BRACED Flood Impact Assessment

Greater Bahr el Ghazal, South Sudan

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Developed and Compiled by

IMPACT Initiatives

IMPACT is a Geneva-based think-and-do-tank that specialises in implementing assessment, monitoring, evaluation, and organisational capacity-building programmes in direct partnership with aid actors or through its inter-agency initiatives, REACH and Agora. IMPACT has an established field presence in over 15 countries, and has been working in South Sudan since 2012.

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Executive Summary

South Sudan is highly prone to climate extremes, with regular drought, torrential rain and seasonal flooding disrupting food production, transportation and trade, and contributing to cycles of armed conflict.

One of the poorest and most fragile countries in the world, South Sudan has faced multiple challenges since its birth in 2011, including civil war, internal displacement and ongoing violence. These factors have combined to put some 4.6 million people in need of humanitarian assistance. Portions of the Greater Bahr el Ghazal region in the country's northwest have enjoyed relative security in the last few years, but still suffer from a deteriorated economy and climatic shocks that have severely limited livelihoods and access to basic goods and services. All of this is compounded by the additional destruction caused by floods and droughts related to climate change.

In response, the United Kingdom's Department for International Development (DFID) has funded a consortium led by Concern Worldwide and made up of ACTED, FAO and The Sudd Institute, to increase the resilience of farmers and agro-pastoralists to disasters across Bahr el Ghazal. This project is part of DFID's Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED) program.

In order to better understand climate change vulnerability, adaptation, mitigation and resilience in the area, the BRACED consortium conducted an assessment of flood vulnerability in flood prone river catchments of Northern Bahr el Ghazal and Warrap, based on a preliminary analysis of secondary data, followed by qualitative and quantitative primary data. Specific areas of interest included the location of flood prone areas, changes in duration and intensity of flooding, vulnerability to flood hazards, and actionable mitigation recommendations for the estimated 100,000 vulnerable households in the area.

Primary data, collected through 1,698 household surveys, 131 community surveys and 22 focus group discussions, was combined with a detailed analysis of historic flood data from satellite imagery, and the assessment of long-term weather patterns and climate change literature. Household survey findings represent flood prone villages in Northern Bahr el Ghazal and Warrap states with 95% confidence and a 7.5% margin of error, while community surveys and focus group discussions provide additional insight.

The project was intended to produce a robust and nuanced understanding of how individuals and communities experience flooding and its impacts, how experiences have changed over time, and what people do as individuals and as communities to mitigate the effects. It also identifies where people may need assistance to better defend themselves from impacts of climate change, and how best to support them to increase their resilience. It is to be used to inform project activities.

Products include this detailed written report, a clean dataset and data collection tools, annotated bibliography, static maps and an interactive online mapping tool openly disseminated with national and international organisations, and available here: http://reach-info.org/ssd/braced2016/

Key findings from the assessment include:

- The rainy season is starting later than it did in previous generations, but with harder and more damaging rains. This brings flash flooding and earlier river floods, both of which damage or destroy crops before food can be harvested.
- Crop damage and destruction is the most critical negative impact of flooding, followed by shelter damage and destruction, and disruptions in access to healthcare and education facilities.
- Though the overall impact of flooding is negative, it does have positive benefits through the provision of fish for eating and sales, grass for cattle grazing, and water for household and livestock use.
- Income-generating livelihood activities follow a clear seasonal pattern, primarily made up of selling firewood, charcoal or grass in the dry season, performing agricultural labour in the rainy season, and selling fish and other wild foods during times of flooding.
- Dyke building is very clearly the primary disaster risk reduction activity, both in terms of its current utilization and in the interest expressed for potential assistance.
- Communities also reported that they would like to receive assistance with the construction of water channels and water storage facilities, provision of food and non-food items, and livelihood support through the provision of tools and seeds.

Seasonal floods and occasional droughts in these areas are a natural occurrence, with both benefits and drawbacks to the local societies that dwell on this land. Traditionally, the destructive effects of these floods have been addressed with semi-

nomadic lifestyles, early planting techniques, and the construction of small dykes, raised tukuls and elevated housing compounds. But in the last few decades, as rains arrive later and come down harder, and as rivers break their banks earlier, these coping mechanisms have proven inadequate.

Development and humanitarian assistance provides some support to these communities when they are overwhelmed by weather extremes. But the needs are great and funding limited. The most remote villages, which in many cases have the highest needs, are totally cut off for long periods of the year. Due to their isolation, any outside aid for these communities must be proactive and supportive, rather than reactive and focused on relief, otherwise the support will inevitably be delayed and ineffective.

To truly support these communities in adapting to climate change and consequent flooding, program activities should:

- Work within the context of indigenous problem solving and belief systems.
- Support easy migration.
- Avoid enabling development in land that will inevitably flood.
- Coordinate between long-term local development projects.
- Coordinate development programming with humanitarian emergency aid actors.
- Coordinate with local government authorities.
- Support peace.

Drought, storms and floods will continue to shape the landscape and lives in Northern Bahr el Ghazal and Warrap states. Traditional coping mechanisms are vital for the continued functioning of these settlements in the face of climatic extremes. But with the added pressure of persistent conflict, dysfunctional economic markets and lingering malnutrition, these local skills will likely not be able to handle the increasingly extreme weather induced by climate change. Already, people are really suffering, due to high levels of hunger, disease and displacement. Though these hardships are great, these communities are also able to maintain a laudable level of stability considering the circumstances; it is critical that any outside support bolsters this stability, rather than undermines it.

Figures, Tables, Narratives and Maps

Geographic Classifications

State	Administration of local government including several Counties
County	Primary administrative level below the State including several Payams
Payam	Intermediate administrative level including several Bomas
Boma	Lowest level of local government administration
Village	Informal gathering of households overseen by a Chief and Deputy Chiefs

Geographic boundaries were recently changed by presidential decree, creating a system of 28 new states and constituent counties. However, the initial project proposal and all existing datasets utilized for this research were based on the previous 10 state scheme. Because of the potential confusion and loss of continuity involved in switching geographic boundaries mid-assessment, all data collection, analysis and reporting relies on the classifications of the 10 states. Furthermore, exact payam boundaries are still being decided in some areas, so the classification of some villages may eventually change.

Abbreviations and Acronyms

BRACE	Building Resilience and Adaptation to Climate Extremes programme
BRACED	Building Resilience and Adaptation to Climate Extremes and Disasters programme
DFID	United Kingdom's Department for International Development
DRRA	Disaster Risk Reduction Activities
EU	European Union
FGD	Focus Group Discussion
HH	Household
IDP	Internally Displaced Persons
NGO	Non -Governmental Organization
ODK	Open Data Kit smart phone application
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
SSP	South Sudanese Pound

Introduction

South Sudan, one of the poorest and most fragile countries in the world, has faced multiple challenges since its birth in 2011. Civil war broke out in December 2013, causing the displacement of more than 1.6 million people and putting nearly 5.1 million in need of humanitarian assistance.[1]

Continued violence, despite the signing of a peace agreement in August 2015, continues to destabilize the livelihoods of the South Sudanese people. Portions of the Greater Bahr el Ghazal region in the country's northwest have enjoyed relative security in the last few years, but still suffer from a deteriorated economy and climatic shocks that have severely limited livelihoods and access to basic goods and services.

The United Kingdom's Department for International Development (DFID) has funded consortium-based interventions in up to 15 countries though the Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED) programme to help vulnerable populations to become more resilient to climate extremes. It is specifically intended to build the evidence on how to do this at scale to influence policy and institutional changes, and build regional and national capacity to respond to climate related disasters. In South Sudan, as part of a consortium led by Concern Worldwide and made up of ACTED, FAO and The Sudd Institute, the project aims to increase the resilience of farmers and agro-pastoralists to disasters.

Climate change adds continued destruction to the already devastated situation in South Sudan.[2] The overwhelming majority of South Sudanese rely directly on the land for their livelihoods, with 85% of the population depending on farming, fishing or herding to meet their food and income needs.[3] Unreliable rains and floods hinder the ability of these people to feed themselves and build their financial standing.[4] This feeds into the continued violence, instability and fragility of the nation.[5] The BRACED consortium intends to improve the ability of these populations to maintain a livelihood, despite climate shocks through localized income diversification and national climate adaptation policies and plans.

As a member of the BRACED consortium, ACTED contracted IMPACT Initiatives to conduct an assessment of flood vulnerability in flood prone river catchments of Northern Bahr el Ghazal and Warrap. This research is intended to contribute to the body of knowledge on climate change vulnerability, adaptation, mitigation and resilience in the area. Specific areas of interest included the location of flood prone areas, changes in duration and intensity of flooding, vulnerability to flood hazards, and actionable mitigation recommendations for the estimated 100,000 vulnerable households in the area. Combined with a detailed analysis of historic flood data from satellite imagery, and the assessment of long-term weather patterns and climate change literature, this project is intended to produce a robust and nuanced understanding of how individuals and communities experience flooding and its impacts, how experiences have changed over time, and what people do as individuals and as communities to mitigate the effects. The project also identifies where people may need assistance to better defend themselves from impacts of climate change, and how best to support them to increase their resilience. Products include this detailed written report, maps and an interactive online mapping tool, which is openly available to national and international organisations.

This project builds upon a prior flood vulnerability assessment and mapping project that ACTED, through the REACH initiative, undertook in December 2013 as part of the Building Resilience and Adaptation to Climate Extremes (BRACE) programme. This report found that both severity and frequency of flooding increased in surveyed communities between 2008 and 2012, and that dyke construction as a preparedness strategy was strongly related to decreased levels of flood-related displacement.

This report provides a detailed description of the methodology and why it was chosen, outlines the key assessment findings, and provides recommendations for program activities.

[1] OCHA South Sudan Country Overview. Accessed 26 July 2016 http://www.unocha.org/south-sudan
[2] United States Geological Survey (USGS), Famine Early Warning Systems Network- Informing Climate Change Adaptation Series, FEWS NET. (2011). A Climate Trend Analysis of Sudan. United States Department of the Interior. http://pubs.usgs.gov/fs/2011/3072/pdf/FS2011-3072.pdf
3 African Development Bank Group. *Infrastructure Action Plan in South Sudan: A Program for Sustained Strong Economic Growth* http://www.afdb.org/en/countries/east-africa/south-sudan/infrastructure-action-plan-in-south-sudan-a-program-for-sustained-strong-economic-growth/
[4] Kirkbride, M., Grahn, R. (2008) Survival of the Fittest: Pastoralism and Climate Change in East Africa. Oxfam Briefing Paper #116. Oxfam International. http://www.oxfam.org.hk/content/98/content_3534tc.pdf
[5] Brown, O., Hammill, A. and Mcleman, R. (2007) Climate Change as the 'New' Security Threat: Implications for Africa. International Affairs 83: 6. The Royal Institute of International Affairs. https://www.iisd.org/pdf/2007/climate_security_threat_africa.pdf

Methodology

Secondary Data Review and Sample Selection

This research began with an extensive secondary data review and analysis of remote sensing data. This guided the primary data collection phase, which combined quantitative household- and community-level data collection methods with comprehensive, targeted qualitative focus group discussions (FGDs). This mixed method data collection was chosen to help triangulate information, provide a contextualized and nuanced analysis and yield a comprehensive dataset on the impacts of climate change in flood prone communities.

Secondary Data Review

An extensive secondary data review of literature related to climate change vulnerability in South Sudan was conducted in order to establish an understanding of current, historic and expected climactic conditions in Northern Bahr el Ghazal and Warrap states. Data was sourced from the REACH Initiative's *Flood Vulnerability and Contingency Plan*[6]; local governments, universities, and other institutions; other published reference materials; and, local and international NGOs and aid organizations. Particular attention was paid to the findings of the Intergovernmental Panel on Climate Change. The information produced and gaps identified provided context for the evaluation, established an analytic framework to be used in the field collection phase of the investigation, and informed primary data collection tool creation and methodology. A full annotated bibliography of research can be found in Annex 8.

Remote Sensing Analysis

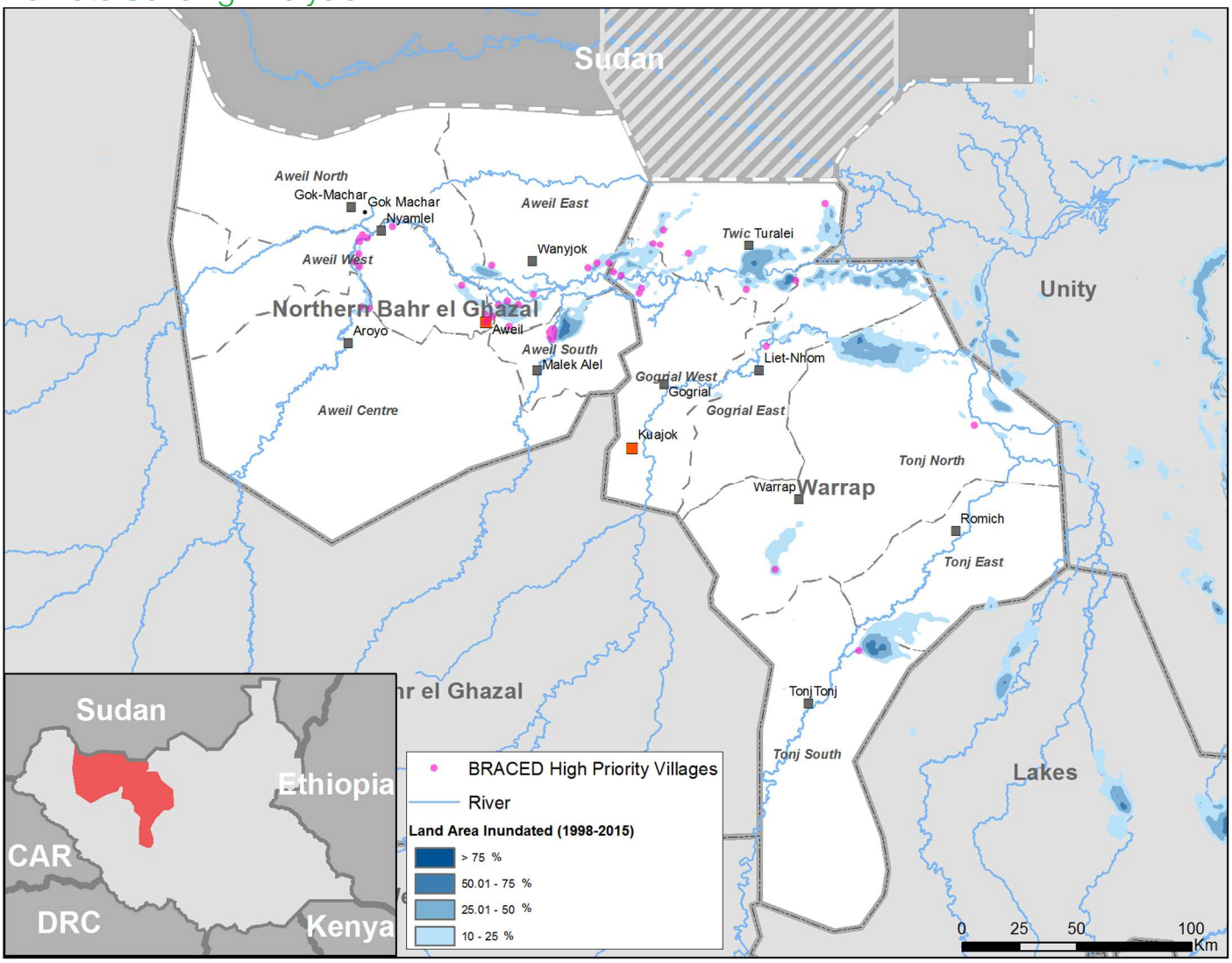
The literature review was followed by a detailed analysis of historic flood data from satellite imagery. Through the analysis of 612 satellite images spanning a 17 year period (1998 – 2015), maps of inundation extent and likelihood were developed. Potentially flood prone areas were identified as having standing water present for at least 10% of this timespan. These areas are identified in blue in Map 1, and include areas found to be inundated for more than 75% of this period.

These inundation maps were used to determine flood-vulnerable villages in flood prone river catchments of Northern Bahr el Ghazal and Warrap states, using a village list dataset from the United Nations Office for the Coordination of Humanitarian Affairs (OCHA). These villages were then targeted for evaluation during primary data collection. This analysis methodology was adapted from and strongly informed by lessons learned during REACH's 2013 flood vulnerability assessment of Warrap State.

Through the remote sensing analysis, a total of 560 villages in flood river catchments of Northern Bahr el Ghazal and Warrap were determined to have a heightened vulnerability to flooding, with 47 identified as critically at risk, due to an increase in nearby standing water over the course of these 17 years.

[6] Available at http://www.reach-initiative.org/wp-content/uploads/2014/06/Flood-Vulnerability-and-Contingency-PlanningReport_WarrapState_SouthSudan_December2013.pdf

Map 1: Critically at Risk Villages Identified by Remote Sensing Analysis



Primary Data Collection Sampling

Based on the remote sensing analysis, a list of 307 villages was selected for primary data collection across 11 counties: Aweil Centre, Aweil East, Aweil West, Aweil North, Aweil South, Gogrial East, Gogrial West, Tonj East, Tonj North, Tonj South and Twic. The sample included all identified payams and all 47 critically at risk villages, as well as 90 spare villages in case travel or other logistical constraints limited access.

Field data collection at community and household level was conducted over a two month period, from 10 March to 29 April 2016. Community representatives in each village were purposively selected for inclusion, providing non-generalizable results, while households were randomly selected, in order to capture a representative sample of residents of potentially flood-prone villages in each county of Northern Bahr el Ghazal and Warrap states.

Due to logistical challenges in the field, primarily based on the difficulty of travel to the remote location of these communities, a total of 131 villages were assessed. Household survey findings are therefore representative with 95% confidence and a 7.5% margin of error for flood prone villages in Northern Bahr el Ghazal and Warrap states. It is important to note that findings from this research are not generalizable to all communities in Northern Bahr e Ghazal and Warrap states, only to those with a heightened vulnerability to flooding.

Of the 47 "critically at risk" villages, 27 were assessed during field data collection. Household survey findings from this sample cannot be claimed to be representative, but provide indicative data to contribute to our understanding of these particularly at-risk communities.

Table 1: Count of Household Surveys by State and County

Northern Bahr el Ghazal	837	Warrap	861
Aweil Centre	42	Gogrial East	26
Aweil East	99	Gogrial West	308
Aweil North	127	Tonj East	66
Aweil South	343	Tonj North	122
Aweil West	226	Tonj South	126
		Twic	213

Primary Data Collection

Team Formation and Training

Data collection teams were formed in late February. Enumerators were chosen based on their skills with English, Dinka, Luo, Arabic and other appropriate local languages, as well as their ability to operate a smart phone and the Open Data Kit (ODK) application.

Training of enumerators occurred 7 and 8 March 2016, including a comprehensive review of all data collection tools and practice sessions. A training document for enumerators on the BRACED assessment project can be found in Annex 7.

Field Logistics

Data collection activities were conducted by two teams, each consisting of a Team Leader, an Assistant Team Leader and six enumerators. These teams generally worked separately, and whenever the proximity of communities in an area allowed it, the Team Leaders and Assistant Team Leader would manage assessments in separate villages. Teams were overseen by a Field Coordinator, an Assessment Officer, and a Senior Field Coordinator. Household surveys were conducted by all field staff, while community surveys were conducted only by Team Leaders and Assistant Team Leaders, and FGDs were conducted only by an Assessment Officer, with a Team Leader or Assistant Team Leader translating.

Upon arrival in each village, the assessment team sought permission from local Chiefs and Deputy Chiefs before gathering village leadership for the community survey. When in a new county for the first time, or if the community survey brought up new and/or interesting results, this survey was followed by a FGD, which was limited to ten or fewer adults; generally including the village chief and deputies.

While community level data collection was taking place, enumerators completed household surveys with residents – preferably heads of household – living in nearby shelters.

Survey Questionnaires

The household and community surveys were designed to gather quantitative data on outputs, outcomes, and impacts. Both consisted of five sections – introduction, flood history, flood impact, disaster risk reduction activities and external assistance.

The household survey was designed to capture the lived experience and consequences of flooding, such as the exact timing of rains, floods and displacement, and changes in livelihood activities. It was intended to take 20-30 minutes to complete and to be administered as many times as possible, in order to have robust findings on exact impacts. Meanwhile, the community survey was designed to capture broader community impacts, particularly the displacement patterns of the entire village, and the impact of flooding on access to a variety of services. This 45-60 minute questionnaire was intended to gather information about the entire community, including more remote, and potentially more flood-prone, households. Some overlap of questions allowed the triangulation of responses and a deeper understanding of the varying perspectives and potential biases of different respondent groups.

The FGDs, taking around 15 minutes, were based around 10 open-ended questions. Participants discussed changes to flooding over time, the impact of flooding, and disaster risk reduction activities. These were intended to give insight into the lived experience of flood prone villages, and to ensure no critical issues were left uncovered by the questionnaires. FGDs were generally appended to community survey sessions, as they focussed on the same target populations.

In total, 1,851 surveys or discussions were conducted, engaging approximately 2,731 individuals. These consisted of 1,698 household surveys, 131 community surveys and 22 FGDs. See Annexes 2, 3 and 4 for all research tools employed during data collection. Maps of all assessed locations can be found in Annex 6.

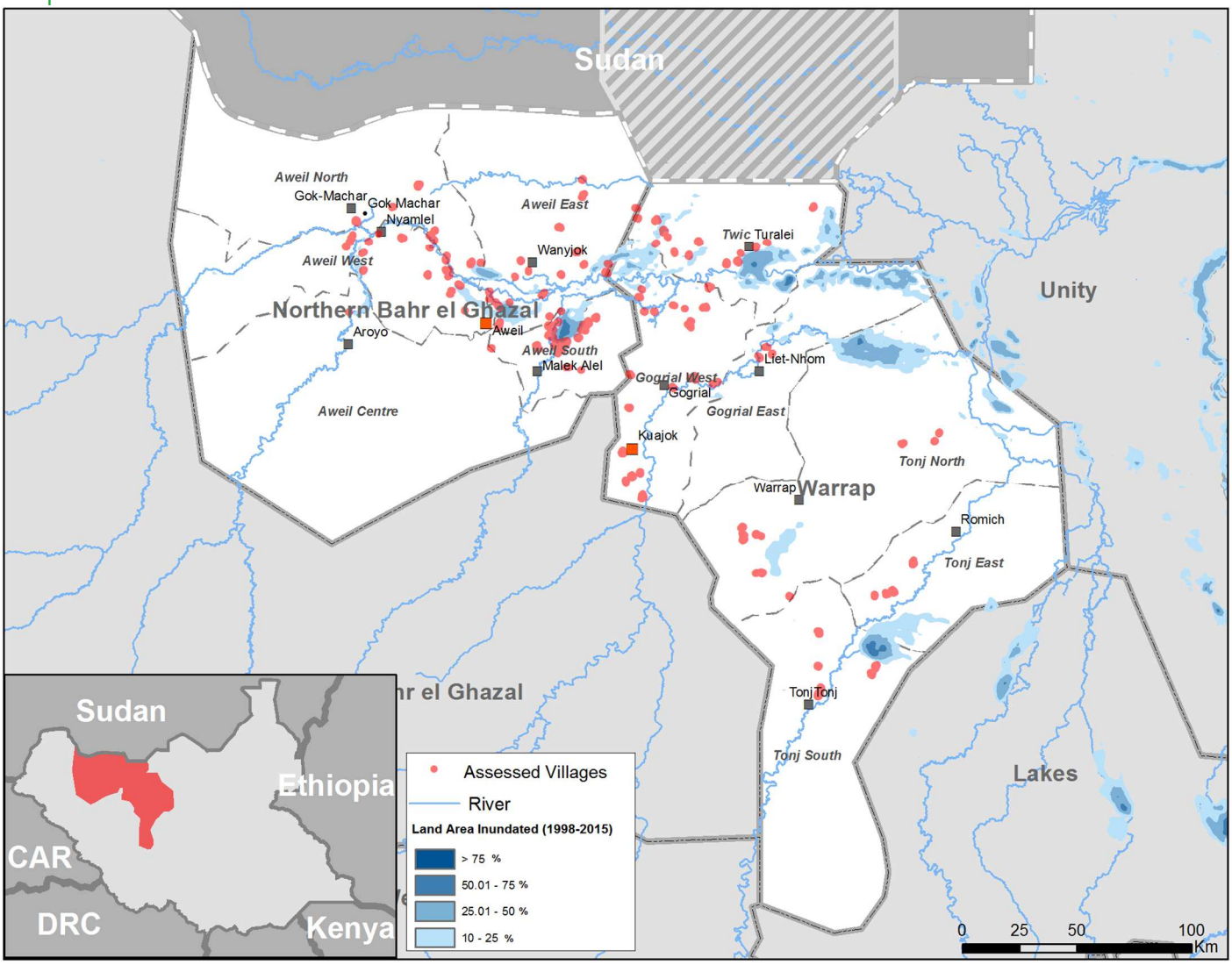
Informed Consent and Refusals

All surveys and discussions began with a description of the voluntary nature of this research and the opportunity to refuse participation, followed by an admission of verbal consent to participate. Very rarely did respondents end their participation in the surveys; when they did it was almost entirely due to the survey taking too much time.

Data Quality Control

The data was collected using Open Data Kit software on Android-based smartphones. GPS data was collected for every household and community group interviewed. Due to the use of mobile data collection, survey data was able to be uploaded directly from smartphones to a central server at the end of each day. Once uploaded, forms were checked and any inconsistencies clarified with enumerators. During both data collection and analysis phases, data was cleaned and outliers were verified or removed.

Map 2: Assessed Locations and Flood Prone Areas



Data Analysis and Reporting

Early in the process of analysis, initial findings were reported to BRACED consortium members for comment and direction into topics of special interest. A joint analysis workshop with a broad range of NGO partners was then conducted to gather the input of stakeholders and elicit guidance on actionable next steps for the findings, including linkages with other projects. Following this, a presentation of findings was scheduled to be given to government officials at the National Early Warning working group, as an opportunity to inform further analysis and next steps; unfortunately, due to the outbreak of conflict in Juba in July 2016, this presentation has been indefinitely postponed. All findings were analysed and visualized using Microsoft Excel and ArcGIS software.

This report documents all major findings and lessons learned, and incorporates feedback and comments from the data analysis input sessions described above. All relevant indicators gathered in this research are also available on a lightweight, openly accessible web platform that allows users to identify flood-prone areas and populations, understand how flooding impacts livelihoods activities and access to goods and services for these communities, and plan their relief, recovery, mitigation and development activities accordingly. This BRACED Consortium product is available here: http://reach-info.org/ssd/braced2016/

Challenges and Lessons Learned

The logistical challenges of operating in Greater Bahr el Ghazal are significant, including bad roads, large distances between study areas, and ongoing social upheaval. While such difficulties were planned for and did not generally limit data collection efforts, the following limitations affected the results of this assessment:

Unreachable Locations

Travel to the assessment locations was one of the biggest challenges. Many flood-prone communities are located far from roads, and often accessible only from a single direction, as surrounding areas are perennial swamps. On average, driving to and from the assessment areas took five hours every day, while sporadic difficulty crossing checkpoints and gaining approval for assessment from payam administrators often exacerbated the problem of time lost en route to assessment locations.

Narrative 1: Persistent Flooding as Barrier to Access

"Instead of driving here, it would have been faster to walk through the swamp."

-Elderly male, Warrap, Twic County, Akoc Payam, Wunchum Village

An assessment team spent a total of nine hours driving to and from this village one day. A large area of waterlogged land lies between it and the nearest town, so road access requires a very long circuitous drive.

For at least five other villages selected for assessment, local authorities advised that the intended location was inaccessible by vehicle due to persistent flooding surrounding the village. For some of these, the water is there throughout the year, for others, a single rainstorm is enough to cut it off for a week or more.

Security concerns limited data collection in a few areas. Villages in Tonj North and Tonj East have seen frequent outbreaks of violence in the last year, both in fighting between tribes and between local subtribes. Though quiet at the time, payam administrators advised that fighting could resume anytime, and that visiting would be ill advised. It is likely that these villages are sparsely populated anyway, as many households were displaced from these areas into other assessed villages.

Some villages identified through the remote sensing analysis could not be found during field assessment. Some of these had been abandoned due to lack of trees and water, others were simply unknown to local government authorities, and still others were known by local authorities but field staff were never able to find them despite long drives through the bush.

Additionally, there was often confusion about the name and exact location of villages and bomas. Since independence from Sudan, many location names have been changed to better reflect local pronunciation, but this is not always reflected in the OCHA village list dataset. Geopolitical boundaries are often inexact in these areas as well. Because of this, respondents or local authorities would sometimes state that a village was in a different payam than field coordination had expected, creating a sometimes uncomfortable situation in which data collection teams were perceived as taking sides in a local power struggle. This issue seems to be somewhat exacerbated by the creation of the 28 states and their constituent counties.

Narrative 2: Hazards during Data Collection

"The only place for toileting is in the forest where the fighting is."

-Young male, Warrap, Tonj South County, Manyang-ngok Payam

Half of the assessment team is sick: nauseous, vomiting and suffering from gastrointestinal complaints, but most are still able to travel into the field. Like every other day, the morning starts with a visit to the payam headquarters in order to verify the security situation and other potential issues of the intended assessment villages. Earlier in the week, county authorities assured security for assessment of the payam in general. Over the course of three hours of driving, cattle herders point the way to the office into deeper and deeper forest. Finally arriving at the payam headquarters, the building is empty, gate left ajar. The area is filled with overgrown trees, empty tukuls and school buildings with doors and windows sealed by brick. No people are to be seen anywhere nearby.

After retreating to a medical facility in a neighbouring village, the team learns that the payam headquarters was abandoned a year or two ago, due to persistent armed conflict with communities in Lakes state, which is separated only by a swampy lowland area. Another 20 minutes of driving brings us to a well-settled village for assessment. Midway through an assessment, however, a staff member must go to the bathroom, so he is driven back into the overgrown area to use the bush as a latrine. Because the village is so deforested, there is no private area to do so anywhere but in the abandoned woods.

Interviewee Reliability and Recall Error

Some findings point to a level of bias in certain community survey responses as compared to household responses. When answering the same questions, community leaders were more likely to state longer durations of flooding, displacement and lack of accessibility. During discussion, they also were more likely to relay more intensive need for outside support. Some of this may in fact be genuine, as these individuals are possibly more likely to know of marginal villagers who face greater impacts from flooding than a typical community member. However, some of this disparity may be attributed to community leaders having greater insight into the aid and development process, and thus intentionally heighten the struggle and needs that they convey to the assessors. Informally, enumerators voiced their suspicion of this second possibility on multiple occasions.

Gender imbalances are another concern related to community survey reliability. Out of 131 community surveys, 51 did not include any women in the group of community elders, and overall, women made up only 20% of all community survey participants. This seems to be a frank reflection of the current role of women in community leadership, in which older men hold most positions of responsibility such as chief and deputy chief. However, as women are underrepresented in this sample, their important understanding of village dynamics may be lacking in these findings. Fortunately, this issue does not impact the household surveys, as women make up 65% of respondents for this part of the assessment. This higher proportion of women is quite typical for assessments which involve home visits, as women are more likely to be there during the day, especially during the dry season.

Another category of questionable responses is population estimates. Community elders would often need five to ten minutes of discussion to come up with answers to the questions on the number of people and the number of households in the village. The household surveys, as well as previous research, show an average of 7.8 individuals per household across the study area, but results from the community survey underestimate this by half as many people. In many instances, enumerators explained that the estimates do not include children. It was later explained that in many communities it is considered inappropriate to inquire into the number of children a family has, thus community leaders often have very poor understanding of the number of youth in the village.

Survey Tool Issues

In the ODK tools, responses were inappropriately required for a series of questions in which a "Not Applicable" response would have been appropriate (i.e. "During which months were household members *forced* to stay outside of your home because of flooding?"). This error was identified after nine days of data collection, at which point a workaround was devised to allow for a "Not Applicable" response. Unfortunately, the first nine days of data on these questions had to be excluded from analysis, significantly weakening our understanding of exactly when households are displaced due to flooding in these villages. Fortunately, all of the affected counties were revisited at later dates, ensuring some understanding of the flood displacement dynamics of the areas.

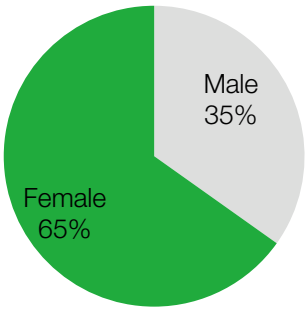
Findings

Interviewee Characteristics

Household

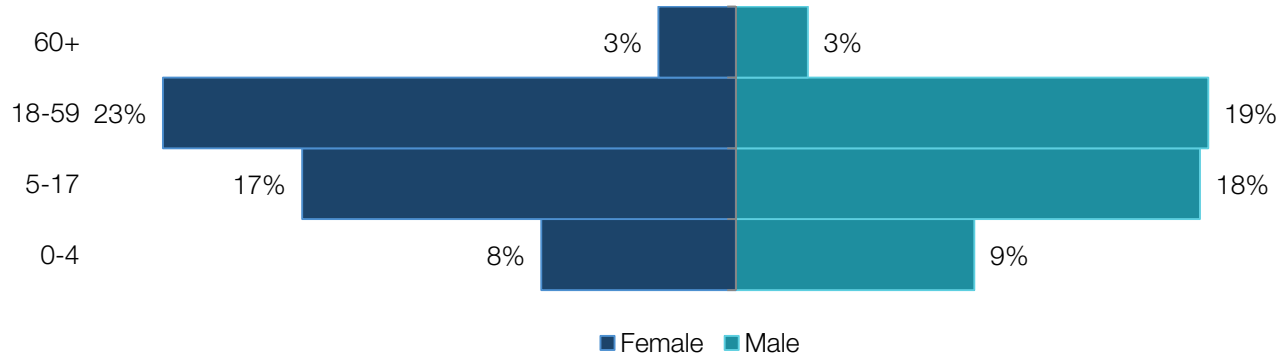
The 1,698 respondents to the household survey were more often female (65%) than male (35%). Their average age was 37, ranging between 18 and 80.

Figure 1: Sex of Household Survey Respondents



The average household size was 7.8 members, including the respondent. These households were made up primarily of youth, aged 17 and younger, (52%), and of slightly more females than males. The average dependency ratio across the study area was found to be 1.42, meaning that for every 100 people of working age, there are 142 children or elderly individuals. This ratio is much higher than that estimated for South Sudan as a whole. [7]

Figure 2: Age Pyramid of Surveyed Household Members



[7] http://data.worldbank.org/indicator/SP.POP.DPND The World Bank estimated South Sudan to have a dependency ratio of .84 in 2015. Dependency ratios are typically calculated using the count of individuals under 15 and over 64, divided by those 15-64. This data collection exercise counted dependent individuals as under 18 and over 59, which will overestimate the ratio, though certainly not to this degree of difference.

Community

Respondents to community surveys were primarily male (80%, compared to 20% female), with a total of 1,033 participants. This is largely due to the sampling focus on village chiefs and other community leaders, who were predominately male.

As noted in the Challenges and Lessons Learned section, village population estimates from the community surveys are dubious. In general, most counts of individuals were probably underestimates, though some outliers (removed during data cleaning) were likely overestimates. Keeping these limitations in mind, estimated village sizes ranged from 100 individuals to nearly 20,000, with a mean of 2,531 and a median of 1500. The count of refugee returnees appears quite low, averaging 57 returnees to villages averaging 2,500 residents, compared to qualitative discussions of larger portions of villages having returned from Sudan or Ethiopia in years past. To partially explain this, it appears that some communities stop categorizing people as returnees if it has been more than 12 months since their return.[8] A few communities reported hosting large numbers of IDPs (in one case up to 1,500 people) from neighbouring villages due to ongoing conflict. In no communities was this influx described as a source of contention in itself.

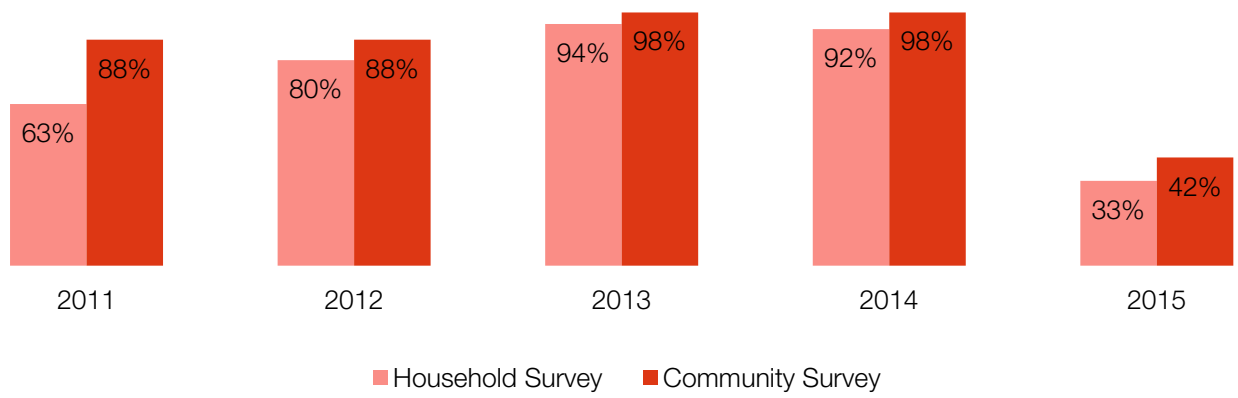
Table 2: Village Populations and Households

	Estimated Population of Assessed Villages			
	Mean	Median	Low	High
Households	816	500	34	6250
Returnee Individuals	57	5	0	750
IDP Individuals	74	0	0	1500
Typical # of Shelters per Household Compound	3	2	1	4

Flood History

Between 2011 and 2015, an average of 72% households reported flooding around their compound, with significant variation each year. Respondents described a number of changes to rain and flood patterns over the course of their lifetimes. These changes related to the timing of rains and floods, as well as the intensity of these events. These changes affect the planting, maintenance and cultivation of crops, and can affect livestock as well.

Figure 3: Respondents Experiencing Flooding by Year



[8] Some enumerators state that this is an official definition, though no documentation has been found from the United Nations High Commissioner for Refugees to support this.

Respondents across the region reported that the rain starts later than it did five or more years ago. In some areas, it used to rain even in January, February and March, softening the soil for early tilling and allowing crops to start growing by March and April. Then the full rains would typically arrive by April or May, so that by June the plants were already very well established. Now the dry season is drier, with the first rains only beginning in April, May or June.

Rains beginning later are reportedly harder and more damaging then they used to be. Respondents spoke frequently of "rain floods," (flash floods) which have occurred with increasing frequency and have a major impact on crops. Because they occur when plants are still small, leaves are commonly shredded or the entire plant is washed away, along with valuable topsoil and fertilizers. Many people reported that because the soil is saturated and carved away by these flash floods, the river floods occur earlier as well.

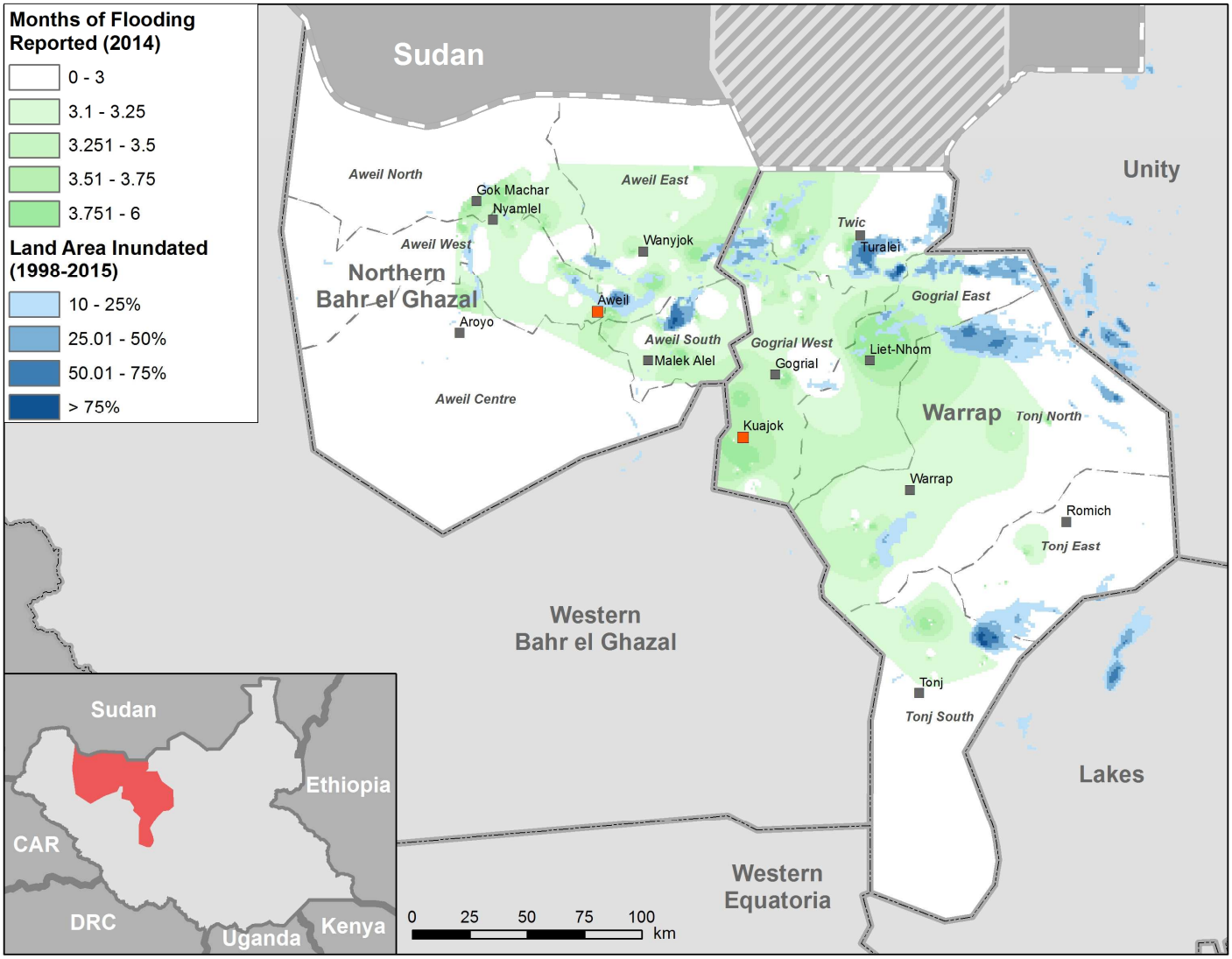
In the past, floods caused by rising rivers usually came in September or October, after the rains had slowed down and crops had been harvested. Now, in combination with the flash floods, the river flooding in some areas is occurring earlier, and with greater speed and depth. These earlier floods, which can begin as early as July, destroy crops before harvest. Even when the floods occur in the same timeframe as in the past, crops are still destroyed prior to harvest, because the later start of the season leads to a later harvest.

Despite this general trend, some areas reported that no real change has occurred in flood patterns in their community; they stated that there has always been a mixture of years with big floods and years with small floods. However, even these villages reported a lack of early rains, which forces later planting and thus plants more vulnerable to being destroyed by the typical floods.

Many respondents reported that the years 1999 to 2011 had little to no destructive flooding, while nearly all reported flooding in 2013 and 2014. In 2015, few communities experienced significant flooding due to weaker than normal rainfall, especially after July. However, those that did see flooding in 2015 were more likely to be heavily inundated by them; these villages were mostly located in areas identified as high risk in our satellite analysis.

Reports from respondents are confirmed by satellite analysis. The longer duration of flooding (shown in green in Maps 3 and 4), are generally located in proximity to areas identified through remote sensing to have major water coverage at some point in the year (shown in blue). This indicates that many of these communities are located in areas close to seasonal swamps, making them flood prone even in years of relatively light rain. In these flood-prone watersheds, flooding generally begins in July or August, peaks in September and October, slowly subsides in November and December, and ends by January or February.

Map 3: Flood Duration in 2015, Compared to Flood Prone Areas



Map 4: Flood Duration in 2014, Compared to Flood Prone Areas

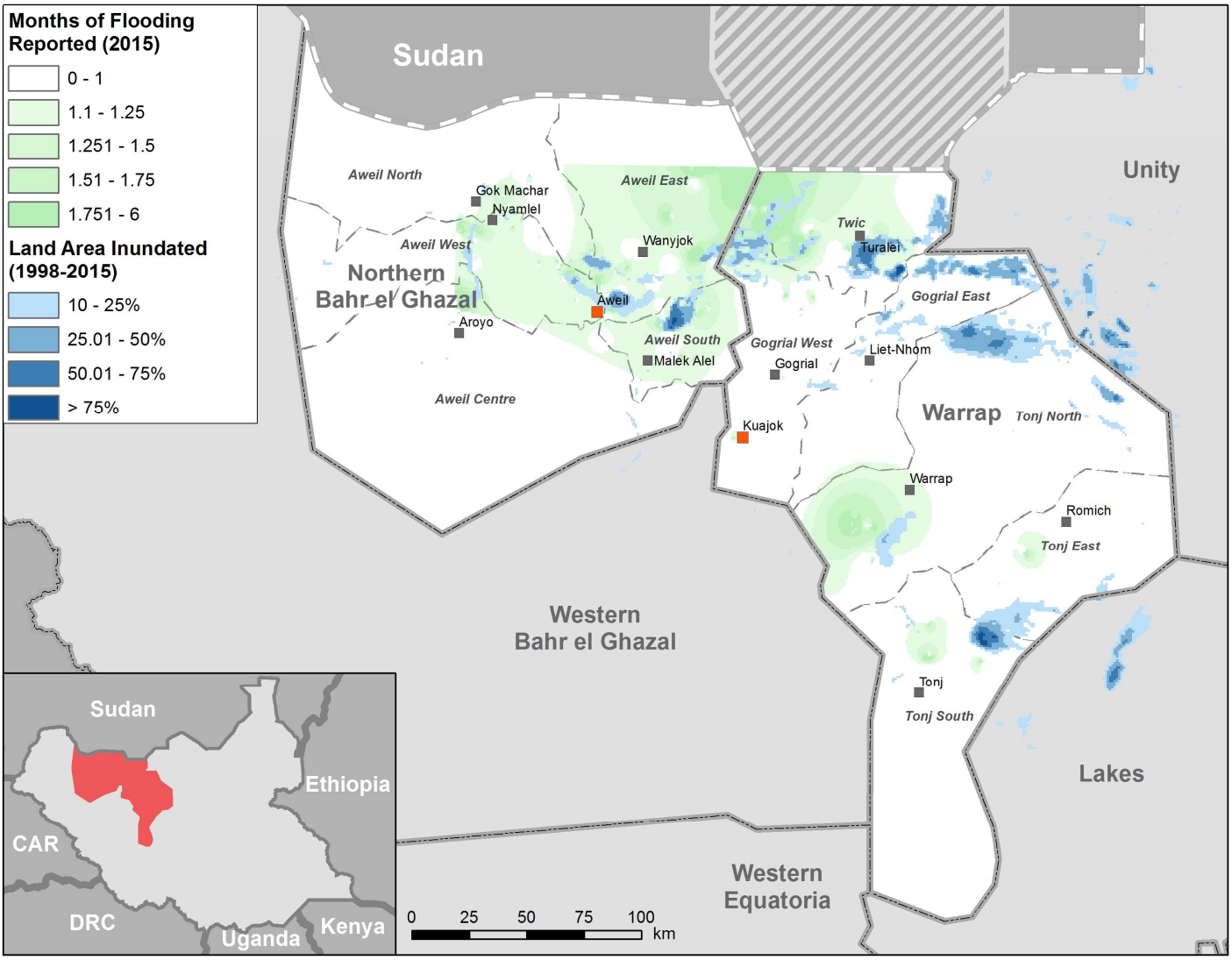
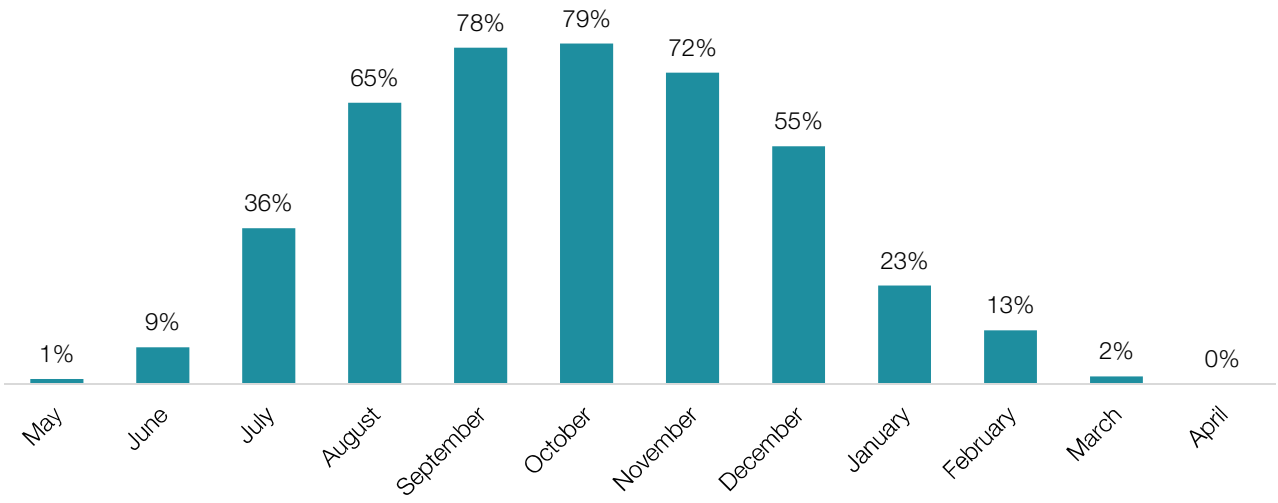


Figure 4: Percentage of Community Survey Villages Flooded by Month, 2011-2015



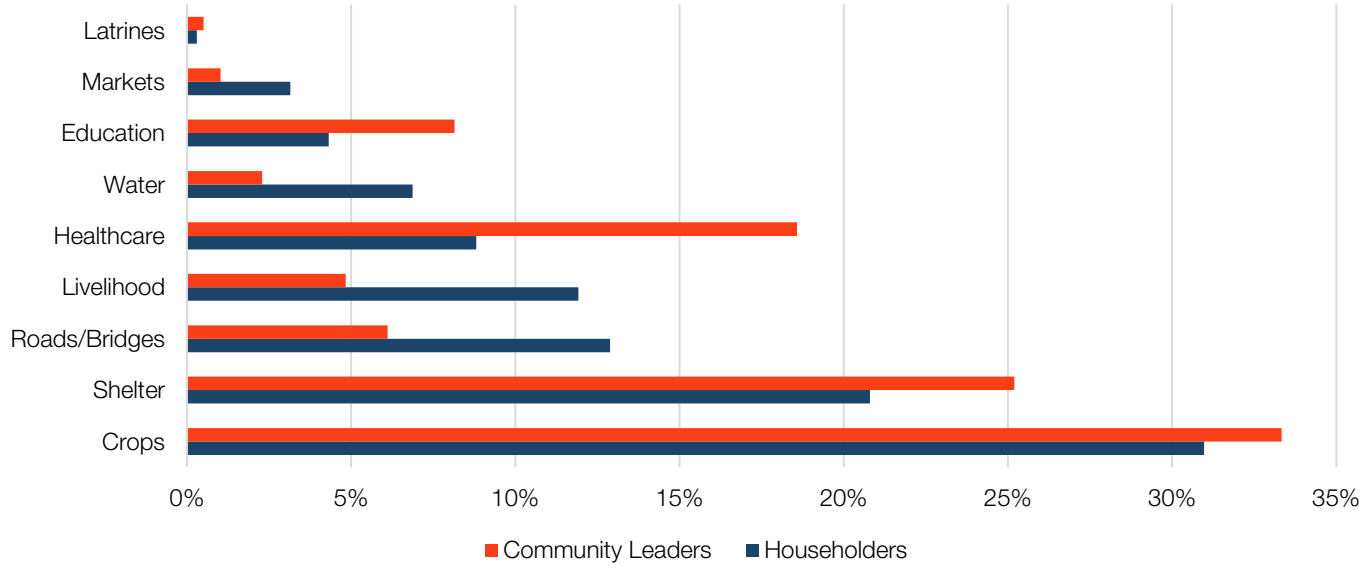
Further investigation into these data could be useful for a variety of purposes. Understanding of the exact timing of the start and end of rains and floods in specific areas is useful in operational terms to inform the selection of appropriate seeds, predict disease outbreaks, pre-position aid and to pilot an early warning system for times of inundation.

Impacts of Flooding

Flooding is a regular part of existence in these areas of South Sudan, with both drawbacks and benefits, even if the timing and severity is changing. Community leaders and households viewed these impacts somewhat differently, with households concerned about a wider variety of problems. Crop damage and destruction was a focus for all, with nearly three-quarters of all respondents listing these as one of the top three impacts of flooding. Community leaders also voiced concern about shelter destruction and the disruption of access to healthcare and education facilities. Households shared these concerns, and also mentioned that they had been affected by water source pollution, livelihood changes, and the damage and destruction of infrastructure.

Crop damage and destruction are clearly the most important impacts of flooding to the assessed population. Food security in these villages is extremely low, both because of environmental conditions and the broader context of market dysfunction and insecurity. Participants in nearly every FGD were interested in producing their own food, including traders and others with non-farming incomes. Because of economic inflation, food production is generally considered more valuable than employment. Unfortunately, flooding makes these efforts highly unreliable, since an entire season of labour can be washed away. When this occurs, communities suffer long periods of hunger, causing illness, disruption to education and employment, and starvation.

Figure 5: Most Important Services or Activities Impacted by Flood Destruction or Disruption



Narrative 3: Flood Season as Relief from Insecurity

"When there's more flood, there's less fighting…last year there was a lot of fighting, 200 people were killed, so cultivation was limited. Though the fighting is stopped for now, it could always resume. The villages on the border with these two areas (neighbouring villages) aren't lived in; the land is only used for cultivation, and people sleep in other villages because security is such a concern. We have people from 21 villages that live with us; there are now more IDPs then residents in this village. They come here and stay with relatives."

–Middle-aged male, Warrap, Tonj North County, Akop Payam, Padoc Village

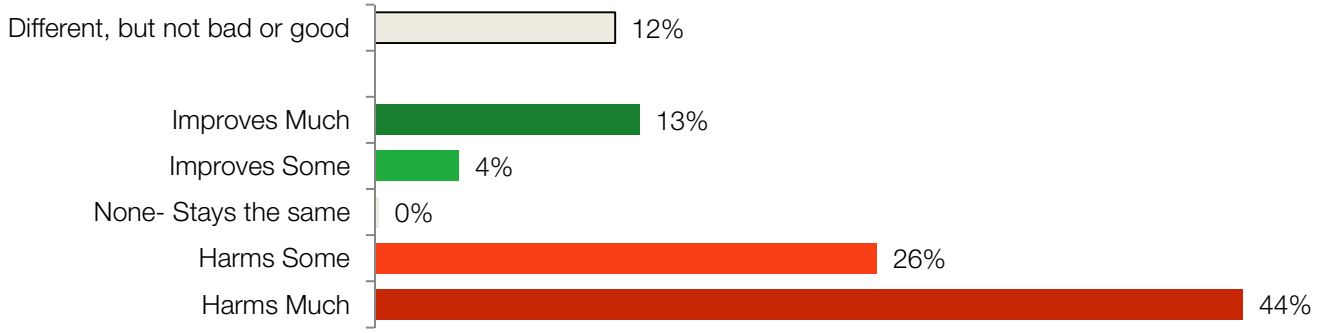
Despite the negative impacts of flooding, many respondents discussed positive impacts as well. Most commonly these include the provision of grass for cattle, fresh water and soil for crops, and fish for eating and sales. For some communities, the greatest benefit to flooding is that it brings a time of security from persistent conflict.

Impact on Livelihoods

Overall, flooding is seen as harmful to both agricultural and pastoral livelihoods, with over two-thirds of respondents claiming negative impacts. Crops and fertilizer can wash away, and plants can drown if the flooding comes too soon. Cows can die from diseases borne by mosquitos, flies and ingested snails. Goats can die from starvation because they are unable to graze flooded pasture.

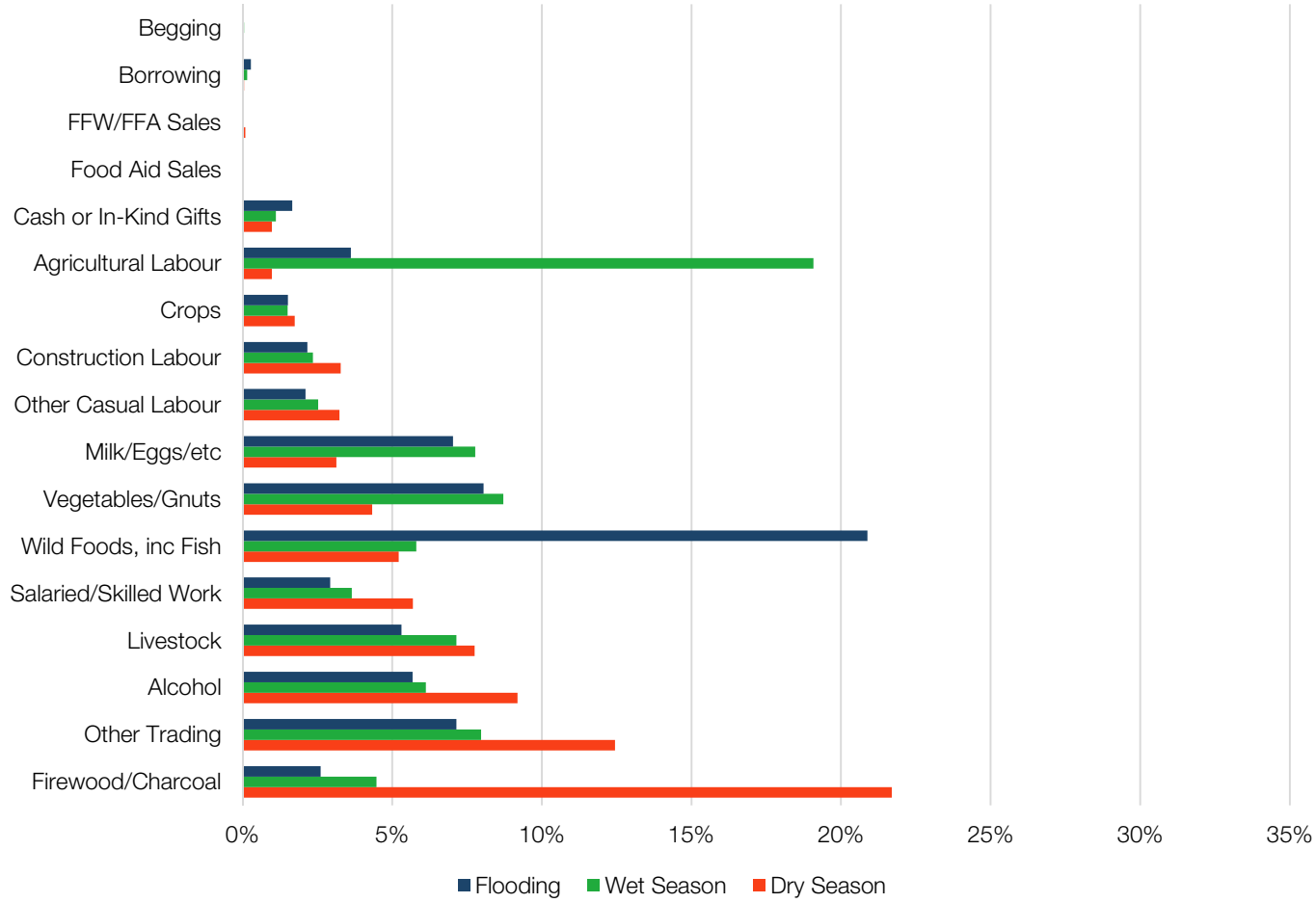
However, some people (17%) saw the floods as more beneficial than harmful. According to these households, the benefits of fish, renewed topsoil and water for grass and animals outweigh the harmful aspects. People with livestock tended to see more benefits in flooding, especially because it waters grass for feed, while those who only raise crops saw more of the destruction caused by floods.

Figure 6: Most Commonly Cited Impact of Flooding on Livelihood Activities



There are very distinct patterns to livelihood activities throughout the year. During the dry season incomes most often come from selling firewood, charcoal and grass, during the wet season agricultural labour dominates. During times of flooding, despite an overall reduction in income sources, sales of fish and other wild foods are key. It is critical to note that these findings only encompass income-generating livelihood activities. Subsistence occupations, such as farming and livestock-tending for home use, are the major activities in these remote communities, but were not captured by the questionnaires.

Figure 7: Top Livelihood Activities by Season

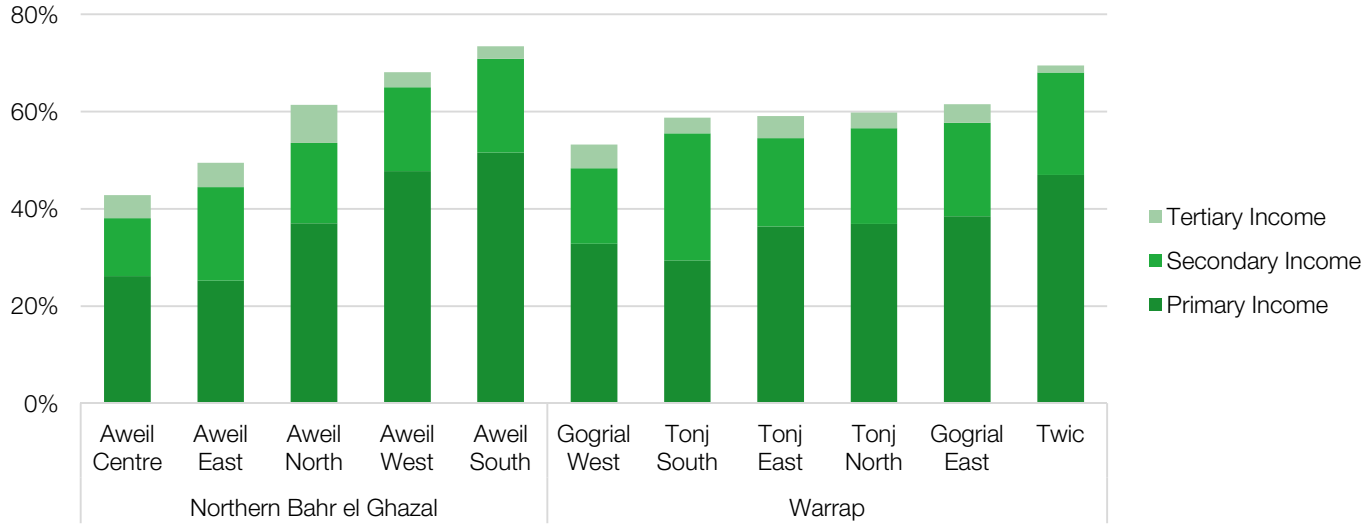


Northern Bahr el Ghazal and Warrap reported very similar income sources. The few differences that were seen are that villagers in Northern Bahr el Ghazal were more likely to earn income from salaried/skilled work, sales of firewood/charcoal/grass, and sales of fish and other wild foods during times of flooding. Those in Warrap were more likely to earn income from agricultural labour and sales of livestock.

Overall, 62% of respondents stated that fishing (and to a small degree other wild foods) was a source of income during times of flooding. This was seen in all areas, but especially in Twic, Aweil South and Aweil West. In addition to this financial boon, the arrival of fish provides a major source of food, effectively marking the end of the hunger season.

A large number of respondents reported that they can sell any fish they catch, and that there is demand for even more fish, but additional market analysis would be useful to understand the opportunities of this value chain. Fish brought to larger markets are typically air dried, but there may be other preservation techniques that may allow for further transportation and wider sales. It would also be valuable to understand the proximity of major fishing areas to larger markets. Some respondents expressed concerns that the fish are smaller and less abundant than they used to be. They worried that this critical source of food is threatened by overfishing, contamination or some other hazard.

Figure 8: Households Selling Fish or Other Wild Foods as an Income Source in Times of Flooding, by County



Respondents did not offer a clear picture of the role flooding plays on the availability of farmland. It does not seem to directly make cultivatable land more or less available. What appears to be happening, instead, is that as communities grow larger and/or as conflict or drought spreads, families are more likely to expand into land that was previously considered too swampy for settlement and cultivation. The land can support crops, but with a greater risk of flood damage than in other areas.

Narrative 4: Food Shortages

"[Asking about] floods is important, but food is also important… Early cultivation is difficult, because it takes so long to till the hard ground by hand."

– Middle-aged male, Northern Bahr el Ghazal, Aweil North County, Malual East County, Koiyom Boma, Paguot Village

"These small children, they're suffering a lot. They just lick this tree because there's no food."

–Young female, Northern Bahr el Ghazal, Aweil West County, Gomjuer East Payam, Buon Ayak Boma, Wathyang Village

"The floods used to come after harvest, which was fine, but now they come earlier and earlier, destroying the crops… We are dying. You can see, we are starving."

–Elderly Female, Northern Bahr el Ghazal, Aweil South County, Nyieth Payam, Riang Man Kuek Boma, Maper Akuel Liec Village

Hunger has many people really suffering across this area of South Sudan. For the last three years, unreliable rains (both excessive and inadequate) have reduced harvests. Familial food stores are very low, and is compounded by the inflation of market prices across the country. Because of this, the hunger season this year is very long and affects nearly everyone. Respondents repeatedly claimed that this lack of food severely limits their ability to build dykes, sow early crops, and other activities which may reduce the devastation flooding brings.

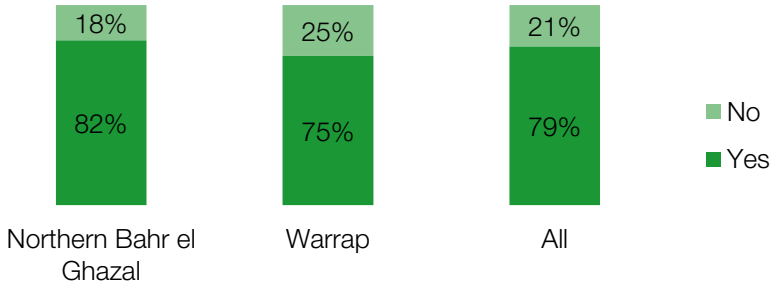
Impact on Shelter

Shelter destruction was listed as a high priority negative impact of flooding by nearly two-thirds of community leaders, but only by a quarter of households. This is unsurprising, as community leaders maintain an awareness of all areas of the village, so even if a small portion of houses are damaged or destroyed by flooding, they will be more likely to bring it up as an issue.

Flooding was found to have a major impact on shelters across assessed areas of Northern Bahr el Ghazal and Warrap. Housing is almost exclusively made up of *tukuls*, traditional structures with mud walls, wooden frames and grass roofs. A family will typically have a couple of these buildings clustered together as a compound on a slightly raised mound of dirt, which helps drain rainwater and reduce the possibility of flooding inside structures. Often, these dirt platforms are made with mud that has been levelled and packed hard, which further helps avoid any swamping in the houses.

Occasionally, a tukul is built atop large timbers, raising the entire structure at least a metre off of the ground (see photograph in Annex 9). Many communities use this design for grain storage structures in order to avoid dampness or infestation, but some use them for housing as well. This design was present in most villages, but only within a few compounds in each village. In no village was this raised design used by a large proportion of the families within the community. Many respondents stated that this design is preferred, but expensive. Due to deforestation, the large timbers necessary for this construction are increasingly difficult to find near the villages, so they must be brought in by trucks, and fuel costs raise the price dramatically.

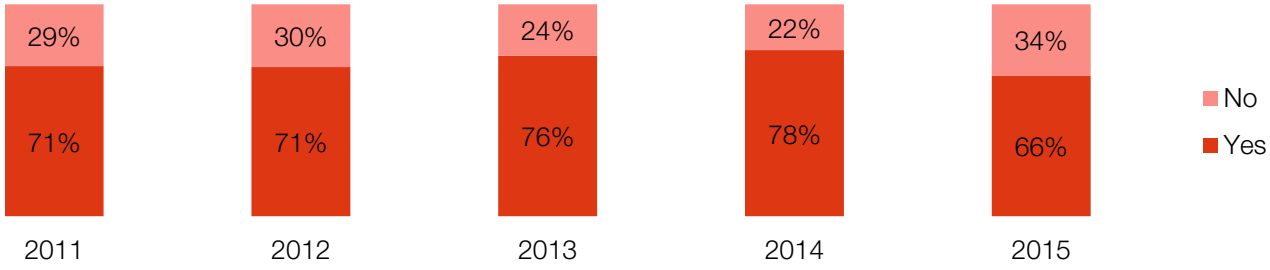
Figure 9: Villages with One or More Shelters Using a Raised Design as Reported by Community Leaders



In many communities, shelters are increasingly located in lower-lying areas that have not previously been populated. A generation or two prior, families moved to these lowlands both because higher areas were running out of water and because population growth forced them to search for unsettled farmlands. Now that wetter seasons have returned, these low areas are becoming submerged.

Some amount of flooding of shelters was common in all communities. Between 2011 and 2015, if flooding occurred near a compound, 73% of the time the shelters were flooded as well. This was seen in both Northern Bahr el Ghazal and Warrap, with 53% of all assessed households reporting shelter flooding in this time period. On average, the flooding of shelters lasted for one and a half months, while flooding around compounds lasted for three and a half months.

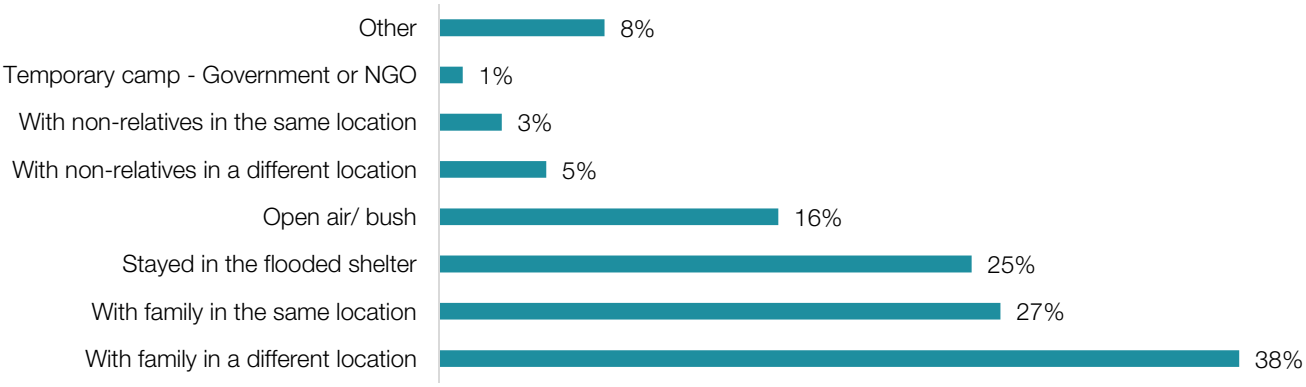
Figure 10: Household Reported Occurrence of Shelter Flooding by Year



Displacement

When shelters flood, most people reportedly stay with family, either in the area (27%) or in another location (38%). The rest typically remain in the flooded structure (27%) or in the open air nearby (16%). A small proportion stays with non-relatives or in camps. Families are rarely split up because of flood displacement, though the nature of some seasonal labour does pull family members to areas far from home. Flood-related displacement from shelters typically occurs in September, October and November, with some variation occurring on either side of these months.

Figure 11: Household Reported Displacement Locations of People Affected by a Flooded Shelter, 2011-2015



No significant variation was seen between the coping strategies adopted by those displaced for more than one month, and those displaced for a shorted period. Few reportedly chose to leave the area, and almost no household reported renting another place to stay, instead households most commonly stayed in the open air or with relatives. Flood-related displacement lasted an average of seven weeks.

Narrative 5: Why Return to Flood-Prone Areas Every Year?

"This is our grandfathers' land…
We can't get new land, because every land has his own people."

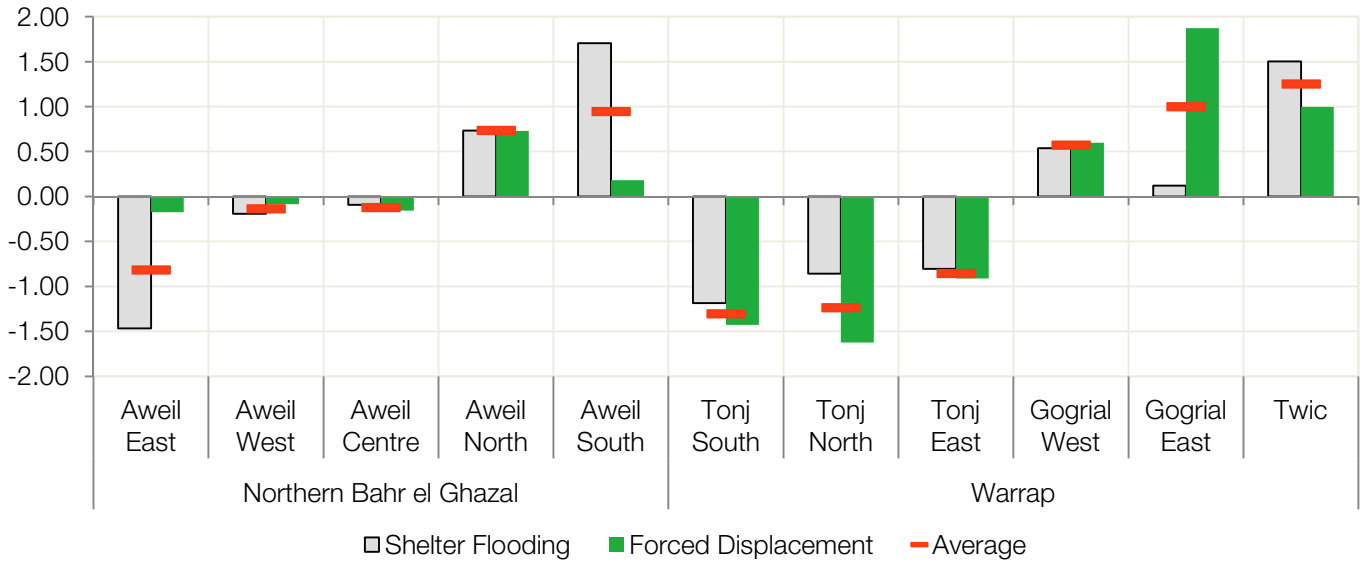
-Middle-aged female, Northern Bahr el Ghazal, Aweil South County, Panthou Payam, Dong Village

Almost every respondent articulated that they did not intend to leave their current village, both for internal and external reasons. The near-universal expression was that this is the land of their ancestors, so to leave would be impossible. When asked to explain further, they explained that the land holds major personal significance because it successfully supported the livelihoods of their forbearers. Some reported that their ancestors moved to this land because their prior home was no longer viable due to conflict, a lack of water or because families became too large for the land to support them. Externally, there is a fear that to move to a new village would invite isolation and poor treatment in the new location. This fear is exacerbated by traditional taboos against marriage between different communities, though this does not apply as strictly in families with greater access to education. Despite rough conditions in flood-prone villages, most respondents simply did not have clear, safe alternatives.

The decision to stay is not universal, however. In a few villages, large proportions of households have evacuated the area due to ongoing floods. In one small village, the population halved, from 84 households to 34, in ten years. Those who left travelled to higher land with a lower risk of flooding.

When normalized using a Z-Score statistic (in which all scores are standardized and measured by their number of standard deviations from the average), a comparison can be made between counties on the occurrence of flooding and forced displacement due to flooding. A higher (or positive) score indicates that these events occur in the area more frequently. When compared to the average across the study area, households in Aweil South and Twic are most likely to have their shelter flooded, while households in Gogrial East are the most likely to be displaced from their homes due to flooding. Households in Tonj area are less likely to face these difficulties, and Aweil East households are the least likely to experience shelter flooding.

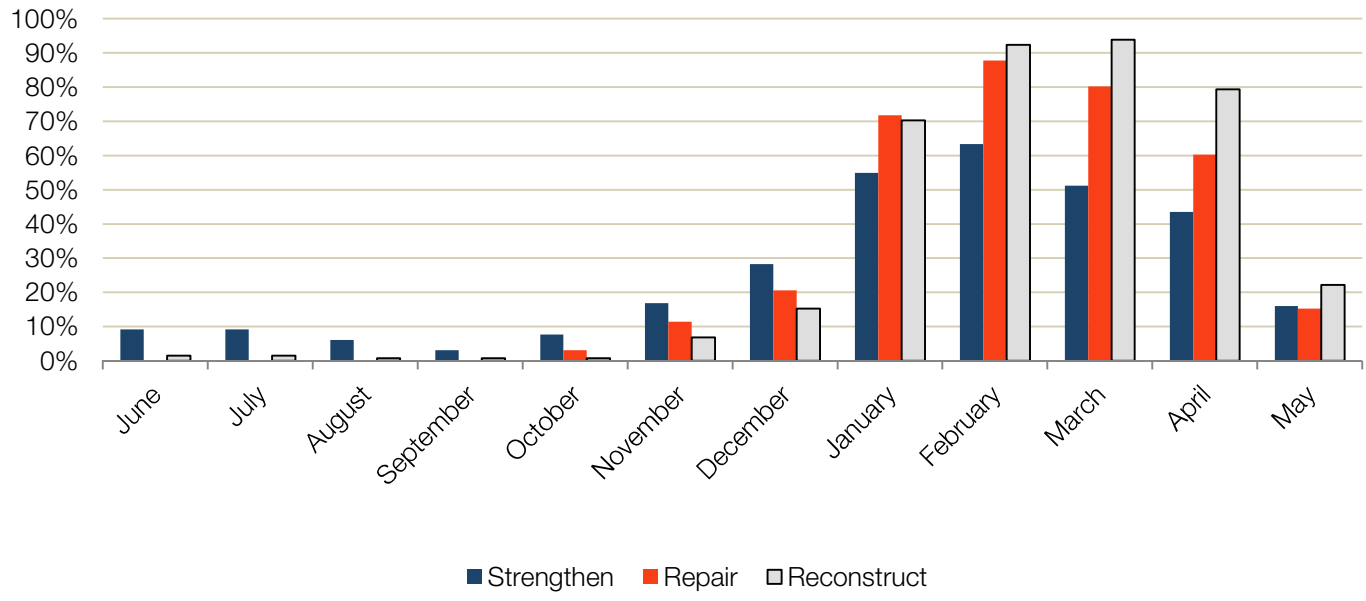
Figure 12: Normalized Shelter Flooding and Forced Displacement Score, by County



Shelter Repair

Respondents described clear seasonal patterns of home rebuilding, repairing and strengthening. The mud walls of tukuls must be built or repaired as soon as the flood waters have receded, when the ground is still wet (typically December-January). The same applies to the optional wood supports that are sometimes sunk into the ground just outside the mud walls. Then the construction of the wood and grass roof can wait until March or April, once the grass has thoroughly dried, just before the first rains begin to arrive. The vast majority of work occurs during the dry season, though some strengthening of shelters occurs during times of rain and flooding.

Figure 13: Percentage of Households Improving Shelters by Month



Building materials, such as grass for roofs and timber for roof frame, are the least expensive in November and December, and most expensive in June, July and August. Most respondents said that this price increase is not exorbitant, but that often the materials simply are not available for purchase at all. Others stated that because no one builds during the flood time, the prices do not go up.

Narrative 6: Deforestation and Charcoal

> *"Men, women and children sell Gum Arabic from these trees (a forest of rusty red Acacia) to traders. These fetch 30 SSP per molo (the volume held by a large USAID cooking oil can) and are eventually sold to merchants from Sudan. The income this brings us is important, so we don't use these trees for firewood."*

-Middle-aged male, Northern Bahr el Ghazal, Aweil East County, Madhol Payam, Marol Akot Boma, Rialdit Ajuong Village

Deforestation is happening at an alarming rate in South Sudan. Some estimates report that 33% of tree cover has been lost in the last 55 years[6]. Meanwhile, sales of firewood, charcoal or grass were reported as an income source for 65% of respondents during the dry season, and as the primary income for 35%. With no other major fuel being used, almost all cooking is done from charcoal. All across Greater Bahr el Ghazal trees were seen being felled and carbonized for eventual transport and sale at market.

Deforestation increases microclimate temperatures and reduces absorption of rainwater. Sales of charcoal and firewood are relatively easy opportunities for income generation, and some land clearing is necessary to open land for cultivation. However, in the long term, the loss of trees at this rate will devastate the landscape and the people who survive on it.

Reducing dependency on firewood and charcoal is a clear opportunity for climate change mitigation and adaptation efforts. Currently tree planting is one of the lowest DRRA being used or preferred by respondents. In addition to afforestation, opportunities include the use of energy saving stoves, the burning of cow dung, and the promotion of Gum Arabic sales. Efforts to switch to these alternatives will take time and care, both to ensure that existing value chains are not disrupted by new programs, and to ensure buy-in from communities on new and potentially taboo practices (such as cooking over dung).

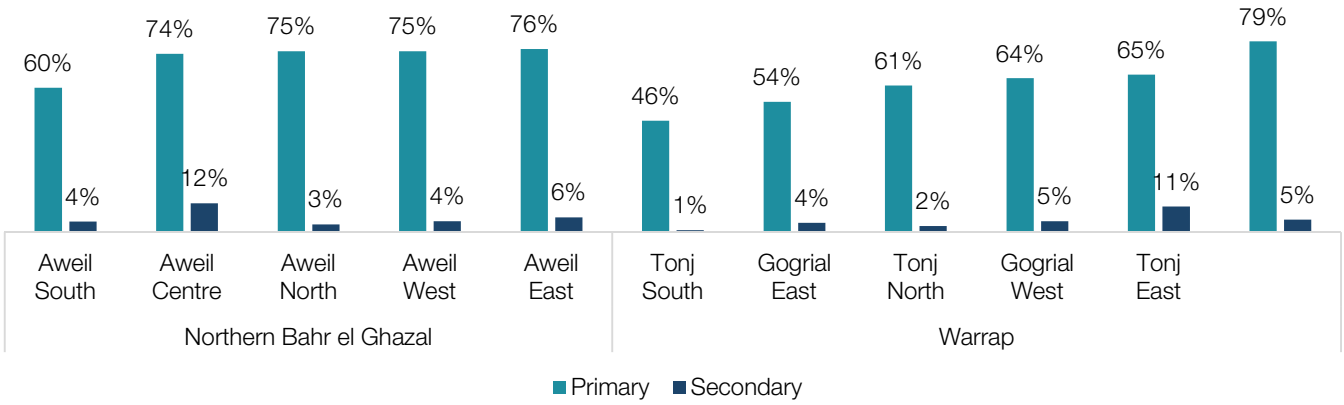
Additional research should be done on what fuel sources are used during the rainy season, particularly during times of flooding. During this time sales of firewood, charcoal and grass are at their lowest and it is possible that families might be using alternative fuels during this period of isolation. Whatever alternative is being used should be investigated for potential upscaling into the dry season. In parallel, existing efforts to strengthen laws and policing against tree felling should be matched with non-punitive programs which support the use of alternatives fuels and income sources.

[6] 8 June 2016. *S. Sudan's forest cover shrinks by 1.5 pct annually: UNEP official*. Xinhua. http://news.xinhuanet.com/english/2016-06/09/c_135423376.htm?

Impact on Education

The majority (66%) of school-aged children in most communities reportedly attend primary school. However, reported attendance rates were lowest in the more remote counties of Tonj South and Gogrial East, where very few (46% and 54% respectively) were reportedly attending. Secondary school attendance was significantly lower in all counties, ranging from 1% in Tonj South to 12% in Aweil Centre.

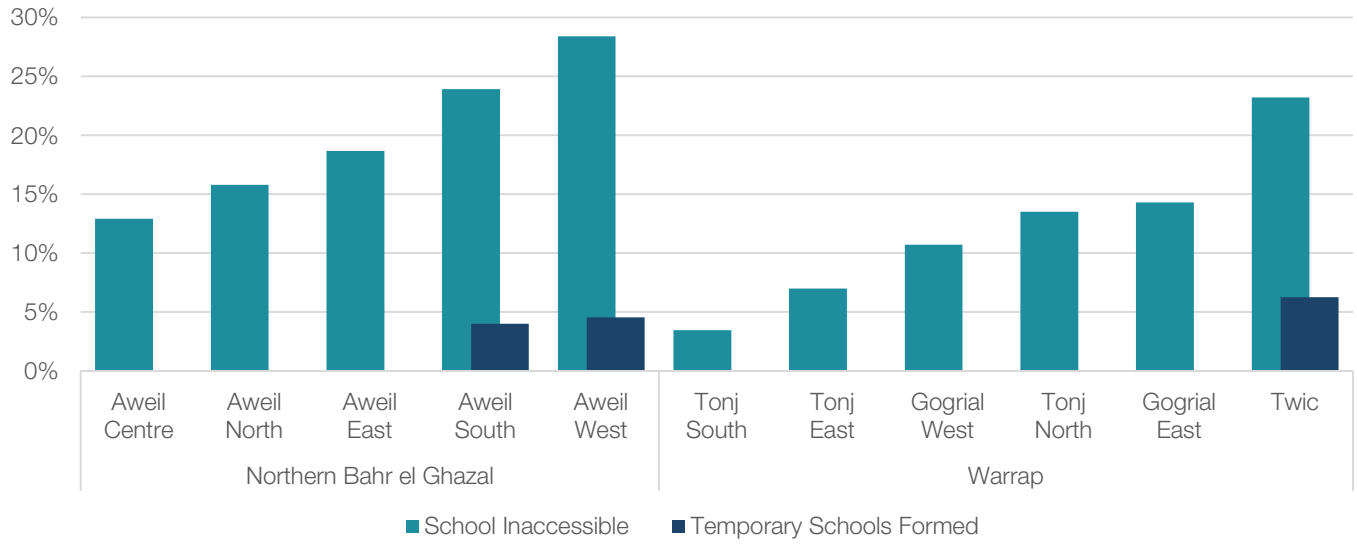
Figure 14: School Attendance Rates by County



In 28% of assessed communities, primary schools were reportedly inaccessible at some point in the year due to flooding, leading 18% of households to report that children were unable to attend at this point. Some families reported that despite schools being very close (only a 10 to 15 minute walk away), their small children cannot attend school during the flood season for fear of being washed away. This leads to periods of extended truancy for the youth, and to an increased burden on mothers as they must look after their children during these days.

Some villages (8%) reported setting up temporary primary schools during times of flooding. These temporary schools were only set up in areas with the highest rate of inaccessible schools, namely Twic, Aweil South and Aweil West. Generally these temporary schools are simply marked by the arrival of a teacher to a designated location in the open air.

Figure 15: School Inaccessibility during Times of Flooding as Reported by Households and Establishment of Temporary Primary Schools as Reported by Community Leaders



Secondary schools are almost exclusively available in distant towns. The few youth who reported attending these schools live either in or near these towns, so flooding has much less impact on their school access. Secondary schools were only reported to be inaccessible by 11% of households. No temporary secondary schools were reportedly created during flooding season.

Narrative 7: Education: Resilient Against Floods, But Not Hunger

"The children only eat in the morning, so by the afternoon they cannot learn anymore."

-Middle-aged male, Warrap, Twic County, Pannyok Payam, Mading Luit Boma, Tumakon Village

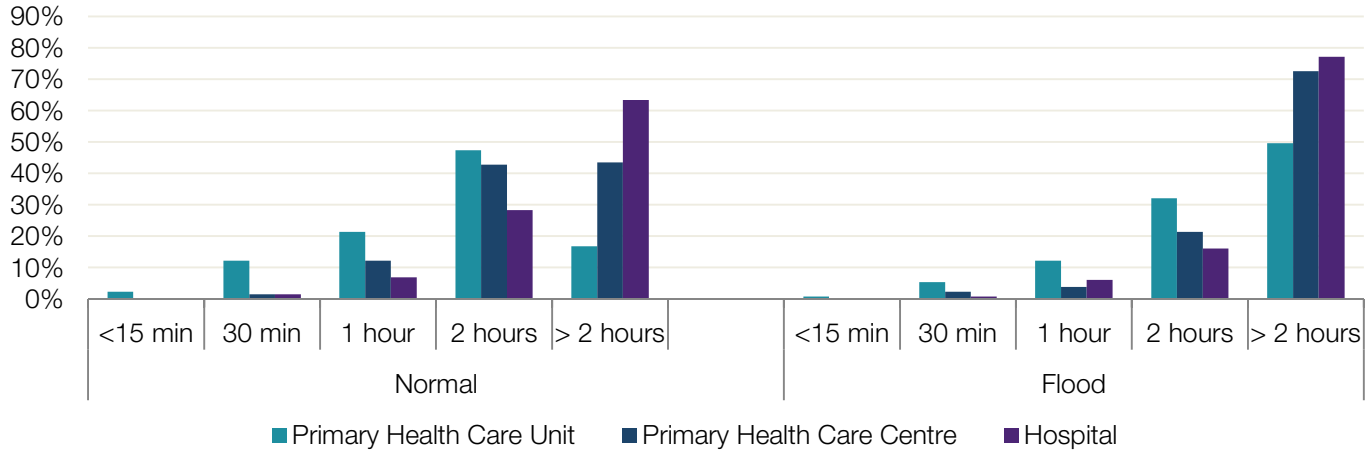
To reach the village requires a barefoot trudge through knee-high mud and water, past cows, crows, storks and other water birds. The village centre hosts a gathering of nearly 30 children listening attentively to a teacher. A large slate chalkboard leans against a termite mound built around the trunk of a mango tree.

The flood season can last six months here. And because the village is so close to the river and marsh, it can flood any month of the year. School is in session all year, but during the dry season it only lasts for half of the day. The children are too hungry to pay attention after that, and there is not enough food for a midday meal. So instead, they are sent home to rest.

Impact on Healthcare

Times of flooding have clear impacts on health. Participants in FGDs often mentioned that water- and insect-borne diseases, especially malaria, increase dramatically during this period. Meanwhile, transportation to medical facilities becomes much more challenging. Most respondents stated that it is extremely rare for flooding to make medical care truly inaccessible; if someone is sick enough, the family of the individual will do whatever is required to bring them to a hospital or clinic. However, it takes 16% longer than normal to travel to medical care, an average of 153 minutes, compared to 131 minutes during the dry season. Travel time to hospitals, which are generally located further away, is clearly more affected by flooding than travel to Primary Health Care Units and Primary Health Care Centres. These delays extend across an average of 3 months of the year. The time and burden costs of this transportation reportedly leads people to often wait too long before seeking medical interventions, leading to additional complications.

Figure 16: Community Leader Reported Travel Time to Medical Facilities, Normal and Flood Times



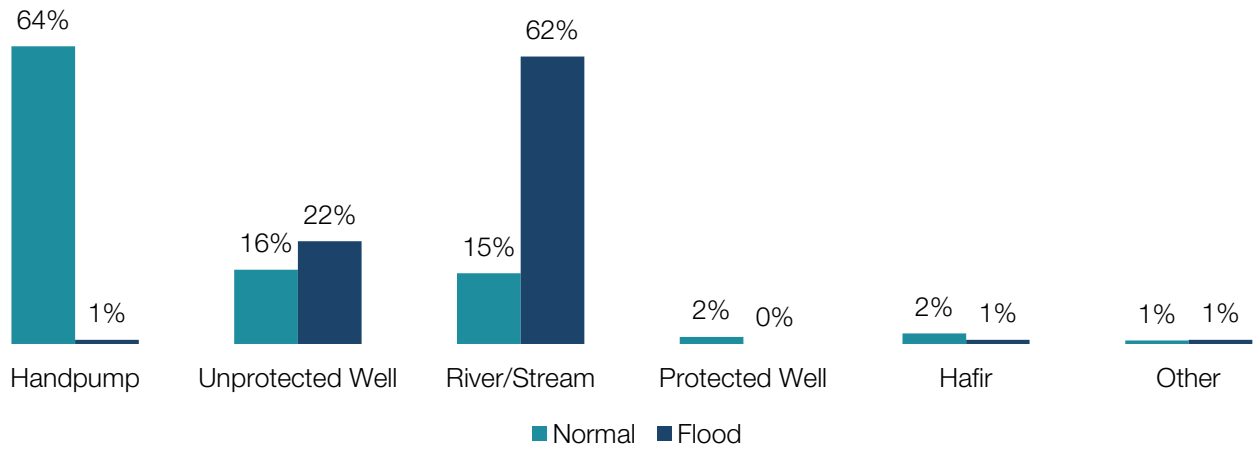
Because of the difficulty of reaching health facilities during times of flooding, many respondents at both the household and community leader level voiced interest in preventative measures to support health. These include the provision of mosquito nets and medication, as well as food aid and food for asset programs, which would help families go into the flood season with greater physical reserves, allowing them to better avoid devastating illness.

Impacts on Water, Sanitation and Hygiene

Drinking water comes primarily from borehole hand pumps during the dry season, and from rivers or streams during times of flooding. During the peak of the dry season, some boreholes reportedly go dry or become very difficult to draw water from.

Throughout the year, defecation occurs almost entirely in the open air. Almost no communities have access to latrines, and very few expressed any interest in acquiring them. Communities report that gastrointestinal illnesses are highest during the dry season, because water sources shrink and become less fresh. When the flooding comes, massive dilution seems to obviate these issues.

Figure 17: Primary Water Source by Season as Reported by Community Leaders



Narrative 8: Hardship Toilets in Flooded Areas

"The old dykes built out in the grasslands were intended to provide some dry ground, but they don't do much."

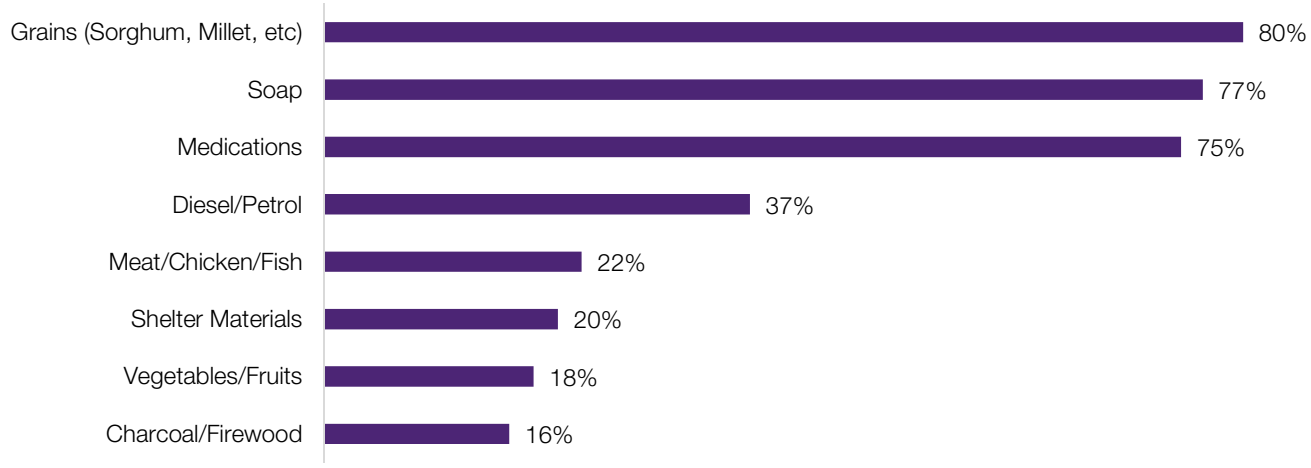
-Young female, Northern Bahr el Ghazal, Aweil East County, Wunlang Payam, Tong-Goi Boma, Areny Piny Village

Past a palm forest, the land opens up into wide-open grasslands. Three tukuls are all built on a levelled mound of soil that has been raised just above the floodline. The small compound act as an island during the flood season, filled with four women, more than twenty children, and occasional snakes and cows. Through embarrassed laughter, the women say that during times of flooding they *"must defecate standing up in the flood water,"* because the water is so deep and dry land so rare.

Impacts on Markets

During floods, local markets and kiosks often close. Those that do remain open often lack staple foods such as sorghum, salt, sugar and groundnuts, as well as soap, medicines, mosquito nets and clothes. Larger markets remain open, but are more difficult to access and commonly experience shortages of goods as well. Families would like to be able to stock up on goods before their access is limited, but they usually have no extra money remaining during the hunger season that immediately precedes the floods. Despite these supply shortages, the price of goods does not seem to rise significantly, because demand decreases through the lack of spare cash and the reduced access to markets.

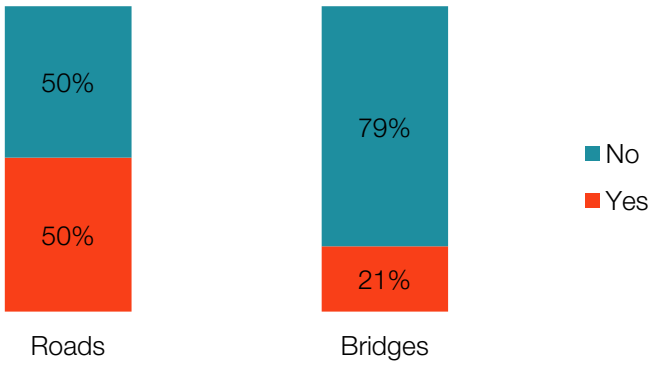
Figure 18: Product Shortages in Marketplaces Reported by Communities



Impact on Infrastructure

Half of the communities reported that roads used to access the village have been damaged or destroyed by floods in the last year. Nearly all (94%) of these roads remain damaged or only partially repaired, and those that have been repaired in the past are no more likely to withstand floods, with 55% not surviving last years' floods. Bridges are more likely to withstand floods, with only 21% being damaged last year. However, one-third of previously repaired bridges were destroyed again last year.

Figure 19: Community Leader Reported Road & Bridge Flood Damage in 2015



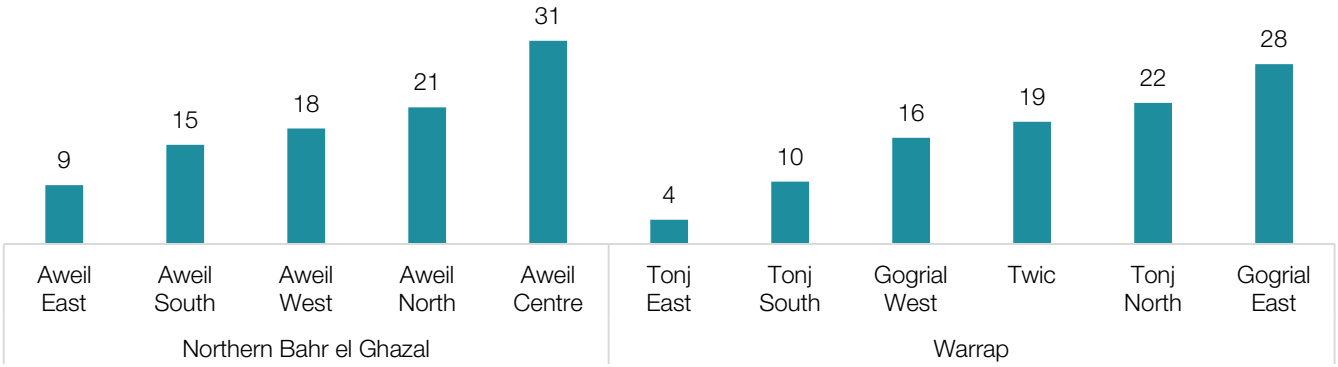
There is considerable frustration in many villages about the state of roads. Residents reported that they are keen to work on road-building projects, as long as they are provided with food and/or tools to complete the job.

Isolation from Flooding

An isolation score was created for each village, developed as a composite of travel times to ten different types of location: primary healthcare units, primary healthcare centres, hospitals, drinking water sources, small markets, large markets, local shop or kiosks, primary schools, secondary schools and telephone towers. Average travel times for both dry season and wet season were calculated, and the difference between the two aggregated by county.

This analysis found that Northern Bahr el Ghazal and Warrap share similar changes in access, with an increase in travel time of approximately 16 minutes across both states. However, in both states there are counties with changes in travel time far from this average. Aweil Centre and Gogrial East both experience a major heightening in isolation, with average travel times increasing by around half an hour in both counties[9].

Figure 20: Increase in Community Leader Reported Composite Travel Time to Key Services between Dry Season and Times of Flooding (in Minutes)



Disaster Risk Reduction Activities (DRRA)

All villages reported they make some attempt to stop flooding or limit their destruction. Before the flood season arrives, the construction of dykes is the most utilized DRRA, with 85% of households listing it as one of their top three strategies, followed by the construction of water channels (53%) and early cultivation (49%). After flooding, activities are more diverse, with an emphasis on tasks that require pliable wet earth, such as dyke building (34%), raising and levelling compounds (43% and 60%, respectively), and reinforcing mud walls (42%).

Dykes

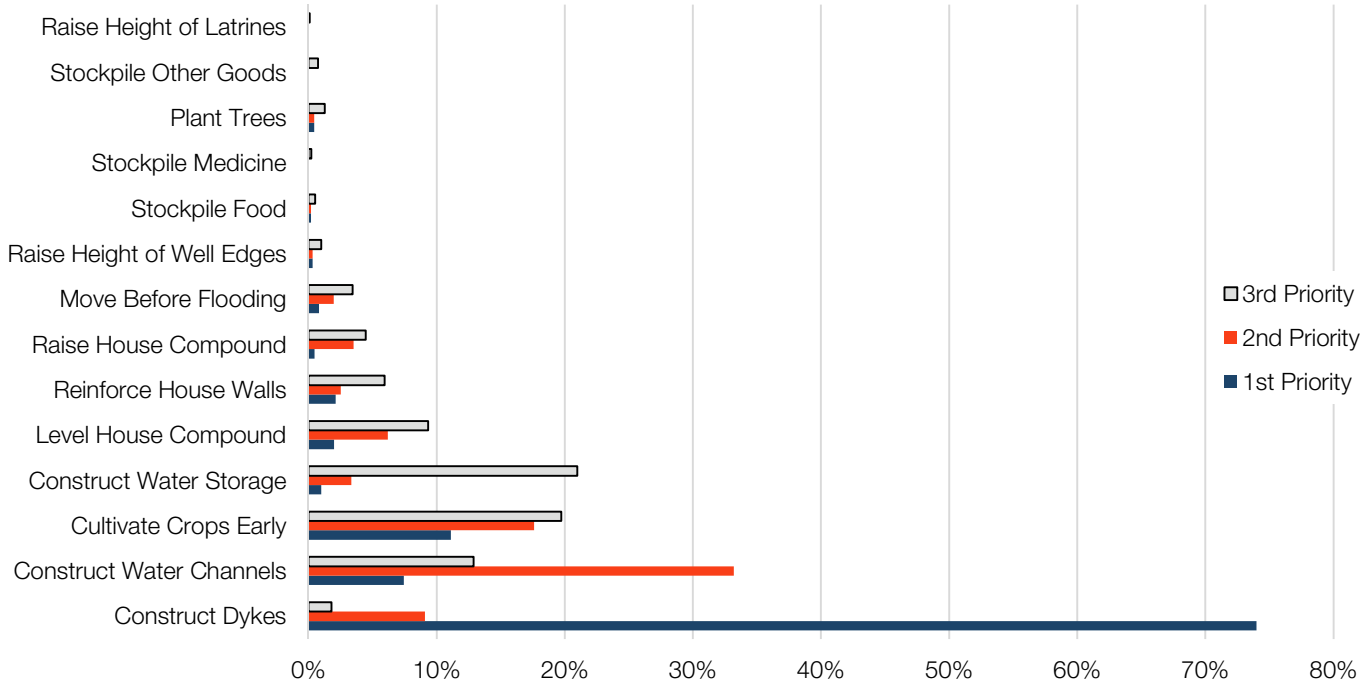
In the past, dykes would typically be built only around housing compounds, if at all. But now that floods increasingly arrive before harvest, communities are attempting to build them around the much larger farmlands as well. Unfortunately, most respondents reported that these dykes do not successfully control the floods, both because they lack tools and strength to build big dykes, and because the floods are more intense than in the past. This inability to control the floodwaters means that crops often drown or are washed away before they yield food.

Though many current dykes do not completely control the flow of water, communities generally reported still being very interested in the continued construction of these structures. They generally expressed more hope in dykes than in any other flood control measure, and found that even a partially functioning dyke is better than none at all.

Raised roadbeds also serve as dykes, sometimes intentionally, and sometimes unintentionally. These large infrastructure projects, if planned thoughtfully, serve to connect communities to nearby markets and services, and also divert floodwaters around vital local resources. However, when poorly planned, they block the flow of water and turn communities into lakes.

[9] Due to the data collection methodology, responses beyond two hours are all grouped together. In total, these answers account for 40% of all travel time responses. For this calculation, responses of “more than two hours” were assumed to be three hours, but in some communities the true time is much greater. Though it is unfortunate that more specific findings are not possible, this alone is noteworthy, that two hours of travel is a minimal amount in nearly half of these communities.

Figure 21: Top Three Currently Utilized Pre-Flooding DRRA for Householders



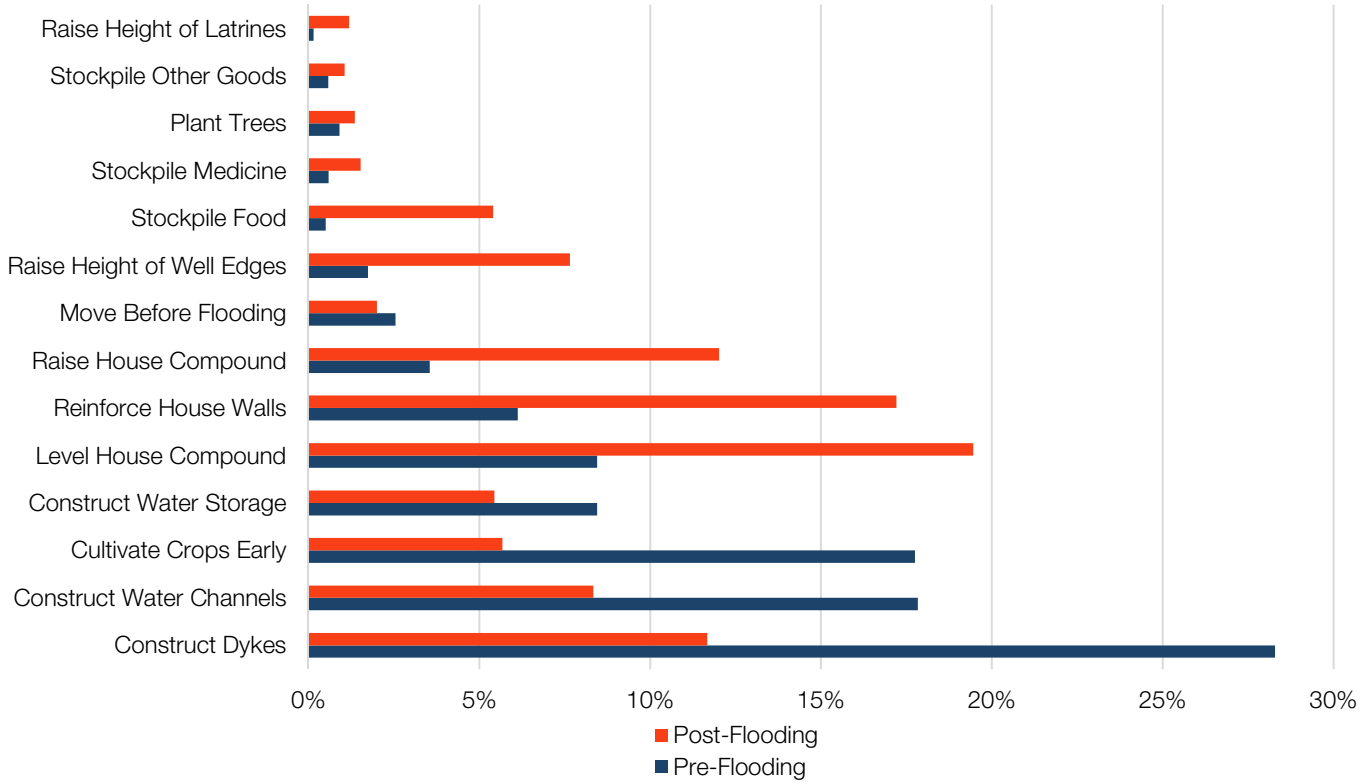
Other DRRA

Though dykes garner the most attention, the construction of water channels and water storage facilities was also reported to be used in some areas. These culverts and artificial ponds allow water to flow away from homes and fields and into nearby locations for storage beyond the flood season. These projects are done both by hand and using heavy machinery. As with dykes, to build these by hand requires tools and food to support the considerable labour needed. Those constructed by heavy machinery are usually associated with a nearby road construction project, because the soil excavated from the storage facility and channels is then used to create the raised roadbed.

Early cultivation is another major adaptation technique used before floods arrive. Planting crops early ensures that the plants have reached harvest before floods destroy them. Unfortunately, as early rains become sparser, this has become increasingly difficult. Tilling the soil while it is still dry is nearly impossible, especially because most farmers use only a *maloda*, a small flat metal tool on the end of a staff. There are some programs in the area promoting ox ploughs, and some farmers are enjoying obvious success from both using ploughs and renting them to neighbouring farmers. However, multiple FGD participants spoke of traditional taboos against utilizing animal labour, which have limited the spread of this technology.

Improvements to homes and compounds is another category of activities, especially during the post-flood period. These include the reinforcement of household construction, and the raising and levelling of the compound platform. In the post-flood period, the primary housing reinforcement consists of strengthening walls and platform, as mud is readily available while the dried grass for roofs is not. Even a small plinth can significantly improve the flow of rainwater away from the houses. For families with more resources, the entire compound is raised a step or two above the surrounding land, with wood beam reinforcement and mud steps. Factors that limit the ability of families to resort to these techniques again revolve around a lack of tools and food for the necessary labour

Figure 22: Primary Currently Utilized DRRA, Pre- and Post-Flooding, for Householders



Narrative 9: Migration to Sudan as a Disaster Risk Reduction Activity

"This is a bad year. Most of the village has left for Sudan, especially mothers with children. They walk to the border, then try to find a ride on a lorry traveling deeper into the country. They are going to work in factories, fields and shops. It has never happened before that so many of our people have left."

-Elderly male, Northern Bahr el Ghazal, Aweil North County, Malual East Payam, Wath-Thok Boma, Makuac Rual Village

"This man has just said goodbye to his wife. She is walking to Khartoum with her child and another woman to look for work. You can seem them right there on the road, they are the ones with bundles on their heads." He is staying here with his other wife."

-Young male, describing a middle-aged male, Warrap, Gogrial East County, Toch East Payam, Maluth Village

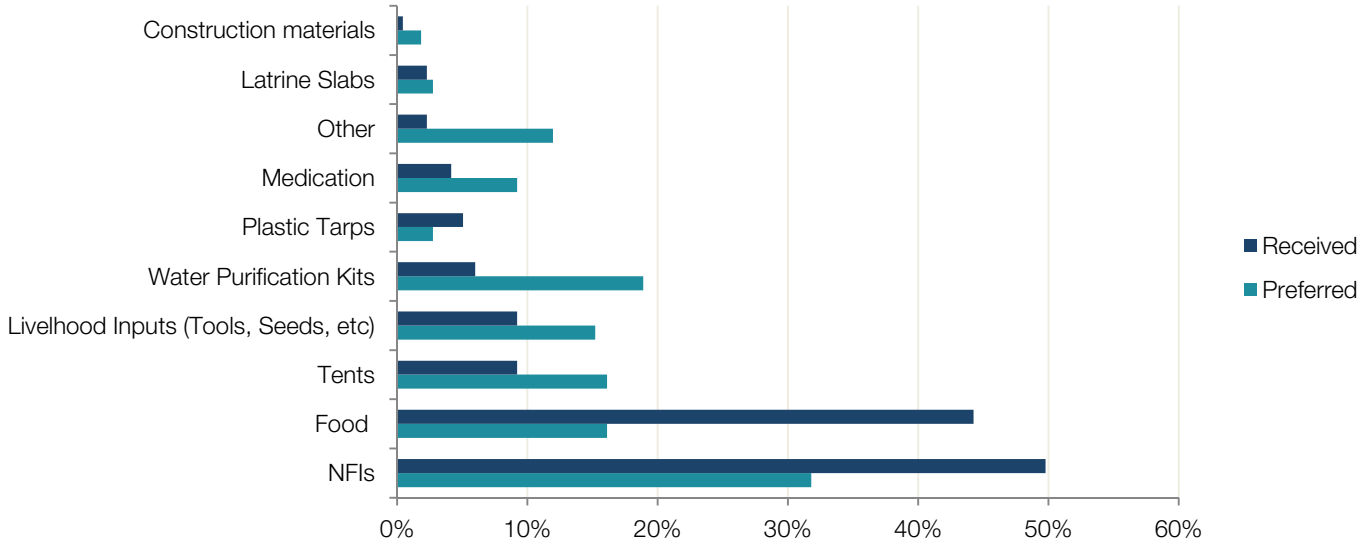
Since the start of 2016, over 80,000 residents from Greater Bahr el Ghazal have migrated to Sudan[8]. Most respondents reported that the Sudanese are welcoming and the job opportunities easy to obtain, though little or nothing is heard from those who have left. Migration is a traditional coping mechanism in the area: it is used annually to bring cattle to hospitable areas, and generationally to settle in areas with an appropriate balance of rain and dry land for the current climate. However, mass migration across an international border is potentially troublesome. It is not clearly known if the people who leave find the opportunities they seek, and reports are emerging that these people are ending up in refugee camps rather than in stable employment. Also, government authorities on both side of the border periodically halt crossings; if a shutdown were to be sustained, this potential escape for the hungry in these communities would be closed off.

[8] United Nations Office for the Coordination of Humanitarian Affairs. (2016). *Humanitarian Bulletin Sudan*. Issue 28. 4 July – 10 July. https://docs.unocha.org/sites/dms/Sudan/Reports/OCHA_Sudan_Weekly_Humanitarian_Bulletin_2016/OCHA_Sudan_Weekly_Humanitarian_Bulletin_Issue_28_(4_-_10_July_2016).pdf

External Assistance

Since the last flood, 13% of households reported having received some form of external assistance in the form of tangible items or construction materials. This came from a variety of actors, many of whom were unknown to the respondents. The best known organizations were reported to be the United Nations World Food Program and World Vision. The items most commonly received were food and NFIs such as blankets, clothing and mosquito nets. The items that these households would have been preferred to have received are diverse: only latrines and building materials were met with little interest by respondents.

Figure 23: Previously Received External Assistance



Narrative 10: Food as Fuel for Dyke Building

"Our grandfathers used to slaughter a bull to feed people when building a dyke. Now the cattle have been lost in war, so we can't build a good dyke."

-Middle-aged male, Northern Bahr el Ghazal, Aweil East County, Wunlang Payam, Tong-Goi Boma, Machar Kou Village

"Our grandfathers had food security, so they were strong and could build the dyke. Now we are hungry and weak, so we cannot."

-Elderly male, Warrap, Gogrial West County, Akon South Payam, Rup Boma, Belic Village

Respondents across the study area continuously repeat that their ability to protect themselves against floods and other hazards is limited by hunger. Most state that their know how to construct protective features, but that a lack of strength and tools makes it impossible to build one large enough to do any good.

Support with Disaster Risk Reduction Activities (DRRA)

People living in these flood-prone areas clearly expressed the desire for support on DRRA. With such a longstanding and precarious nutrition and security situation, they certainly could use assistance to better adapt to the changes in rain and flood patterns, either in the form of direct provision of goods, Food for Work/Food For Assets programs, or training programs.

Residents, community leaders and local authorities all advocated for assistance in the form of tools. Most people reported that they would also be happy to receive other non-food items such as mosquito nets and tents, but they also clearly understand that multi-use tools such as *malodas*, wheelbarrows and tractors would help them to build dykes and water channels, and help them cultivate earlier and more efficiently. There is also clear interest in supplies for fishing. Fishing line and hooks, as well as string for making nets would be a boon for both their nutrition and their income generating abilities.

Narrative 11: Lost Skills for Coping with Flooding

"We lost the skills of our grandfathers."

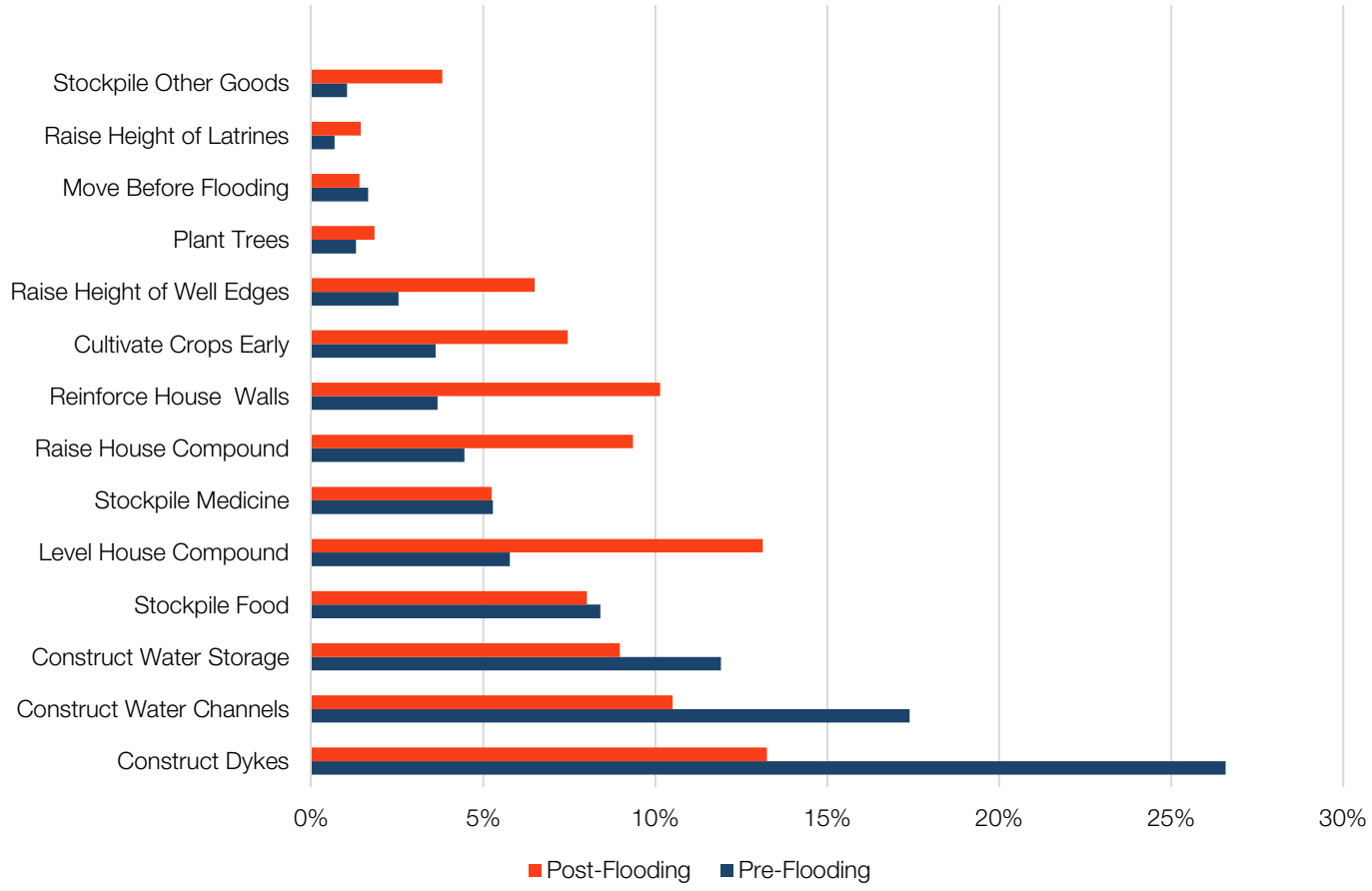
-Middle-aged male, Warrap, Twic County, Pannyok Payam, Mit Piny Village

Many village elders explained that they did not know how to do flood control work. They used to build dykes, but not anymore. Their grandparents were also able to cultivate more food in the dry season gardens; now their yields are too small to carry them through the hunger season.

Others explained how their grandfathers used to make boats and paddles from palm tree trunks, allowing them to travel more easily through the floods, but today they no longer know how to make them. While there are a still few boatmen in the area available for hire, they have to guard their paddle because it is so valuable to their trade and difficult to reproduce.

Respondents want to build infrastructure assets, such as dykes, water channels and water storage facilities so they do not have to be displaced by flooding. But in addition to lacking tools for building these themselves, many expressed that their hunger saps their strength for performing such arduous tasks. They seek food or money so that they can build these assets and be more physically prepared for the work of the next cultivation season.

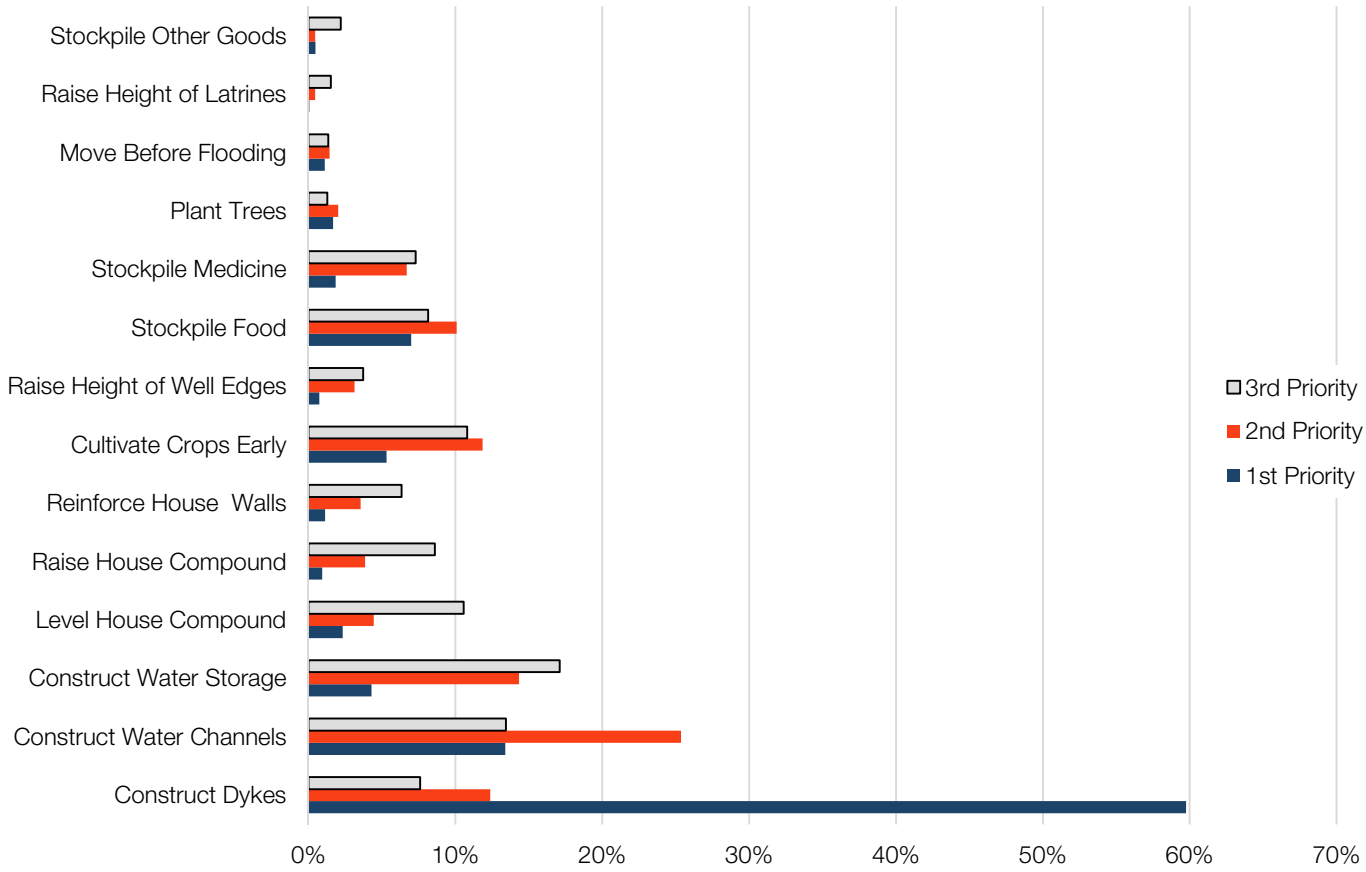
Figure 24: Preferred Pre-and Post-Flooding DRRA for Householders



A number of other DRRA garner attention from respondents. Stockpiles of medicines would be useful in the wet season, because travel to a pharmacy or medical care for the sick can be so tough during this time. Seeds would help support both dry season gardens and early cultivation. Hospitals and schools are often further from home then people would like. Local reforestation, though not a high ranking activity, would have very valuable long term impacts on climate change adaptation; in addition to simply planting trees, there may be opportunities for advocating to the Ministry of Education for a stronger forestry component in national curricula.

The months preceding the rainy season see the most DRRA activity in these villages. The activity that respondents are most interested in receiving support on during this time is clearly the construction of dykes, trailed by the construction of water channels and water storage facilities.

Figure 25: Top Three Preferred Pre-Flooding DRRA for Householders



Narrative 12: Consequences of Unfulfilled Assistance

"No work and less cultivation and drought has us really suffering now."

-Middle-aged male, Warrap, Gogrial East County, Toch East Payam, Maluth Village

Last year, the local government or an NGO announced to residents that the village would be getting a new road through a Food for Asset program. In response, residents cultivated less than normal, thinking they would have to leave their fields soon anyway to begin work on the roadway in exchange for food. But then it was announced that because this road was used primarily by locals, the residents needed to repair it for themselves, and that no food or other assistance would be provided for this work.

There are a few differences between the desires of householders and of community leaders. Community leaders are more interested in receiving support on stockpiling food, medicine and other goods than individual householders. This could indicate that they see a need for these items across their communities that individuals do not, or possibly that they see this as an opportunity for personal gain or political leverage if they are in charge of distributing such items.

For any of this potential assistance, it is critical to research and mitigate potential disruption to local markets that the provision of such assistance could create. Some tools and supplies are already available in marketplaces near these areas, so traders could be adversely affected if many tools or supplies are brought without foresight. It is also critical to ensure that short term projects do not distract residents from cultivation and other important long term endeavours.

After years of fragmented aid and development work, many villagers are extremely sceptical of external assistance. They expect broken promises and poor execution. Because most communities are desperate, they will still accept whatever is offered. But with an increase in stability and living conditions, villages will likely begin to demand improved service delivery.

Narrative 13: Pushback against Fragmented External Assistance

"The rain was very poor last year, so what should we do with no food? You take our information and pass it on, but what if it goes nowhere? We will die."

-Elderly male, Warrap, Gogrial West County, Kuac North County, Luk Luk Boma, Panreu Village

Near these houses, an NGO dug out a latrine pit, but never returned to build a toilet on top of the hole. Now it is killing goats and cows that fall in. We are welcome, they will answer our questions, but we are told NGOs never bring anything good, and they expect this will be the same.

"NGOs have diverted money that is for us. They do assessments, but provide no services. And a new program gave tools only to one payam, so now there is tensions with the others."

-Elderly male, Warrap, Tonj East County, Ananatak Payam, Akok Village

Many residents are reluctant to participate in assessments. There are clear arguments between village elders on whether or not to allow a community survey.

"Flooding is worse now because the new road blocks the flow of water. There are no drainage pipes, so the water builds up in the village."

-Executive Chief, Warrap, Gogrial West County, Gogrial Payam, Mandeng Boma, Mandeng Village

These villages, among others, complain of unintended consequences of external assistance that has been given to them.

Conclusion

The communities in low-lying areas of Northern Bahr el Ghazal and Warrap states have dealt with extreme weather and wide variations in climate for generations. Lengthy droughts, relentless heat, heavy rains, overflowing rivers, boggy soil and dust storms are standard features of the landscape. In addition, the area has seen persistent brutal conflict over the last 60 years. These conditions compound to create a society with only trace presence of modern civilization. Most families rely on subsistence farming and herding, and markets carry only basic goods.

Seasonal flooding is a consistent presence in the life of these villagers, supplying drinking water, supporting grass for cattle and bringing fish for food and sale, as well as causing damage to crops and livelihoods, and inhibiting access to basic services. Traditionally, the destructive effects of these floods have been addressed with semi-nomadic lifestyles, early planting techniques, and the construction of small dykes, raised tukuls and elevated housing compounds. But in the last few decades, as rains arrive later and come down harder, causing rivers to break their banks earlier, these coping mechanisms have not been adequate.

This is exacerbated by high levels of food insecurity, malnutrition, and lack of financial or livestock savings of households caused by years of war and economic crisis. Because of this deficit, families generally do not have the physical strength or capital to perform the physical tasks that may help them avoid the destructive effects of flooding, such as early soil tilling, building larger dykes and digging water channels and storage basins. Additionally, as the population increases in these areas, more families choose to settle in low-lying areas previously thought of as too wet for permanent dwelling.

Development and humanitarian assistance provides some support to these communities in the face of climate extremes. However, the most remote villages, which in many cases have the highest needs, are totally cut off for long periods of the year. Because they are so isolated, any outside aid for them must be proactive and supportive, rather than reactive and focused on relief, otherwise the aid will inevitably be delayed and ineffective.

On formation, the South Sudan BRACED consortium developed three multi-dimensional outputs that the project was expected to produce, in order to improve food security, livelihoods diversification and natural resources management. To achieve each of these below-listed outputs, the following recommendations should be incorporated into program activities:[10]

Output 1: "Enhance sustainable livelihoods through the introduction of climate smart technologies for agriculture, livestock, natural resources management and livelihoods diversification."

- Work within the context of indigenous problem solving and belief systems. Traditional social structures and coping mechanisms in the area are generally well adapted to maintaining local stability, and at adapting to extreme climatic conditions.[11] Programs should promote local coping strategies and should seek to avoid creating imbalances of voice and power which may lead to further vulnerability and conflict.

- Support easy migration. It is critical that programs, policies and infrastructure support residents' continued ability to live the semi-nomadic lifestyle historically seen in the area.[12] Without massive infrastructure projects to transform the flooding characteristics of the landscape, settlers in these areas will inevitably continue to face hydrological conditions that pose challenges to their daily lives. This migration is most obvious in the seasonal movements many people make with cattle. But it is also occurs over the course of generations. Successive dry years will continue to pull people to resettle in low-lying areas with sufficient grass for livestock and crops, while wet spells will push people to highlands with unsubmerged land for dwellings and animals.

[10] Output's adapted for length and legibility from *Annex 4a ConcernWWide South Sudan Concept Note - Revised 280214*
[11] Nyong, A. Adesina, F., Osman Elasha, B. (2007). The Value of Indigenous Knowledge in Climate Change Mitigation and Adaptation Strategies in the African Sahel. Mitigation and Adaptation Strategies for Global Change. 12:787-797. DOI 10.1007/s11027-007-9099-0 https://www.researchgate.net/profile/Anthony_Nyong/publication/46537001_The_value_of_indigenous_knowledge_in_climate_change_mitigation_and_adaptation_strategies_in_the_African_Sahel/links/55476f460cf26a7bf4d906e6.pdf
[12] Little, P. D., Mahmoud, H., Layne Coppock, D. (2000) When Deserts Flood: Risk Management and Climatic Processes among East African Pastoralists. Climate Research 19: 149-159. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.556.7326&rep=rep1&type=pdf

The ability to move back and forth between areas of varying opportunity supports income diversification and resilience to change. Policies should improve access to markets and pasture for nomadic people, and should also reduce the tendency towards large-scale settlements based on food aid and relief, which discourage herders from the mobility that enables them to survive climate extremes.

- **Avoid enabling development in land that will inevitably flood.** In 2015, the Government of South Sudan submitted a draft plan for participation in the United Nations Framework Convention on Climate Change, which included plans for creating buffer zones around flood-prone areas and relocating vulnerable communities.[13] Some flood-prone villages have been settled quite recently, with families arriving only a generation or two ago. Previously this land was considered unfit for human habitation by nearby communities, but drought, overpopulation and insecurity drove people to establish homes there.

  Before embarking on major infrastructure projects, serious consideration should go into deciding whether development should be supported in these areas at all. Some may flourish with the right combination of water control and economic development. But others may require dyke-building or related projects every few years because the land is so unsuitable for housing. Supporting development in these areas may induce in-migration that cannot be sustained without regular external assistance.

Output 2: "Identify hazards, mitigate risks and establish disaster information sharing and improve coping strategies. Form Disaster Management Committees preparing Disaster Preparedness Plans and locally adapted early warning systems for coping with disasters."

- **Coordinate between long-term local development projects.** Because this area has been one of the most stable in South Sudan in the last few years, it has been the focus of numerous development projects by the government, NGOs and private actors.[14] This area will likely continue to function as a pilot for how to transition from emergency relief to longer-term development. In order to create lasting change, it will be important to understand the full spectrum of needs in each settlement, and to have the interdisciplinary partnerships necessary to support a fully-functioning community.

- **Coordinate development programming with humanitarian emergency aid actors.** The severity and extent of food insecurity has increased to the point where General Food Distributions by the United Nations World Food Program have begun in some sections of the study area.[15] If these activities continue, they will distort the potential benefits of food for assets or food for work projects that might be considered. It is important that any potential projects account for this during planning and implementation.

Output 3: "Promote effective policy, planning and learning, particularly on investment in agro-pastoral communities, climate change adaptation, disaster preparedness and gender specific risks. Strengthen citizen participation in policy formulation and government planning at the county and state level through community conversations."

- **Coordinate with local government authorities.** In the process of strengthening local ability to grow food and develop livelihoods, it is important not to undermine the legitimate role of state actors.[16] The creation of the 28 states and their constituent jurisdictions of counties and payams, on top of local power struggles still lingering from the civil war, has infused instability into the authority and dependability of local government officials in the eyes of many residents. This is exacerbated by the severe financial shortfall currently faced by the government.

[13] Republic of South Sudan. (2015). Intended Nationally Determined Contribution (Draft).Submitted Towards the Requirements of the United Nations Framework Convention on Climate Change. Submitted 23 November 2015. http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx

[14] United Nations Food and Agriculture Organization (FAO) and World Food Program (WFP). (2014). Special Report: FAO/WFP Crop and Food Security Assessment Mission to South Sudan. http://www.fao.org/docrep/019/i3652e/i3652e.pdf

[15] United Nations Children's Emergency Fund (UNICEF). (2016). South Sudan Humanitarian Situation Report #82, 11-24 March 2016. http://www.unicef.org/appeals/files/UNICEF_South_Sudan_Humanitarian_SitRep_24_March_2016.pdf

[16] Peters, K. and Vivekananda, J. (2014). Topic Guide: Conflict, Climate and Environment. Evidence On Demand. DAI / IMC Worldwide Limited Joint Venture. http://dx.doi.org/10.12774/eod_tg.november2014.peterskandvivekanandaj

It is in the long-term interest of the South Sudanese people to have a stable government able to provide the basic services typically expected of a state. Large infrastructure projects and social service delivery should be developed in a manner that encourages this good governance and enables a robust civil society which can maintain it.

- Support peace. A strong civil society helps pastoral communities survive the challenges of a changing climate.[17] In the villages of Northern Bahr el Ghazal and Warrap, there is a tradition of community conversations long preceding the involvement of development and aid actors. Though it is important to open these conversations up to more members of the community, especially women, the framework for democratic self-governance and resilience-building is already largely in place. Unfortunately, lingering insecurity disrupts this system and its communication channels to government authorities, stalling the development it fosters. The achievement of a lasting cessation to conflict would have dramatic benefits for the promotion of capacity building, citizen participation and overall resilience.

Drought, storms and floods will continue to shape the landscape and lives in Northern Bahr el Ghazal and Warrap states. Traditional coping mechanisms are vital for the continued functioning of these settlements despite these events. However, the added pressure of persistent conflict, dysfunctional economic markets and food insecurity mean these local skills likely will not be able to handle the increasingly extreme weather induced by climate change. Already, people are really suffering, due to high levels of hunger, disease and displacement. Though these hardships are great, these communities are also able to maintain a laudable level of stability considering the circumstances; it is critical that any outside support only bolsters this stability, rather than undermines it.

[17] Kirkbride, M., Grahn, R. (2008) Survival of the Fittest: Pastoralism and Climate Change in East Africa. Oxfam Briefing Paper #116. Oxfam International. http://www.oxfam.org.hk/content/98/content_3534tc.pdf

Annexes

Annex 1: Terms of Reference

Terms of Reference
Flood mapping specialist
"Flood Vulnerability Mapping for Flood Prone River Catchment Areas in Northern Bahr el Ghazal and Warrap States"

Executive summary

Donor:	Department for International Development (DFID)
Project title:	Flood Vulnerability Mapping for Flood Prone River Catchments in Northern Bahr el Ghazal and Warrap States
Project duration:	5 working months (November 2015 – March 2016).
Project locations:	Flood Prone River Catchments in Northern Bahr el-Ghazal & Warrap States of South Sudan
Main objective:	To contribute to the body of knowledge created by the BRACED consortium on climate change vulnerability, adaptation, mitigation and resilience in flood prone river catchment areas in Northern Bahr el Ghazal and Warrap States, South Sudan.
Specific objective:	To expand on existing consortium research pertaining to environmental analysis and provide critical information regarding the location of flood prone areas, changes in duration and intensity of flooding over the past 20 years, population vulnerability to flood hazards, and actionable mitigation recommendations for an estimated 100,000 flood prone households to local actors, the Government of South Sudan and the humanitarian community
Expected outputs:	Actionable report detailing: Current, historic trends and expected climactic conditions Locations of areas and populations vulnerable to flooding Impact of flooding on the lives and livelihoods of inhabitants of the study area Mitigation techniques currently used by communities Specific settlements where community defenses may need strengthening Suggestions for location-specific mitigation strategies Maps of each state showing probability of inundation and flood extents, roads, villages and other critical thematic indicators Map q of BRACED programme implementation locations Open-access web map showing likelihood of inundation and flood extent, roads, villages and other critical thematic indicators A suite of open source tools, methodology and indicators related to flood vulnerability mapping and modeling
Methodology:	Undertake secondary (data review to establish an understanding of current, historic and expected climactic conditions in the study area Analyze remotely-sensed data to map flood duration/ extent change over time (~20 years) and identify populations vulnerable to flood

	Conduct field research to triangulate vulnerability, understand impact of floods on livelihoods, assess local mitigation strategies and identify potential Disaster Risk Reduction activities in study areas using quantitative data collection tools (mobile phones equipped with ODK), focus group discussions and direct observation
Expected completion date: (Final report)	March, 2016

Background to the Project

The UK Department for International Development's (DFID) BRACED fund is expected to directly benefit up to 5 million vulnerable people, especially women and children, in developing countries by helping them become more resilient to climate extremes. In addition, through improved policies and institutions at the national level and better integration of disaster risk reduction (DRR), climate adaptation and development programs, the program is expected to reach and help many millions more.

BRACED is designed as a two phase program. In its first four year phase from August 2013 DFID will provide up to GBP 140 million from the UK's International Climate Fund (ICF). This will be used to scale interventions in up to 15 countries and to build the evidence on how to do this at scale to influence policy and institutional changes, and build regional and national capacity to respond to climate related disasters. This will be achieved through grants to, among others, NGOs and their partners. In part to research, evaluate and build the evidence on what works on adaptation and DRR.

Figure 1. BRACED flood vulnerability mapping will target flood prone catchments in the NBEG and Warrap States

In South Sudan, as part of a consortium, ACTED has been chosen to work to build the resilience of pastoralists and agro-pastoralists through its BRACED project through the use of APFSs[18] and assorted interventions including income generating activities, establishment of VSLAs, strengthening of the input sector and state level resiliency planning.

This project targets pastoralists and agro-pastoralists in all counties of Warrap and Northern Bahr el Ghazal States (see Figure 1 above). These states were chosen because significant populations are exposed to flood hazards and they are both relatively secure and accessible. A flood vulnerability mapping and modelling study of communities in the target states, carried out during the formative phase of the program, will contribute to a consortium-wide deepening of understanding of historic, current and expected future climactic conditions in the study area, the location flood prone areas, changes in duration and intensity of flooding over the past 20 years, population vulnerability to flood hazards, and mitigation strategies.

The Sudd Institute's Assessment of Policy and Institutional Responses to Climate Change and Environmental Disaster Risks in South Sudan (March 2015) indicates that rainfall in South Sudan has decreased by 10-20%, average annual temperatures have increased by more than 1C in the last 40 years, formerly stable annual rainfall patterns have become erratic, and the frequency of both droughts and floods have increased and become more severe. South Sudanese living in Northern Bahr el Ghazal and Warrap are accustomed to intra-annual variations in rainfall and have adapted and timed their livelihood strategies over generations to match the ebb and flow of floods. The disruption of these patterns by unexpected and unpredictable inter-annual climactic variability, caused by the larger global trend of anthropogenic climate change, has exacerbated vulnerability to shocks caused by the increasingly random 'natural' occurrences.

Disruption of expected weather patterns, coupled with widespread violence and instability stemming from the ongoing conflict begun in December 2011 and a rapidly worsening economic situation, compounds the difficulties agro-pastoralists in Northern Bahr el Ghazal and Warrap State face in securing food and engaging in durable and productive livelihoods. Recognizing this, ACTED, through the REACH Initiative, undertook a comprehensive flood vulnerability mapping and assessment in December 2013, which aimed to strengthen coordination between aid actors during flood emergency response and develop a disaster risk reduction strategy for Warrap State.[19] This report found that both severity and frequency of flooding increased in surveyed communities between 2008 and 2012, and that dyke construction as a preparedness strategy was strongly related to decreased levels of flood-related displacement.

Further immediate research is required to create a deeper understanding of how changing climatic conditions are impacting peoples' lives and livelihoods across the flood plains of Northern Bahr el Ghazal and Warrap States. Governments at all levels, local actors and the humanitarian community must clear understand what inhabitants of these areas are doing to fight back against rising floods and deepening droughts, and where support may be needed to help shore-up community defenses to lessen the impact of what appear to be inevitable occurrences.

Objectives of the Research

Products from this project will contribute to the body of knowledge created by the BRACED consortium on climate change vulnerability, adaptation, mitigation and resilience in Northern Bahr el Ghazal and Warrap States, South Sudan. Using methodology adapted from the REACH Initiative's 2013 assessment of Warrap State, ACTED will undertake a detailed analysis of historic flood extent data derived from remotely sensed images, assessment of long-term weather patterns and predictions, desktop review of location-appropriate climate change literature.

[18] An Agro Pastoralist Field School (APFS), also known as "a school without walls", is a community managed learning experimentation, extension and adaptation platform where groups of pastoralists systematically discuss about their social, economic and ecological issues on a regular basis.
[19] "Flood Vulnerability and Contingency Plan; Warrap State, South Sudan Mapping and Assessment Report, December 2013" accessible at http://www.reachresourcecentre.info/system/files/resource-documents/lea.macias-11042014-095746-SSD_Flood%20Vulnerability%20and%20Contingency%20Plan_FinalReport_9April.pdf

The secondary data review will complement primary data collection in the form of an evaluation of flood-prone villages which will include focus group discussions and direct observation of current flood mitigation techniques. These two components will form the core of a critical flood vulnerability knowledge product that will be easily accessible through a detailed written report, static maps and an online mapping tool. These products will be directly disseminated to over 500 users in more than 50 domestic and international organizations.

This project will fill existing information gaps - such as where vulnerable communities are located, how flood duration, intensity and timing have changed over time, and how communities and individuals are acting to mitigate the worst effects of flooding creating actionable knowledge related to an estimated 100,000 households in flood prone areas. Overall, it provides a user-friendly, robust and extensible lens through which to understand changes in seasonal flood patterns and community vulnerabilities, as well as what actions may need to be taken to reduce these vulnerabilities in flood prone river catchments in Northern Bahr el Ghazal and Warrap States.

IMPACT - a Swiss NGO and member of the ACTED Group - will undertake these activities on behalf of ACTED. All communication with IMPACT is the responsibility of ACTED. ACTED will provide oversight of IMPACT's involvement, ensuring full compliance by IMPACT with the terms of the Grant Agreement between Concern Worldwide (UK) and ACTED. In particular, the copyright and all other intellectual and proprietary rights in any material produced in the course of the project specified herein will be the property of Concern Worldwide. (Reference: Clause 16 Sub Grant Agreement signed between ACTED and Concern Worldwide (UK); Grantee Reference Nos. B17).

To achieve the objectives of this tender, the project timeline shall be moved forward to begin as soon as possible. Data collection teams must be in the field and assessing areas as soon as seasonal floods have receded and study areas have become accessible. This will allow for the collection of information that is recent in interviewee's memories. Further, outputs of this project will be invaluable to informing successful implementation of other aspects of the BRACED programme, as well as unrelated humanitarian programming. These products need to be produced as soon as possible to support the greater goals of BRACED.

Project Activities

Result 1: Establish an understanding of current, historic and expected climactic conditions Northern Bahr el Ghazal and Warrap States

1.1. **Secondary data review (SDR)** on the past, present and expected climate-change related variations in flooding in flood prone river catchments in Northern Bahr el Ghazal and Warrap States area over a one month period.

- Data should be sourced from the Reach Initiative's "Flood Vulnerability and Contingency Plan"; local governments, universities, and other institutions; internet and other published reference materials; and, local and international NGOs and aid organizations. Particular attention will be paid to the findings of the IPCC5.
- The information produced and gaps identified will be used to provide context for the evaluation, establish an analytic framework to be used in following phases of the investigation, and inform primary data collection tool creation and methodology

1.2 **Remote Sensing analysis and review.**

- It should include moderate resolution inundation extent and likelihood mapping will be accomplished using analysis of MODIS or Landsat images spanning an approximately 20 year period (~1995 – present). Inundation maps will be used to determine flood-vulnerable villages in flood prone river catchments of Northern Bahr el Ghazal and Warrap States; these will be targeted for evaluation during primary data collection
- Analysis methodology will be adapted from, and strongly informed by, lessons learned by ACTED during the 2013 flood vulnerability assessment of Warrap State

1.3 **Set up of a consortium online web platform to visualize SDR and remote sensing findings.**

- All knowledge created from this component should be available on a lightweight, openly accessible web platform that allows users to identify flood-prone areas and populations, understand where access may be an issue throughout the year due to floods, and plan their relief, recovery, mitigation and development activities accordingly

- Web mapping tool will be branded as a BRACED Consortium product and will reside with a yet to be determined local institution

Result 2: Conduct field research to triangulate vulnerability, understand impact of floods on livelihoods, assess local mitigation strategies and identify potential Disaster Risk Reduction activities in study areas

2.1 Primary data collection.

- Field data collection should fill information gaps identified through the analysis of the secondary data sources outlined above. It will focus on flood prone river catchments in Northern Bahr el Ghazal and Warrap States, as identified via remote sensing
- Areas identified as potentially flood-prone through secondary data review should be triangulated against information from community leaders and local authorities and be included in evaluation as needed
- Mobile data collection tools should be used to administer community focus group discussions, and capture direct observations; Most Significant Change technique will be used to capture a more nuanced and personal understanding of flood impact
- Methodology and tools should be based on those used by the REACH Initiative during the 2013 flood vulnerability assessment of Warrap State; they will be further adapted with the input of BRACED Consortium members based on the indicators they feel are important to measure and build a comprehensive picture of flood vulnerabilities in the target communities; tools will consist of a community focus group discussion form, a direct observation tool, and a most significant change story facilitation tool
- Data should be collected over an eight week period
- At minimum, a representative sample (95% confidence, 5% margin of error) of potentially flood-prone villages should be assessed in each county of Northern Bahr el Ghazal and Warrap States
- Based on the 2013 flood vulnerability assessment of Warrap State, an estimated 212 bomas will be evaluated across Northern Bahr el Ghazal and Warrap States; the precise number cannot be determined until completion of remote sensing analysis
- Research will establish an understanding of exposure and vulnerability of populations in flood prone areas, if/ how changing drought/ flood cycles have impacted them, what they are doing to insulate themselves from the negative effects of these changes, and where they may need outside assistance to defend their lives and livelihoods

Result 3: A final set of products synthesizing above three components is produce and disseminated as well as project documentation is catalogued and preserved for future reference

1.1 Drafting of a final report (30-50 pages) documenting the findings of all three components of the research will be written. Report will be branded as a BRACED Consortium product

- The report will develop an in-depth understanding of, and connections between (where possible), past, present and future climactic conditions of the study area, changes in flood duration and extents, community vulnerabilities related to flood patterns, their current mitigation strategies, and potential disaster risk reduction strategies in flood prone river catchments of Northern Bahr el Ghazal and Warrap States
- The final report will include annexes with all research tools employed during data collection
- The final report will include a lessons learnt section 3-5 pages in length which highlights the challenges with implementing research in the field, obstacles encountered and how the research team attempted to or did overcome them
- 1 to 2 weeks before submission of the final report, the researcher shall provide the BRACED Consortium with a comprehensive draft report for review and comments.
- Any feedback and comments should then be taken into account before the report is finalized

1.2 Production of an A0-sized map showing inundation likelihood and vulnerable communities should be produced for flood prone river catchments of Northern Bahr el Ghazal and Warrap States (one map per state). Maps will be branded as a BRACED Consortium product and be available in softcopy.

1.3 Production of an A2-sized map showing locations of BRACED programme implementation.

1.4 Research documentation. All assessments, project documents, data sets, tool and methodology are stored, organized, preserved and handed over to BRACED Consortium at the completion of the project; this web mapping tool will be housed with a yet to be determined local institution. All spatial data and maps will be handed over in a native ArcGIS format.

Timeline:

Activities		Nov		December				January				February				March				April	
		3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
Secondary data																					
Collect data from partners																					
Complete desktop review																					
Remote sensing																					
Data acquisition																					
Data processing + analysis																					
Primary data / Assessment																					
Preparation	Development of tools																				
	Identification of target assessment sites																				
	Recruit field teams																				
	Training of field teams																				
Data Collection	Conduct pilot phase																				
	Data collection in the field																				
Analysis / Assessment finding																					
Data Analysis	Data Cleaning																				
	Data analysis																				
	Flood Vulnerability mapping																				
Report of findings	Complete reporting																				
	Presentation of findings to Consortium																				
	Web Map portal creation																				

Annex 2: Household Questionnaire

We are working on behalf of the BRACED Consortium, conducting interviews to understand the impact of floods on people and places in Northern Bahr el Ghazal and Warrap. We would like to ask you some questions to find out what life is like here. Any information you provide will not be able to be used to identify you. Reponses are voluntary and you can choose to stop the interview, or not answer questions, at any time. However, we hope you will participate since your views are important to understanding problems related to flooding in the area. Do you have any questions? May we begin now?
Location - 8m accuracy *or a smaller number!
A1: Enter Enumerator ID No.
Introduction
Location
What state is the interview taking place in?
What county is the interview taking place in?
What payam is the interview taking place in?
What is the name of the payam
What is the name of the village/ location the interview is taking place in?
Population
How many people live in the household?
Household Members
MALE
Male **0-4** years old?
Male **5-17** years old?
Male **18-59** years old?
Male **60** years or **more**?
FEMALE
Female **0-4** years old?
Female **5-17** years old?
Female **18-59** years old?
Female **60** years or **more**?
HH Members calculation
Study History
Has your household EVER been surveyed in relation to flood vulnerability?
Do you remember what organization did that study?
What was the name of that organization?
Do you remember the year that study was conducted?
What year was that study?
Flood History
Flooding by Year
IN THIS LOCATION ONLY In which of the following years areas near your compound flood?
Flooding in 2015
During which months was the area around your compound flooded in 2015?
Did your shelter flood during 2015?
How long was your shelter flooded for
Where did you and your household members live when your shelter was flooded?
What other place did your household members stay?
During which months were household members FORCED to stay outside of your home because of flooding?
Was your shelter damaged or destroyed during the floods?
How badly?

How much of the damage were you able to repair?
Did you rebuild your shelter in the same location?
Why did you rebuild in the same location

Flooding in 2014

During which months was the area around your compound flooded in 2014?
Did your shelter flood during 2014?
How long was your shelter flooded for?
Where did you and your household members live when your shelter was flooded?
What other place did your household members stay?
During which months were household members FORCED to stay outside of your home because of flooding?
Was your shelter damaged or destroyed during the floods?
How badly?
How much of the damage were you able to repair?
Did you rebuild your shelter in the same location?
Why did you rebuild in the same location

Flooding in 2013

During which months was the area around your compound flooded in 2013?
Did your shelter flood during 2013?
How long was your shelter flooded for?
Where did you and your household members live when your shelter was flooded?
What other place did your household members stay?
During which months were household members FORCED to stay outside of your home because of flooding?
Was your shelter damaged or destroyed during the floods?
How badly?
How much of the damage were you able to repair?
Did you rebuild your shelter in the same location?
Why did you rebuild in the same location

Flooding in 2012

During which months was the area around your compound flooded in 2012?
Did your shelter flood during 2012?
How long was your shelter flooded for?
Where did you and your household members live when your shelter was flooded?
What other place did your household members stay?
During which months were household members FORCED to stay outside of your home because of flooding?
Was your shelter damaged or destroyed during the floods?
How badly?
How much of the damage were you able to repair?
Did you rebuild your shelter in the same location?
Why did you rebuild in the same location

Flooding in 2011

During which months was the area around your compound flooded in 2011?
Did your shelter flood during 2011?
How long was your shelter flooded for?
Where did you and your household members live when your shelter was flooded?
What other place did your household members stay?
During which months were household members FORCED to stay outside of your home because of flooding?
Was your shelter damaged or destroyed during the floods?
How badly?
How much of the damage were you able to repair?
Did you rebuild your shelter in the same location?

Why did you rebuild in the same location

Flood Impact

Livelihoods

What is your household's MAIN INCOME SOURCE during DRY SEASON?

What is your household's SECOND INCOME SOURCE during DRY SEASON?

What is your household's THIRD INCOME SOURCE during DRY SEASON?

What is your household's MAIN INCOME SOURCE during WET SEASON?

What is your household's SECOND INCOME SOURCE during WET SEASON?

What is your household's THIRD INCOME SOURCE during WET SEASON?

Flood Livelihoods

What is your household's MAIN INCOME SOURCE when the village is flooded?

What is your household's SECOND INCOME SOURCE when the village is flooded?

What is your household's THIRD INCOME SOURCE when the village is flooded?

What is the MOST COMMON impact of flooding on the livelihoods/ income generating activities of your household?

Education

Do your children attend school

Did flooding in the LAST 12 MONTHS make it impossible for your children to access the primary school?

Which months was the primary school NOT accessible during the LAST 12 MONTHS as a direct result of flooding?

Did flooding in the LAST 12 MONTHS make it impossible for your children to access the secondary school?

Which months was the secondary school NOT accessible during the LAST 12 MONTHS as a direct result of flooding?

Ranked Impacts

You will now be asked to rank the three most important impacts of flooding on your household. You may choose each answer only once.

What is the most important negative impact of flooding in the household?

What is the second most important negative impact of flooding in the household?

What is the third most important negative impact of flooding in the household?

Are there any positive impacts of flooding in your household?

What is the most important positive impact of flooding in the household?

Disaster Risk Reduction Activities

You will now be asked to rank the three most important activities taken by your household BEFORE FLOODING to reduce its impact

BEFORE THE FLOOD What is the most effective action taken by your household to reduce the impact of flooding?

BEFORE THE FLOOD What is the second most effective action taken by your household to reduce the impact of flooding?

BEFORE THE FLOOD What is the third most effective action taken by your household to reduce the impact of flooding?

BEFORE THE FLOOD Are there any other critical actions THAT WERE NOT LISTED that your household takes to reduce the impact of flooding?

You will now be asked to rank the three most important activities taken by your household AFTER FLOODING to recover

AFTER THE FLOOD What is the most effective action taken by your household to recover from flooding?

AFTER THE FLOOD What is the second most effective action taken by your household to recover from flooding?

AFTER THE FLOOD What is the third most effective action taken by your household to recover from flooding?

AFTER THE FLOOD Are there any other critical actions THAT WERE NOT LISTED that your household takes to reduce the impact of flooding?

External Assistance

Did your household receive any emergency assistance after the last flood?

Name of the Agency

What kind of items were received?
What other items were received?
Would any other items have been preferred INSTEAD?
What other items would have been preferred?
Think about when the flood was at its worst, how long after that time did the community receive support?
You will now be asked to rank the three most important types of support your household needs BEFORE FLOODING to reduce its impact
BEFORE THE FLOODS What is the most important type of support your household needs to reduce the negative impact of floods?
BEOFRE THE FLOODS What is the second most important type of support your household needs to reduce the negative impact of floods?
BEFORE THE FLOODS What is the third most important type of support your household needs to reduce the negative impact of floods?
BEFORE THE FLOODS Are there any other important types of support your household needs to reduce the negative impact of floods?
You will now be asked to rank the three most important types of support your household needs AFTER FLOODING to reduce its impact
AFTER THE FLOODS What is the most important type of support your household needs to reduce the negative impact of floods?
AFTER THE FLOODS What is the second most important type of support your household needs to reduce the negative impact of floods?
AFTER THE FLOODS What is the third most important type of support your household needs to reduce the negative impact of floods?
AFTER THE FLOODS Are there any other important types of support your household needs to reduce the negative impact of floods?
Anything Else
Is there anything else you would like to tell us?
Final note
Thank you for taking the time to participate in the survey.

Annex 3: Community Questionnaire

We are working on behalf of the BRACED Consortium, conducting Focus Group discussions to understand the impact of floods on people and places in NBeG and Warrap State. We would like to ask you some questions to find out what life is like here. Any information you provide will not be able to be used to identify you. Reponses are voluntary and you can choose to stop the interview, or not answer questions, at any time. However, we hope you will participate since your views are important to understanding problems related to flooding in the area. Do you have any questions? May we begin now?
Introduction
Enter Enumerator ID No.
Enter the number of men participating in the focus group
Enter the number of women participating in the focus group
Total participants in the Community Discussion
The total number of people participating in the Community Discussion is x. Is that correct?
Location
What state is the survey taking place in?
What county is the survey taking place in?
What payam is the survey taking place in?
What is the name of the payam?
What is the name of the village/ location the survey is taking place in?
Village Demography
What is the total population of the village?
How many households are in the village?
How many returnees (individuals, not hh) have come back to the village in the last 12 months?
How many IDPs have arrived in the village in the last 12 months
How many shelters does a household compound typically have
Flood History
In what month did the rainy season start last year?
In what month did the rainy season end last year?
Flooding by Year
In which of the following years did the village flood
Flooding in 2015
What proportion of the village flood in 2015?
During which months was the village flooded in 2015
Flooding in 2014
What proportion of the village flood in 2014?
During which months was the village flooded in 2014?
Flooding in 2013
What proportion of the village flood in 2013?
During which months was the village flooded in 2013?
Flooding in 2012
What proportion of the village flood in 2012?
During which months was the village flooded in 2012?
Flooding in 2011
What proportion of the village flood in 2011?
During which months was the village flooded in 2011?

Flood Impact
Health Services
For the NEAREST Primary Health Care Unit:
What is the most common mode of transport to reach the NEAREST Primary Health Care Unit?
How long does it normally take to reach it with this transport mode?
What is the most common mode of transports to reach the NEAREST Primary Health Care Unit DURING A FLOOD?
How long does it normally take to reach it with this transport mode DURING A FLOOD?
Which months was the health care unit NOT accessible during the LAST 12 MONTHS as a direct result of flooding?
For the NEAREST Primary Health Care Center:
What is the most common mode of transport to reach the NEAREST Primary Health Care Center?
How long does it normally take to reach it with this transport mode?
What is the most common mode of transports to reach the NEAREST Primary Health Care Center DURING A FLOOD?
How long does it normally take to reach it with this transport mode DURING A FLOOD?
Which months was the Primary Health Care Cetre NOT accessible during the LAST 12 MONTHS as a direct result of flooding?
For the NEAREST Hospital:
What is the most common mode of transport to reach the NEAREST Hospital?
How long does it normally take to reach it with this transport mode?
What is the most common mode of transports to reach the NEAREST Hospital DURING A FLOOD?
How long does it normally take to reach it with this transport mode DURING A FLOOD?
Which months was the Hospital NOT accessible during the LAST 12 MONTHS as a direct result of flooding?
WASH
What is NORMAL MAIN SOURCE of drinking water for the community?
HOW LONG does it take to go there, get water and come back?
Does the MAIN SOURCE of drinking water for the community change when there is a flood?
What is the MAIN SOURCE of drinking water during a flood?
HOW LONG does it take to go there, get water and come back?
What type of toilet facility is MOST COMMONLY used by the community during dry season?
What type of toilet facility is MOST COMMONLY used by the community DURING A FLOOD?
Martkets and Livelihoods
For the NEAREST small market:
What is the most common mode of transports to reach the NEAREST small market?
How long does it take to reach the nearest small market with this transport mode?
What is the most common mode of transports to reach the NEAREST small market DURING A FLOOD?
How long does it take to reach the nearest small market with this transport mode DURING A FLOOD?
Which months was the small market NOT accessible during the LAST 12 MONTHS as a direct result of flooding?
Are there shortages of normally available goods at the market DURING A FLOOD?
What goods?
For the NEAREST large market:
What is the most common mode of transports to reach the NEAREST large market?
How long does it take to reach the nearest large market with this transport mode?
What is the most common mode of transports to reach the NEAREST large market DURING A FLOOD?
How long does it take to reach the nearest large market with this transport mode DURING A FLOOD?
Which months was the large market NOT accessible during the LAST 12 MONTHS as a direct result of flooding?
Are there shortages of goods at the market DURING A FLOOD?
What goods?

For the NEAREST local shops or kiosks:

What is the most common mode of transports to reach the NEAREST local shops or kiosks?

How long does it take to reach the nearest local shops or kiosks with this transport mode?

What is the most common mode of transports to reach the NEAREST local shops or kiosks DURING A FLOOD?

How long does it take to reach the nearest local shops or kiosks with this transport mode DURING A FLOOD?

Which months were the local shops or kiosks NOT accessible during the LAST 12 MONTHS as a direct result of flooding?

Are there shortages of goods at the market DURING A FLOOD?

What goods?

Livelihoods

What is the MOST COMMON impact of flooding on the livelihoods/ income generating activities of village residents?

Education

For the primary school used by MOST of the village

What is the most common mode of transport used to reach the primary school

How long does it take to reach the primary school with this transport mode?

What is the most common mode of transport used to reach the primary school during a flood

How long does it take to reach the primary school with this transport mode DURING A FLOOD?

Did flooding in the LAST 12 MONTHS make it impossible to access the primary school?

Which months was the primary school NOT accessible during the LAST 12 MONTHS as a direct result of flooding?

Was a temporary school set up during the time the primary school was not accessible?

For the secondary school used by MOST of the village

What is the most common mode of transport used to reach the secondary school

How long does it take to reach the secondary school with this transport mode?

What is the most common mode of transport used to reach the secondary school during a flood

How long does it take to reach the secondary school with this transport mode DURING A FLOOD?

Did flooding in the LAST 12 MONTHS make it impossible to access the primary school?

Which months was the secondary school NOT accessible during the LAST 12 MONTHS as a direct result of flooding?

Was a temporary school set up during the time the secondary school was not accessible?

Infrastructure

Access to Payam centre

Could you reach a Payam centre from this village by road (with vehicles) at some point during the last 12 months?

Could you reach the Payam centre by road (vehicles) at all times during the last 12 months?

During which months could you not reach the Payam centre by road (vehicles)?

For the NEAREST Telephone tower (e.g. MTN, Viva, Zain):

How long does it normally take to reach the tower?

How long does it take to reach the tower DURING A FLOOD?

Does the network stop working, of work less frequently, DURING A FLOOD?

Infrastructure Damage

Were any roads damaged in the last 12 months as a direct result of flooding?

Are they still damaged or have they been repaired?

Did any roads repaired from PREVIOUS (2011-2014) years' flood damage survived undamaged in the last floods?

Are there any bridges in the area that are necessary to access the village by road?

Were any bridges damaged in the last 12 months as a direct result of flooding?

Are they still damaged or have they been repaired?

Did any bridges repaired from PREVIOUS (2011-2014) years' flood damage survived undamaged in the last floods?

Shelter
Are there houses raised above the ground level in the village?
What percentage of shelters (where people sleep) were uninhabitable during the last flood?
What percentage of SHELTERS were COMPLETELY destroyed by the last flood?
What percentage of SHELTERS that were COMPLETELY destroyed by the last flood - were NOT RECONSTRUCTED?
During which months do people typically strengthen their shelters?
During which months do people typically repair their shelters?
During which months do people typically reconstruct their shelters?
Do prices of shelter building materials go up during the rainy season?
Do prices of shelter building materials go up during a flood?
Do prices of shelter building materials go up after a flood?
Displacement
What percentage of ALL HOUSEHOLDS IN THE VILLAGE were living in the open air for MORE THAN ONE MONTH because there shelters were damaged by the last flood?
What percentage of ALL HOUSEHOLDS IN THE VILLAGE were living with relatives FOR MORE THAN ONE MONTH because there shelters were damaged by the last flood?
What percentage of ALL HOUSEHOLDS IN THE VILLAGE were renting accommodation FOR MORE THAN ONE MONTH because their shelters were damaged by the last flood?
What percentage of ALL HOUSEHOLDS IN THE VILLAGE moved away from the Boma for more than 2 MONTHS because of damage caused by the MOST RECENT flood?
Among these HOUSEHOLDS how many moved back?
What percentage of HOUSEHOLDS moved away from the Boma for more than 2 MONTHS after floods in 2014?
Among these HOUSEHOLDS how many moved back?
Ranked Impacts
You will now be asked to rank the three most important impacts of flooding on the community. You may choose each answer only once.
What is the most important negative impact of flooding in the village?
What is the second most important negative impact of flooding in the village?
What is the third most important negative impact of flooding in the village?
Are there any positive impacts of flooding in you village?
What is the most important positive impact of flooding in the village?
Disaster Risk Reduction Activities
You will now be asked to rank the three most important activities taken by the community BEFORE FLOODING to reduce its impact
BEFORE THE FLOOD What is the most effective action taken by the community to reduce the impact of flooding?
BEFORE THE FLOOD What is the second most effective action taken by the community to reduce the impact of flooding?
BEFORE THE FLOOD What is the third most effective action taken by the community to reduce the impact of flooding?
BEFORE THE FLOOD Are there any other critical actions THAT WERE NOT LISTED that the community takes to reduce the impact of flooding?
You will now be asked to rank the three most important activities taken by the community AFTER FLOODING to recover
AFTER THE FLOOD What is the most effective action taken by the community to recover from flooding?
AFTER THE FLOOD What is the second most effective action taken by the community to recover from flooding?
AFTER THE FLOOD What is the third most effective action taken by the community to recover from flooding?
AFTER THE FLOOD Are there any other critical actions THAT WERE NOT LISTED that the community takes to reduce the impact of flooding?
External Assistance
Did the community receive any emergency assistance after the last flood?
Name of the Agency
What kind of items were received?

What other items were received?

Would any other items have been preferred INSTEAD?

What other items would have been preferred?

Think about when the flood was at its worst, how long after that time did the community receive support?

You will now be asked to rank the three most important types of support your community needs BEFORE FLOODING to reduce its impact

BEFORE THE FLOODS What is the most important type of support your village needs to reduce the negative impact of floods?

BEOFRE THE FLOODS What is the second most important type of support your village needs to reduce the negative impact of floods?

BEFORE THE FLOODS What is the third most important type of support your village needs to reduce the negative impact of floods?

BEFORE THE FLOODS Are there any other important types of support your village needs to reduce the negative impact of floods?

You will now be asked to rank the three most important types of support your community needs AFTER FLOODING to reduce its impact

AFTER THE FLOODS What is the most important type of support your village needs to reduce the negative impact of floods?

AFTER THE FLOODS What is the second most important type of support your village needs to reduce the negative impact of floods?

AFTER THE FLOODS What is the third most important type of support your village needs to reduce the negative impact of floods?

AFTER THE FLOODS Are there any other important types of support your village needs to reduce the negative impact of floods?

Anything Else

Is there anything else you would like to tell us?

Final note

Thank you for taking the time to participate in the survey.

Annex 4: Focus Group Discussion Tool

South Sudan – BRACED FLOOD MAPPING

FGD Questioning Route

08.03.2016

Moderator Name: Assistant Moderator Name:

Focus Group Location: Started at Completed at

Name	Age	Sex
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Facilitator's welcome, introduction and instructions to participants [5 minutes]

Introductory note [2 minutes]

Welcome and thank you for volunteering to take part in this focus group discussion about the impact of flooding on your lives and livelihoods. Your point of view and knowledge about your community's situation and current needs will be used to inform research that **may** inform future actions related to reducing the impact of flooding in your community.

Please note that this meeting does not have any impact on whether you or your family receives assistance. These discussions are only meant to better understanding how you, your household, and the community are affected by floods.

Anonymity: I would like to assure you that the discussion will be anonymous. I and the other focus group participants would appreciate it if you would refrain from discussing the comments of other group members outside the focus group. If there are any questions or discussions that you do not wish to answer or participate in, you do not have to do so; however please try to answer and be as involved as possible.

The discussion will take no more than one hour.

Ground rules [2 minutes]

1. The most important rule is that only one person speaks at a time. There may be a temptation to jump in when someone is talking but please wait until they have finished.
2. There are no right or wrong answers
3. You do not have to speak in any particular order

4. When you do have something to say, please do so. There are many of you in the group and it is important that I obtain the views of each of you
5. You do not have to agree with the views of other people in the group you can say that.
6. Does anyone have any questions? (answers).
7. OK, let's begin

Instructions to moderators

Purpose: These lines of questioning are designed to gain a greater narrative understanding of the changes in timing, flood duration and intensity over time (as far back as the participants can remember); the impact of floods and how this may or may not have changed over time; how people and communities cope with floods and how this may or may not have changed over time. These should complement the data collected using the household and community forms, and should add a human element to the quantitative information we produce with those tools.

Questions to participants: these are the questions that should be read and communicated to the participants. If there are some specific vocabulary which may be unclear, do not hesitate to provide a definition for the purpose of the exercise.

Probing questions: Probes and clarifying questions are an important part of interviewing and have two main purposes: **1)** To help clarify what an interview respondent has said and **2)** To help get more detailed information on topics of interest. Probes allow the interview respondent to provide more than just a one-sentence answer to the questions you ask. **Do not read probing questions together with the questions to participants**. Use or adapt them if necessary

Questioning Route

STAGE 1: INTRODUCTION

Questions to Participants:
(Engagement question) Did you ever participate in an assessment exercise with UN agencies or NGOs? If yes, how did it go? [5 minutes]

This is a warm up question, encourage a lively discussion – but don't let the conversation stray too far off topic. As soon as you feel everyone is engaged and talking, move on to question 2.

STAGE 2: CHANGE IN FLOODING OVER TIME

Questions to Participants:
Can you tell me how flooding season has changed over the time you have lived in this place?

Probing question: Has the time of year when flooding happens changed?

Is it sooner or later than it used to be?

Probing question: Has the length of time your village is flooded changed over time?

Is it shorter or longer than it used to be?

Probing question: Has the intensity of flooding changed over time?

Are the floods more or less destructive?

Are flood waters higher or lower?

Do flood waters rise faster or slower?

STAGE 3: IMPACT OF FLOODING

Have you ever been displaced because of flooding?

Probing question: Where did you go? How long were you displaced for?

Does how you/ your family earn your livelihood change when it floods?

Probing question: What impact does this have on your lives?

Probing question: Are there any positive impacts of flooding?

Does flooding impact the health of you or your family?

Why do you live in a place that floods?

STAGE 4: DRR

What do you do to prevent floods from damaging your home?

Probing question: IF APPLICABLE - How did you learn about these activities?

Are there any activities you know would be useful in preventing floods from damaging your home but you don't do?

Probing question: IF APPLICABLE – what keeps you from conducting these activities?

How does your community help you protect your home?

Is there any information about flooding in this place that we did not ask and that we should know?

Annex 5: List of Assessed Villages

County	Payam	Boma	Location	Household Surveys	Community Survey	FGD	Reduced Dataset
Northern Bahr el Ghazal							
Aweil Centre	Chel South		Akuangar	x	x		
Aweil Centre	Nyalath	Amethic	Amethic	x	x		
Aweil Centre	Nyalath	Amethic	Cibidhok	x			
Aweil Centre	Nyalath	Amethic	Mangok Nyor	x			
Aweil Centre	Nyalath	Kuom	War Apac	x	x		
Aweil East	Baach	Chumator	Dong	x	x		
Aweil East	Baach	Chumator	Malek	x	x		
Aweil East	Baach	Mayenadhot	Lool Akuei	x	x		
Aweil East	Madhol	Majok Dut Depjok	Majak	x	x		
Aweil East	Madhol	Marol Akot	Mayom Piol	x	x		
Aweil East	Madhol	Marol Akot	Rialdit Ajuong	x	x	x	
Aweil East	Malual-bai	Adoor	Thoi	x	x		
Aweil East	Malual-bai	Marol Lacch	Pan-nhial	x	x		
Aweil East	Wunlang		Akuem	x	x		
Aweil East	Wunlang	Makuei	Wun Hong	x	x		
Aweil East	Wunlang	Tong-Goi	Areny Piny	x	x	x	
Aweil East	Wunlang	Tong-Goi	Machar Kou	x	x	x	
Aweil East	Yargot	Nyak-ral	Nyakrel	x	x		x
Aweil North	Ariath	Amel	Gungier	x	x		
Aweil North	Ariath	Pandit	Machot	x	x		
Aweil North	Ariath	Pandit	Malook	x	x		
Aweil North	Malual Centre	Ajak-Wol	Ariik-Kuel	x	x		
Aweil North	Malual East	Koiyom	Paguot	x	x	x	x
Aweil North	Malual East	Warpac	Maper Gier	x	x		x
Aweil North	Malual East	Warpac	Pan Wet Kuek	x	x		x
Aweil North	Malual East	Wath-Thok	Makuac Rual	x	x	x	x
Aweil North	Malual North	Peth-Atak	Adhotic	x	x		
Aweil North	Malual West		Adhotic	x	x		
Aweil South	Ayai	Ajiith	Guk-tiit	x	x		x
Aweil South	Ayai	Ajiith	Riang Aleu	x	x		x
Aweil South	Ayai	Amet Weer	Kuei-wiir	x	x		x
Aweil South	Ayai	Amet Weer	Mangar	x	x		
Aweil South	Ayai	Amet Weer	Marol	x	x		
Aweil South	Ayai	Majak Chuei	Rolchol	x	x		
Aweil South	Gakrol	Jarajep	Duel	x	x		

Aweil South	Gakrol	Jarajep	Lingir	x	x		
Aweil South	Nyieth	Panrual	Amethic	x	x		x
Aweil South	Nyieth	Riang Man Kuek	Hoong Akoon	x			x
Aweil South	Nyieth	Riang Man Kuek	Maper Akuel Liec	x	x	x	x
Aweil South	Nyieth	Riang Man Kuek	Pan Thoi	x	x		
Aweil South	Nyieth	Riang Man Kuek	Riang Man Kuek	x	x		x
Aweil South	Nyocawany II	Mayom Lac	Akuak	x	x	x	
Aweil South	Nyocawany II	Mayom Lac	Dieric	x	x		
Aweil South	Nyocawany II	Mayom Lac	Rolngap	x	x	x	
Aweil South	Panthou	Mading Chan	Akocic	x	x		x
Aweil South	Panthou	Riang Aker	Dong	x	x		x
Aweil South	Panthou	Riang Aker	Lol Kou	x	x		x
Aweil South	Panthou	Riang Aker	Mayom Ajiwak	x	x		x
Aweil South	Tar-weng	Majok-Abyei	Mawier Wartiok	x	x		
Aweil South	Tar-weng	Makuei Alel	Rumachuul	x	x		
Aweil South	Wathmuok	Achian	Achien Nhom	x	x		x
Aweil South	Wathmuok	Achian	Wathmuok	x	x		x
Aweil South	Wathmuok	Majak Muocdit	Majak Muocdit	x	x		x
Aweil South	Wathmuok	Majak Muocdit	Mathil	x	x		x
Aweil West	Ayat Centre	Baryang	Marial Adoot	x	x		x
Aweil West	Ayat East	Majok Adim	Panlang	x	x		
Aweil West	Ayat East	Marial Baai	Marial	x	x		
Aweil West	Ayat East	Marial Baai	Panhong	x	x		
Aweil West	Gomjuer Centre	Akuang Ngap	Akueng Ngap	x	x		x
Aweil West	Gomjuer Centre	Malou Angol	Marol Atak	x	x		
Aweil West	Gomjuer Centre	Malou Angol	Yardit	x			
Aweil West	Gomjuer East	Buon Ayak	Aweet	x	x		x
Aweil West	Gomjuer East	Buon Ayak	Gukwet Athuai	x	x		x
Aweil West	Gomjuer East	Buon Ayak	Mabil	x	x		x
Aweil West	Gomjuer East	Buon Ayak	Wathnyang	x	x	x	x
Aweil West	Gomjuer West		Lang Akeen	x	x		
Aweil West	Gomjuer West		Pan Tiit	x	x		x
Aweil West	West	Anyuop Juang	Chilic	x	x		x
Aweil West	Mariem East	Maduany	Akalthut	x	x		x
Aweil West	Mariem East	Maduany	Gongor	x	x		x

Aweil West	Mariem East	Maduany	Mabior	x	x		
Aweil West	Mariem East	Malou Dut Agany	Wakabil	x	x		x
Aweil West	Mariem West		Marial Wut	x	x		x
Aweil West	Mariem West		Udhum	x			x
Aweil West	Mariem West	Chimel Maken	Karkou	x	x		
Aweil West	Mariem West	Chimelthii	Makuac-chimel	x	x		x
Aweil West	Mariem West	Chimelthii	Makuac-Lang	x	x		x
Gogrial West	Alek South		Pajok Bek	x	x		

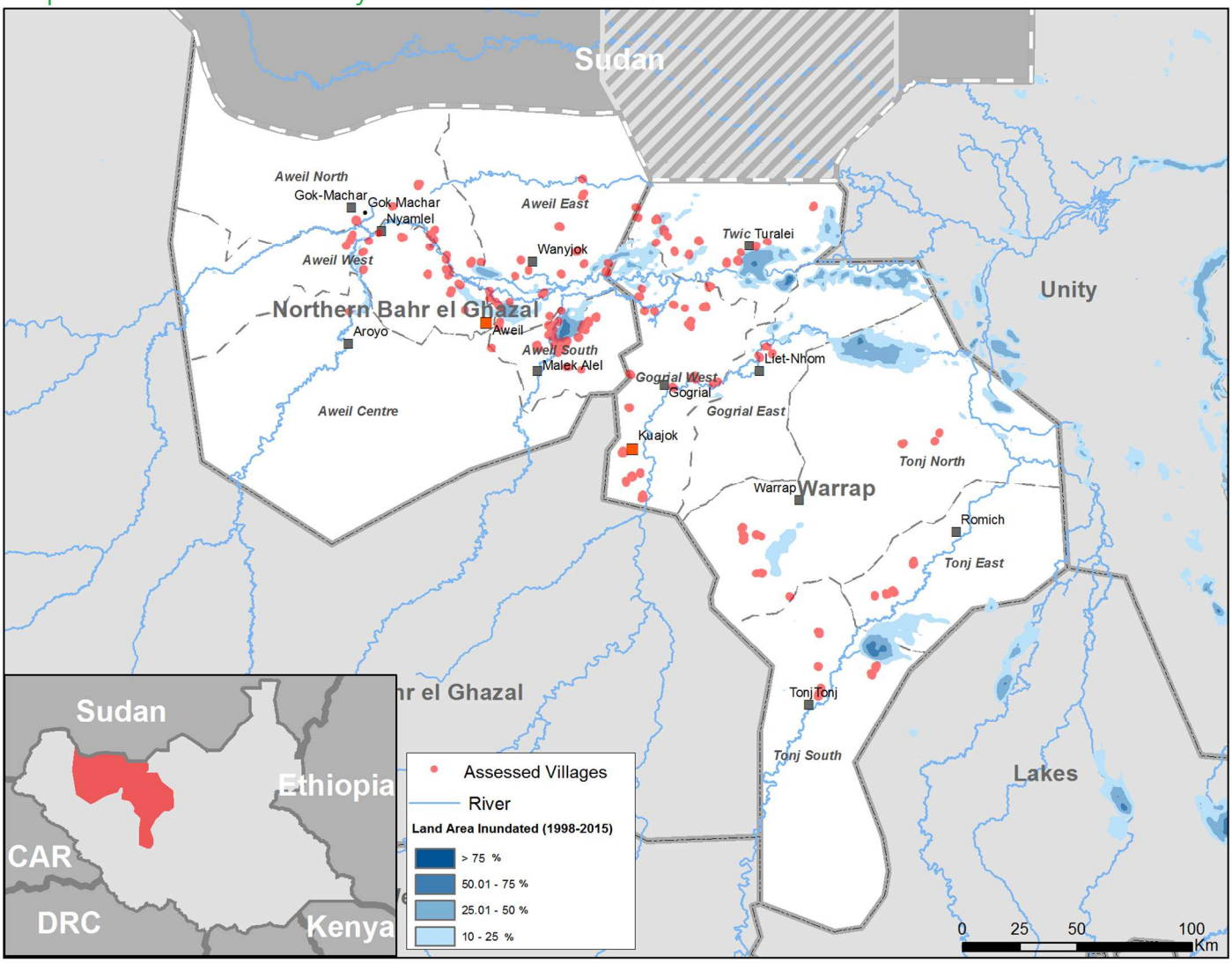
Warrap

Gogrial East	Nyang	Mayen-Jur	Maluil	x	x		x
Gogrial East	Toch East		Agor	x	x		
Gogrial East	Toch East		Kual-Kou	x	x	x	
Gogrial East	Toch North		Maluth	x	x	x	
Gogrial East	Wau Bai	Dong	Aliap	x	x		
Gogrial West	Akon North		Amou	x	x		
Gogrial West	Akon North	Mabil	Athieng	x	x		
Gogrial West	Akon South		Thur	x	x		
Gogrial West	Akon South	Rup	Belic	x	x	x	
Gogrial West	Alek North		Anguoth	x	x		
Gogrial West	Alek South	Ameeth	Ameth	x	x		
Gogrial West	Alek South	Ameeth	Marol	x			
Gogrial West	Alek South	Ngap Athian	Majok-amal	x	x		
Gogrial West	Alek West		Wun Kir	x	x		
Gogrial West	Alek West	Alueth	Alueth	x	x		
Gogrial West	Gogrial		Marol-Thok	x	x		
Gogrial West	Gogrial	Maluil Ajak	Matuong Luol	x	x		
Gogrial West	Gogrial	Mandeng	Mandeng	x	x	x	
Gogrial West	Kuac North		Lieth	x	x		
Gogrial West	Kuac North	Angui	Mayol	x	x		
Gogrial West	Kuac North	Luk Luk	Panreu	x	x	x	
Gogrial West	Kuac South	Warkou	Wuncuei	x	x		
Gogrial West	Riau		Panliet	x	x		
Gogrial West	Riau		Rum Ameth	x	x		

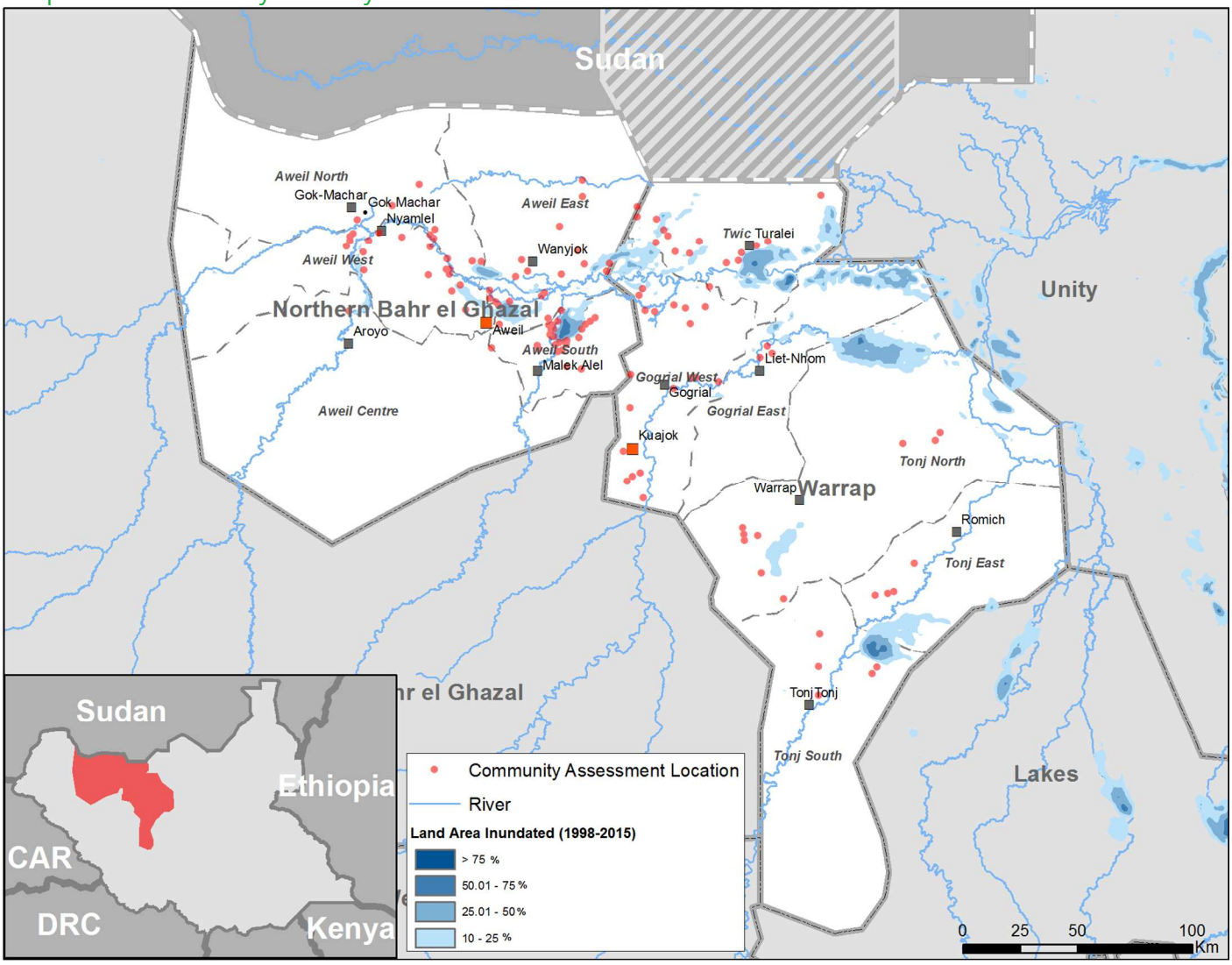
Gogrial West	Riau		Waijang	x	x	x	
Tonj East	Ananatak		Akok	x	x	x	
Tonj East	Ananatak		Payuiel	x	x		
Tonj East	Ananatak		Wunkot	x	x		
Tonj East	Palaal		Palaal	x	x		
Tonj East	Palaal		Pawel	x	x		
Tonj North	Akop	Achuol-Lok	Achuol Lok	x	x	x	
Tonj North	Akop	Achuol-Lok	Padoc	x	x	x	
Tonj North	Akop	Athieng Puol	Mamer	x	x		
Tonj North	Man-loor		Jarjiep	x	x		
Tonj North	Man-loor		Man-loor	x	x		
Tonj North	Man-loor	Akur Biok	Atap	x	x		
Tonj North	Man-loor	Mathiang	Kueng	x	x		
Tonj North	Pagol		Majok	x			
Tonj North	Pagol	Majok	Wun Pac	x	x		
Tonj North	Pagol	Mayen-Loc	Maluiltit	x	x		
Tonj South	Manyang-ngok		Atong	x	x	x	
Tonj South	Manyang-ngok		Wun kot	x	x		
Tonj South	Tonj		Abelek	x	x		
Tonj South	Tonj		Maper	x			
Tonj South	Tonj		Wartit	x	x		
Twic	Ajak-kuac		Pan Riang	x	x		x
Twic	Akoc		Manyiel	x	x		
Twic	Akoc		Wunchum	x	x		x
Twic	Akoc	Tiit	Mangok Dut Lual	x	x		
Twic	Akoc	Yiik	Atong Akuak	x	x		
Twic	Aweeng		Maper	x	x		x
Twic	Pannyok		Ayikou	x	x		
Twic	Pannyok		Baar Aruet	x	x		
Twic	Pannyok		Mit Piny	x	x	x	x
Twic	Pannyok	Mading Luit	Bador Luit	x	x		x
Twic	Pannyok	Mading Luit	Tumakon	x	x	x	x
Twic	Turalei		Machar	x	x		x
Twic	Turalei		Wang Lath	x	x		x
Twic	Turalei	Nyiel Abiel	Nyiel Abel	x	x		x
Twic	Wunrok		Achol Khor	x	x	x	
Twic	Wunrok	Tiit Cok	Managui	x	x		

Annex 6: Maps of Assessed Locations

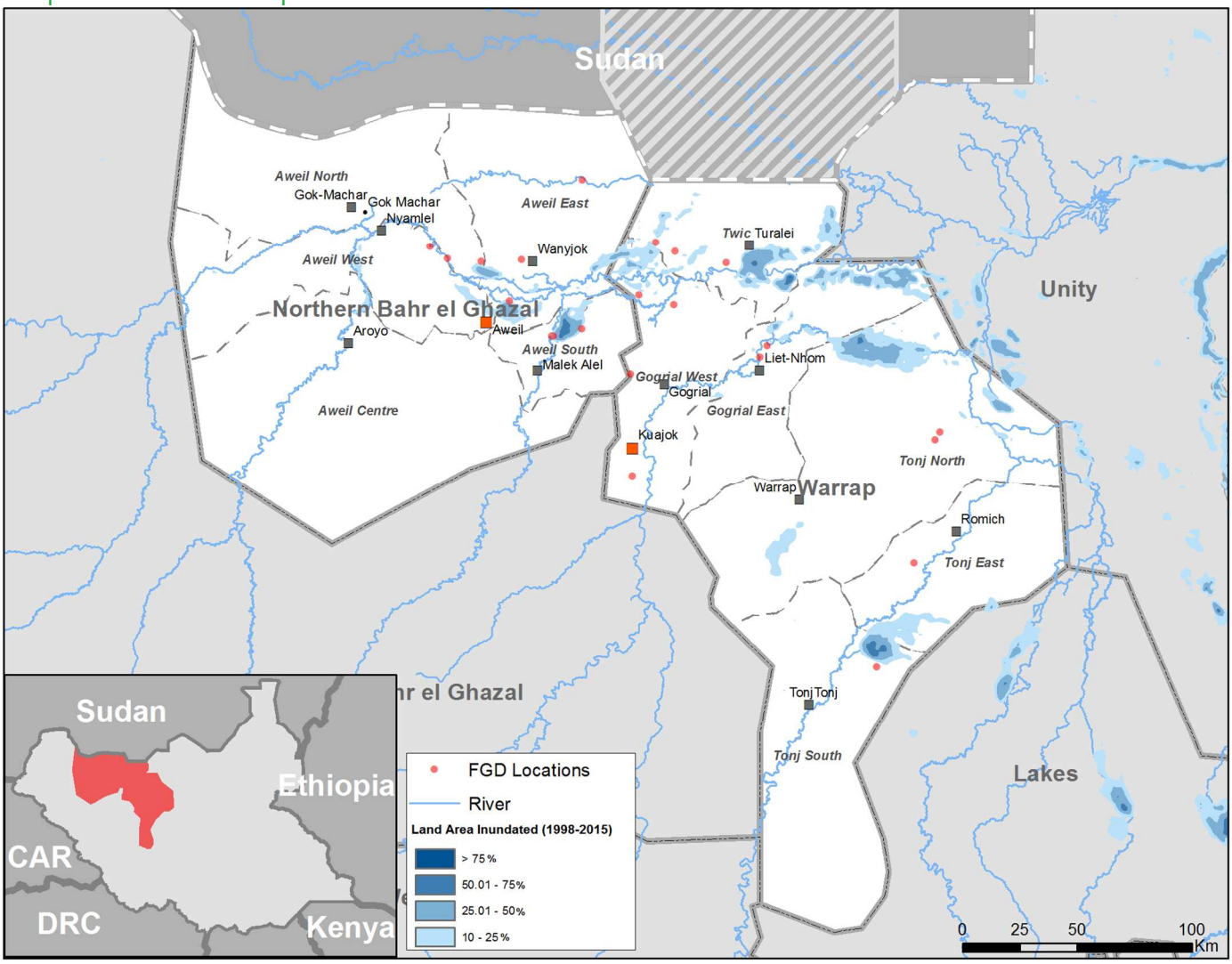
Map 5: Household Survey Locations



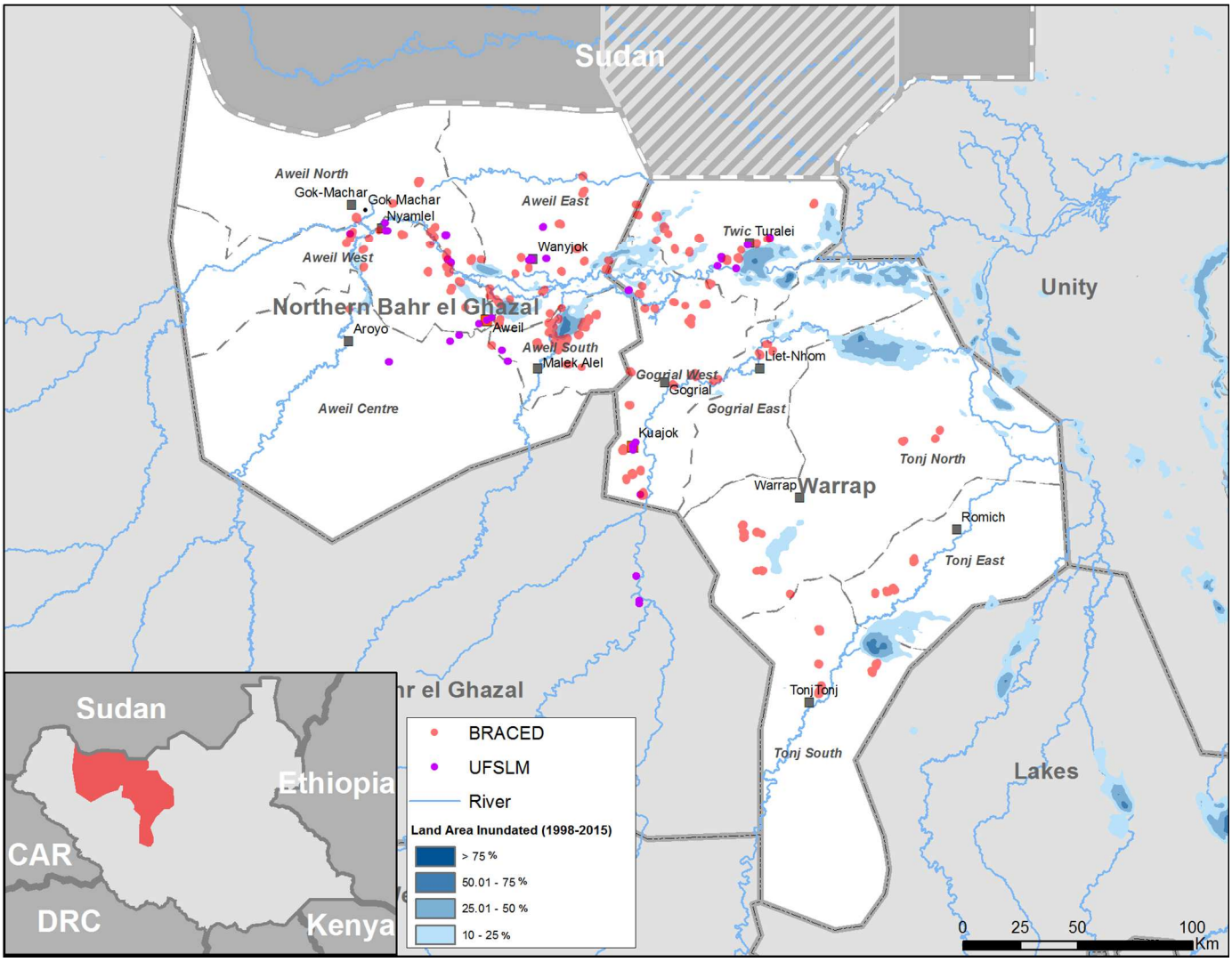
Map 6: Community Survey Locations



Map 7: Focus Group Discussion Locations



Map 8: BRACED Assessment Locations Compared to Locations Assessed in the DFID-Funded Urban Food Security and Livelihoods Program Baseline Assessment



Annex 7: BRACED Guide for Enumerators

IMPACT and ACTED Partnership

You are hired by ACTED, on behalf of IMPACT Initiatives. IMPACT is an international NGO based in Geneva, Switzerland. IMPACT does research on the strengths and challenges and needs of people all over South Sudan, and in other countries. IMPACT does not run any programs or provide services to any community (such as food, water pumps, and seeds). It only collects data, writes reports, and makes maps. The REACH Initiative is a major part of the work of IMPACT, but what we are doing is not part of REACH.

ACTED is the host organization for IMPACT in South Sudan. IMPACT and ACTED are sister organizations that support the work of each other. ACTED is an international NGO based in Paris, France. ACTED provides goods and services, such as seeds and business trainings.

DFID is our project funder. This is the United Kingdom's Department For International Development. The people of England pay taxes to their government, and these taxes are used to fund development projects in South Sudan and other parts of the world. BRACED is one of these projects.

BRACED Assessment

BRACED stands for Building Resilience and Adaptation to Climate Extremes and Disasters. It is a very large project that started in 2013, with many organizations running many projects, such as funding schools, starting sanduks, planting trees, and training farmers. All of these projects are intended to help people be more resilient to climate disasters, such as floods and droughts.

Part of this project is to better understand which parts of South Sudan have the worst floods every year. Our job is to go to villages in NBeG and Warrup to ask about the floods, and to ask about how people deal with bad floods. In December 2013, ACTED and IMPACT ran a similar assessment, and we are now trying to find out even more information on how badly it floods, and how people defend their homes and their lifestyles against floods.

Schedule

We will have approximately 45 days of field work in 300 villages in the counties of the former NBeG and Warrup states. This will take place between now and early-May.

In general, we will work in the field for two weeks at a time (Monday until the following Friday), with one day off (Sunday), in the middle. Then you will have a two day weekend (Saturday and Sunday), then we will leave for the field again on Monday.

We will start by traveling to Aweil on Wednesday, and be based there until Friday, 18 March. We will be doing assessments in Aweil West and Aweil South during this first field trip.

You will not be paid for days we do not work and you will receive no Mission Allowance for days you are working in Wau. You will be paid for overtime for the Saturdays you work in the field, but not for the Sundays in the field, because we will not work these days.

We work 8:30am until 5:30pm. Time management is very important. Some days, because of travel, lunch might be delayed. Some days we will have time for a chai break, but this is not guaranteed, and if it happens, it must be very quick.

Teams

We will split into two teams, one lead by John Atak the other led by Makuei Wilson as Team Leaders. Michael and James will help them as Assistant Team Leaders. Daniel will typically travel with one team; I will typically travel with the other. Your team leaders will be your focal points for any questions or concerns. Daniel, as a REACH Field Coordinator, will work directly for me and will be primarily responsible for collecting phones from the team leaders, organizing logistics (daily data collection locations, hotels, etc..), and contacting community leaders to mobilize community members.

We will be moving fast, with each team visiting 4 or 5 villages each day. You are expected to complete 12-16 surveys each day, with 3 or 4 in each village you visit.

You will be going door to door to conduct household surveys. The Team Leaders and Assistant Team Leaders will sometimes be running similar surveys with groups of community leaders as focus group discussions.

Annex 8: Annotated Bibliography

The collected data covers broad aspects of flooding and its livelihood impacts in South Sudan. This includes an overview of climate change and mitigation, agro-pastoralism and other relevant literature.

Climate Change and Mitigation

Intergovernmental Panel on Climate Change (IPCC). (2014). *Climate Change 2014: Synthesis Report*. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC, Geneva, Switzerland.
http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf

The 2014 Synthesis Report contains a comprehensive review of the threats and opportunities posed by climate change. Among key findings of threats relevant to South Sudan are the increase in heavy precipitation events, increased vulnerability to current climate variability, longer and more frequent heat waves, and a particular burden being placed on the poor. Relevant opportunities include indigenous knowledge and practices (which increases the effectiveness of adaptation and which previously has generally been excluded from adaptation efforts), aligning climate policy with sustainable development, and utilizing economic diversification and urban planning as strategic tools for climate resilience.

King, D., Schrag, D., Zhou, D., Ye, Q., and Ghosh, A,. (2015). Climate Change: A Risk Assessment. United Kingdom Foreign and Commonwealth Office. http://www.csap.cam.ac.uk/media/uploads/files/1/climate-change--a-risk-assessment-v9-spreads.pdf
This report intends to gather the best evidence on climate change to inform countries on how to prioritize threats related to emissions, direct risks, and systemic risks. The direct risk of river flooding is found to depend on population growth, economic growth, and the extent of mitigation efforts. These include physical flood defences, buildings and infrastructure sited in low-exposure areas, and proper flood response and recovery mechanisms. It also outlines the methodology for estimating flood impacts, and explains the considerable uncertainty underlying the process.

United States Geological Survey (USGS), Famine Early Warning Systems Network- Informing Climate Change Adaptation Series, FEWS NET. (2011). *A Climate Trend Analysis of Sudan.* United States Department of the Interior.
http://pubs.usgs.gov/fs/2011/3072/pdf/FS2011-3072.pdf

This factsheet overviews the climate trends and related food security issues of pre-independence Sudan. Key findings include a drop in rainfall by up to 20%, a temperature increase equivalent to an additional 20% rainfall reduction in the last 40 years, and clear threats to South Sudan's ability to grow food. Predicted (2010-2039) rainfall amounts drop below the critical 500mm per annum threshold directly over Aweil East and along other edges of the study area.

Climate Resilience in Contexts of Agro-Pastoral Communities, Conflicts and Disasters

Brown, O., Hammill, A. and Mcleman, R. (2007) *Climate Change as the 'New' Security Threat: Implications for Africa.* International Affairs 83: 6. The Royal Institute of International Affairs.
https://www.iisd.org/pdf/2007/climate_security_threat_africa.pdf

This paper describes the relationship between climate change and insecurity as it applies to Africa and presents a conceptual diagram for the interaction. It refutes assertions by security organizations that climate change is exclusively a security issue, to be dealt with through increased defences between nations and increased intervention in ecological crises by outside actors. Further, it describes the great ability of African societies to adapt to climate variability, utilizing a number of strategies including migration, conflict resolution and management of water, switching agrarian practices, complex socioeconomic relationships between urban and rural areas, and income diversification. This is despite the described constraints of chronic poverty, economies overreliant on natural resource extraction, and leadership prone to corruption and mismanagement.

Kirkbride, M., Grahn, R. (2008) Survival of the Fittest: Pastoralism and Climate Change in East Africa. Oxfam Briefing Paper #116. Oxfam International.
http://www.oxfam.org.hk/content/98/content_3534tc.pdf

This official briefing describes the climate change challenges faced by pastoralists in East Africa, including marginalization, inappropriate development policies, and resource competition. It recommends investment in basic services such as health care and education, flood-proof transport and communication links, financial and technical support services, livestock-marketing opportunities, drought and flood mitigation and preparedness systems, access to climate information, and

effective conflict-mitigation mechanisms. It outlines the need to address the needs and interests of both women and me. It also advocates for strong representative civil organizations, and accountable and responsive government institutions.

This article also cites the French-language report by Dr. Jeremy Swift (1988) 'Major Issues in Pastoral Development with Special Emphasis on Selected African Countries', Rome: FAO: "Almost all pastoral communities practise some cultivation and other income generating activities in addition to herding. However, cultivation typically forms a smaller part of household food and income than livestock products. A widely used definition is that pastoralist households are those in which at least 50 per cent of household revenue comes from livestock or livestock-related activities. In contrast, agro-pastoralists derive more than 50 per cent of household gross revenue from farming and 10–50 per cent from livestock."

Ruttinger, L., Smith, D., Stang, G., Tanzler, D. and Vivekananda, J. (2015). A New Climate for Peace: Taking Action on Climate and Fragility Risks. adelphi / International Alert / Woodrow Wilson International Center for Scholars / European Union Institute for Security Studies.
https://www.newclimateforpeace.org/#report-top

This is an independent report commissioned by the G7 members looking specifically at the nexus between climate risks and pre-existing socio-political fragility. It utilizes the concept of climate change as a threat multiplier to add urgency to the call for climate change mitigation and adaptation measures to be joined with development processes. It calls the involvement of stakeholders in project implementation critical for successful projects, especially in the face of unpredictable funding, weak institutions, and siloed agendas. It further outlines specific action strategies for bolstering food security, increasing local resilience, and cooperatively addressing the needs of diverse societies. Finally, it calls for humanitarian organizations to follow the principle of "do no harm" in order to avoid causing negative side effects in their work.

Peters, K. and Vivekananda, J. (2014). Topic Guide: Conflict, Climate and Environment. Evidence On Demand. DAI / IMC Worldwide Limited Joint Venture.
http://dx.doi.org/10.12774/eod_tg.november2014.peterskandvivekanandaj

This topic guide is part of a series developed by the United Kingdom's Department for International Development (DFID) to inform a programme advisors in the department on cross-cutting technical issues. It explores the root causes of vulnerability to climate change, the risk of inappropriate aid interventions, and the importance of strong social capital and economic stability in counteracting the impacts of conflict, political instability, and climate change. It notably advises carefully nuanced approaches to community-based adaptation, especially when a program runs the risk of undermining the government by empowering local action that should be covered by taxing authorities. It finds that women are more at risk for gender differences in the effects of displacement, with women bearing a greater burden of mental health outcomes and loss of social networks and social capital due to climate change and conflict.

Little, P. D., Behnke, R., McPeak, J. and Gebru, G. (2010). *Policy Options for Pastoral Development in Ethiopia.* Pastoral Economic Growth and Development Policy Assessment, Ethiopia, Report 3. London: UK Department for International Development.
https://www.researchgate.net/publication/257993033_Policy_Options_for_Pastoral_Development_in_Ethiopia_Report_Number_3_Pastoral_Economic_Growth_and_Development_Policy_Assessment_Ethiopia

This paper is part of a series on pastoral economic growth and development in Ethiopia, commissioned by DFID, at the request of the Ethiopian government. It finds that pastoralism will increasingly use a fixed-base model, in which part of the family remains at home to perform whatever income generating activity is available in the area. These can include cultivation, trading, and paid work, in addition to the seeking of services available in settlements, especially schools. Meanwhile, animals will typically still seasonally migrate, primarily with young men of the family. It also expects conflict to be a major risk to pastoral economies and development possibilities, unless peace is instituted.

Waithanji, E. M. (2008). Gendered Impacts of Sedentarization of Nomads on the Somali Community in Mandera Central Division of Northeastern Kenya. PhD Dissertation. Clark University.
https://books.google.com/books?id=7s96J1W0hL4C

This dissertation investigates the changing dynamics of pastoralism in East Africa, and its impacts on women. It finds that sedentarization means different things to different categories of stakeholders, that women's mobility become more culturally restricted than men's after sedentarization, and that gender insensitivity can be found in the systems, organizations and development interventions of the area.

Indigenous Mitigation Techniques

Nyong, A. Adesina, F., Osman Elasha, B. (2007). The Value of Indigenous Knowledge in Climate Change Mitigation and Adaptation Strategies in the African Sahel. Mitigation and Adaptation Strategies for Global Change. 12:787-797. DOI 10.1007/s11027-007-9099-0
https://www.researchgate.net/profile/Anthony_Nyong/publication/46537001_The_value_of_indigenous_knowledge_in_climate_change_mitigation_and_adaptation_strategies_in_the_African_Sahel/links/55476f460cf26a7bf4d906e6.pdf

This article supports the incorporation of indigenous adaptation strategies in climate change interventions in Africa's Sahel region. It argues that, on a local scale, communities have experienced documented extreme climatic conditions and population densities for centuries, and successfully utilized traditional methods for land management to deal with the consequences. With a focus on agriculture and land use changes, it recommends utilizing indigenous knowledge for the management of communal forest reserves and agroforestry; local weather and climate predictions to guide cropping patterns and planting dates; and the preservation of pastoral seasonal mobility. Useful steps for integrating this knowledge into mitigation and adaptation programs include prior success of these methods, use a bottom-up participatory approach, and treat communities as an equal partner. It advocates for implementing organizations to hold the perspective of "we are only enhancing an internal process" that is already occurring in these communities.

Little, P. D., Mahmoud, H., Layne Coppock, D. (2000) When Deserts Flood: Risk Management and Climatic Processes Among East African Pastoralists. Climate Research 19: 149-159.
http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.556.7326&rep=rep1&type=pdf

This research finds that the lived experience of drought by pastoralists may be more extreme than what is belied by research on rainfall amounts alone, due to reduced mobility, diminished soil fertility, and reductions in both social capital and political leverage. It finds that mobility is a critical, if not the sole, factor for faring well during climate extremes, as it ensures adequate access to grazing and water. It states that the goal of supportive programs should be to diversify and supplement pastoralism, not replace it with other land use systems like irrigated agriculture that are more exposed to climate variability risks. Policies should improve access to markets and pasture, and should also reduce large-scale settlements based on food aid and relief, as these discourage herders from the mobility that enables them to survive climate extremes.

South Sudan Political Framework

Oliver, D. B. (2013). *Presentation on Efforts to Address Climate Change in South Sudan*. Workshop on sustainable ecosystem management for adaptation to climate change and improved livelihoods in the Nile Basin. Food Access Organization.
http://www.fao.org/forestry/39595-0d29aa96b994d11cc6fd6a7b8f68cd2f2.pdf

This presentation by the Ministry of Environment describes the effects of climate change in South Sudan, relevant policies, and necessary steps for moving forward. It describes efforts towards climate change adaptation and mitigation that were underway in 2013, which have since been severely disrupted by the crisis. These efforts included assessments, development of climate change plans, and applications for international implementation funding.

Republic of South Sudan. (2015). *Intended Nationally Determined Contribution (Draft).*Submitted Towards the Requirements of the United Nations Framework Convention on Climate Change. Submitted 23 November 2015.
http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx

This draft plan for South Sudan's participation in the United Nations Framework Convention on Climate Change. As a "least developed" nation, South Sudan has limited obligations to reduce emissions at this time. This document outlines the challenges facing the nation, intended mitigation and adaptation measures, and future needs. It states the goal that by 2040 South Sudan will be host industry and moderate incomes. It states plans to create buffer zones around flood-prone areas and to relocate vulnerable communities. It is unclear how this report will be utilized by the newly formed government of national unity.

Netherlands Commission for Environmental Assessment, the Dutch Sustainability Unit (2015). *Climate Change Profile: South Sudan.* Netherlands Ministry of Foreign Affairs/ Centre for Development Innovation / Netherlands Water Partnership / Dutch Sustainability Unit / Independent Consultants
http://api.commissiemer.nl/docs/os/i71/i7152/climate_change_profile_south_sudan.pdf

This report summarizes the latest research on South Sudan as relates to climate change vulnerabilities and adaptation strategies. It reviews the history of policies and financing that have been pursued, as well as climate change projects being implemented, especially those related to water and/or food security. Specifically identified contributions of the Netherlands Embassy include improved water access, diversified cropping and farming systems, adapted seed varieties and improved seed sector, value chain development, watershed protection, women-focused water resource management trainings, and improved rural infrastructure.

South Sudan Current Situation

United Nations Food and Agriculture Organization (FAO) and World Food Program (WFP). (2014). Special Report: FAO/WFP Crop and Food Security Assessment Mission to South Sudan.
http://www.fao.org/docrep/019/i3652e/i3652e.pdf

This report provides critical background information on the typical agriculture setups of communities across South Sudan prior to the 2013 crisis, in addition to providing statistics and discussion on crop yields and food security, both prior to the crisis and in its early days.

United Nations World Food Program (WFP). (2016). South Sudan: The 2016 Rainfall Seasonal Analysis. VAM Food Security Analysis. May 2016.
http://fscluster.org/south-sudan-rep/documents?text=Rainfall

This presentation on the current predictive rainfall models finds that rainfall is looking to be above average for the 2016 growing season. The analysis shows that the growing season in Greater Bahr el Ghazal began early this year, which hopefully counteract the lower than average vegetation cover, especially in the key crop areas of Aweil East, Gogrial West, and Tonj East Counties. Notably, heightened flood risk is not predicted for the western half of the country.

United Nations Children's Emergency Fund (UNICEF). (2016). *South Sudan Humanitarian Situation Report #82, 11-24 March 2016*.
http://www.unicef.org/appeals/files/UNICEF_South_Sudan_Humanitarian_SitRep_24_March_2016.pdf

This report indicates that Food insecurity continues to rise in Greater Bahr el Ghazal, with a great increase in the number of children and adults being treated for malnutrition. The food security situation is stated as deteriorating due to limited available food in markets and price increases. It states that a study will be undertaken to understand the persistent rise in malnutrition in the area.

Annex 9: Photograph of Raised Tukul Design

BRACED Building Resilience and Adaptation to Climate Extremes and Disasters

Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED)
Improving Resilience to Climate Change in South Sudan (IRISS)

IRISS-BRACED is a consortium led by Concern Worldwide
Working together with ACTED, FAO, and The Sudd Institute.

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