database from the desk review (task A) and the field data collection (task B). Among others, the database should include the following:

- Sub-catchments, their design discharges based on DTM/DEM and other courser DEMs outside area and extreme rainfall events.
- Maps of enlisted tasks under section 1) physical/hydrological data and section 2) social economic features of targeted areas
- Maps of areas prioritized for improved flood protection based on location of built-up areas, discussions with local authorities and other stakeholders
- Maps on land use/land plans derived from satellite images or from orthophoto image
- Other relevant maps (e.g. soil map, geological map, etc.) as available.

C. Flood model development

Flood modeling is required to test the flood risk reduction interventions in the targeted areas. The flood model can compare the effectiveness of defined interventions using the DTM (provided by IOM) and water related data as an input. Software for the flood modeling will be provided by IOM. The consultant will build the flood model for the targeted areas to simulate flooded areas in light of inputs below:

- Time series rainfall data both upstream and in the focused area
- Channels conditions include water discharge (upstream and downstream) and river cross section.
- High resolution DTM/DSM data
- Lower resolution DEM data for the surrounding area wherever needed.
- Existing drainage, channels, and dykes network
- Infiltration rates
- Open water evaporation and evapotranspiration
- Flood river water levels
- Extreme precipitation scenarios to simulate both local pluvial flood events (e.g., flash flooding) and fluvial flood events (i.e., river peak discharge).

The developed model should be calibrated/verified with the current conditions e.g., frequency and intensity, e.g., water depth of flooded area.

D. Define long-list of possible flood risk reduction interventions/investments.

The consultant will apply the flood model to develop a long list of possible flood risk reduction/investments (outlining the short, medium, and long term) based on ECRP-II frameworks and consultations with local authorities and beneficiaries. As per the ECRP-II framework, which was defined together with the GoSS during

project preparation, proposed investments should not include large scale physical investment, such as large-scale flood storage dams, river diversion or river dredging.
IOM will facilitate the consultation meeting with relevant stakeholders both at national and sub-national level to discuss the long-listed solutions and identify a set of criteria to be used to prioritize the selection of investments for the target areas.

E. **Provide detailed engineering designs** for selected flood risk reduction investments. Prepare an outline engineering design, provide costs estimates, and evaluate priority interventions based on environmental and social assessments. The detailed engineering design should include detailed engineering drawings and specifications, detailed bills of quantities, environmental and social risk management study of prioritized flood reduction infrastructures according to the World Bank Environmental and Social Framework (ESF), and the Environmental and Social Management Framework for ECRP-II. Prepare BOQ after market survey and support in preparing tendering document with IOM team and in accordance with IOM procedures.

4. Deliverables

1. Inception Report covering: i) Workplan, ii) policy and safeguard legal frameworks review, iii) Approach and methodology, iv) Overview/summary of status of Knowledge Base.
2. Progress Reports covering: i) an overview of work done including stakeholder involvement, ii) status of Knowledge Base, iii) status of Flood Control Intervention Development, iv) status of flood risks update, v) an updated workplan.
3. Database developed in section A & B including the flood model (C) and Analyses Report which includes: i) a presentation of the knowledgebase and ii) preliminary long list of flood risk reduction interventions to be considered (iii) brief technical guidelines explaining how to operate the database and the flood model.
4. Technical Report describing the implementation of the methodology, including database, flood model, intervention selection, detailed design and ESIA for selected flood reduction measures.

5. Schedule and Timeline

The study is expected to be completed within a nine (9) months period from contract signing. The table below summarizes the key deliverables and schedule of the assignment.

Period (TBD)	Key deliverables
One month after signing contract	Inception Report covering: i) Workplan, ii) policy and safeguard legal frameworks review, iii) Approach and methodology, iv) Overview/summary of status of Knowledge Base.
Every three months from date of contract signing until submission of Draft Technical Report	Progress Reports covering: i) overview of work done including stakeholder involvement, ii) status of Knowledge Base, iii) status of Flood Control Intervention Development, iv) status of risks update, v) an updated workplan. Progress meetings are expected to take place every two-weeks between the consultant and the ECRP-II team
Three months after signing	Database Development and Analyses Report which includes: i) a presentation of the knowledgebase (e.g. maps), ii) preliminary selection of flood modelling software, iii) preliminary flood risk reduction -interventions to be considered

Seven months after signing	Submission of Draft Technical Report describing the implementation of the methodology, including database, flood model, activities/ interventions/ investments selection, detailed design and ESIA
Nine months after signing	Final Technical Report with final database including the final flood model, ranked activities/interventions/investments, outline designs, detailed engineering designs, and ESIA

6. Additional requirements

Given the extensive E&S requirements under the presented consultancy assignment ToR, selected vendor is required to secure:

a. E&S experts: one environmental risk management expert and one social risk management expert to address environmental and social considerations of the proposed assignment throughout the contract period.
b. Develop detailed Environmental and Social Impact Assessment (through deploying independent individual environmental and social risk management experts) for the proposed engineering designs of prioritized/selected flood risk reduction investments that is in line with the WB Environmental and Social Framework. Further, the preparation of the ESIA and detailed engineering designs must be conducted simultaneously to inform each other and to ensure integration of the E&S considerations into all aspects of flood risk reduction interventions.

Definition of Firm Qualifications /selection criteria are stated in the technical call for proposal, including travel/security arrangements for selected vendors.