Building Climate Resilience in Fragile Contexts: Key Findings of BRACED Research in South Sudan

Improving Resilience to Climate Change in South Sudan

BRACED

Contents

Executive Summary

Since 2013 South Sudan has been in a protracted crisis brought about by conflict. It is within this context that the UK Aid funded Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED) programme became operational. BRACED supports building national climate resilience at multiple levels within South Sudan.

Climate change is already visible in South Sudan. Farmers, pastoralists, and fishing communities have already noticed increased extreme weather events, increased temperatures, increases in the frequency and severity of drought and flood events and shifting seasonality affecting all aspects of food security within the country.

Research is critical to understanding the full impact of climate change on the lives of people in South Sudan. This paper is a synthesis of research that was undertaken within the BRACED Programme. The research was undertaken between 2016 and 2017. The research covered a number of areas, including:

1. A literature review of existing studies on climate change and gender relevant to South Sudan, as well as, a review of available datasets to determine suitability for understanding associations between gender and climate.
2. A short-term ethnographic research study on perceptions of climate change at local level. This was undertaken using a series of focus group discussions and key informant interviews and observations in Aweil West and Tonj South.
3. A literature review on climate change and conflict and linkages to existing datasets that demonstrated correlation.
4. A quantitative survey of climate information services in South Sudan and how local people react to their dissemination.
5. An analysis of flood risk and people's adaptive capacity to these conditions in the chosen implementation sites.
6. A literature review of the connections between land tenure and climate change.
7. An analysis of seed systems and climate change in South Sudan, with a particular focus on drought and flood resistant Sorghum varieties.

Taken by the BRACED consortium members, 2017.

The research uncovered a number of findings. Firstly, that climate change and conflict are poorly correlated in South Sudan. Secondly, that there is an extensive knowledge of drought and flood resistant sorghum at the local level.

Thirdly, many communities believe that flood and drought is God-sent and they have low levels of power to tackle it. Fourthly, that women are deeply affected by a changing climate given their dependence on natural resources. Finally, land tenure and the management of commons areas may offer opportunities for peace dividends and conflict resolution.

The above findings offer an opportunity for various stakeholders in South Sudan to work together to bring about meaningful change. These changes will need to occur at micro, meso and macro levels in order to be transformative in nature.

1. Introduction

This paper is a synthesis of the key findings from research undertaken with the BRACED portfolio. The paper makes a number of recommendations for future work and research. The aim of all of the research undertaken was to influence and strengthen the delivery of BRACED programming in South Sudan and national and sub-national climate related programming in the future.

South Sudan is one of the most vulnerable countries to climate change (NAPA, 2016). It is vulnerable to climate change and associated socio-economic losses and damages due to the dependence of its population, both men and women on climate-sensitive natural resources for their livelihoods (NDC[1], 2015). Key economic sectors, although nascent and emerging, are also affected. These include: agriculture, infrastructure, and health. Addressing climate change must therefore be integrated into national development in the country. Furthermore, there is currently limited institutional strength, technical capacity, appropriate technologies and financial resources to support the implementation of interventions for adaptation to climate change.

Protracted conflict since 2013 has enhanced displacement of the population and increased vulnerability for multiple groups, including women, children and the elderly. It has also exacerbated increased gender disparity, gender based violence and access to resources.

Almost no studies have been conducted in South Sudan with a climate change lens. This digest, which has been guided by both Concern Worldwide and the Sudd Institute, is a compilation of the key findings from the research. It outlines recommendations for future policy and projects related to climate change in South Sudan. For each topic area, there will be an introduction, description of the methodology and description of the research, key findings and recommendations for further research/implementation.

In the most part, the production of this digest is a synopsis of the body of work that has been led by the Sudd Institute, a local member of the BRACED Consortium with key insights into national social policy issues and now a strengthened focus on climate change. The ACTED managed research on flood management and ethnography of climate change perceptions the local level, has also greatly contributed to our understanding of how climate change is affecting the Greater Bahr El Ghazal Region.

1.1 Background

The global community has in the past 5 years been putting in place new global frameworks to address the defining challenges of our time: sustainable development and climate change. South Sudan has committed to both the sustainable development agenda and to the accomplishment of global climate change goals. Through the Sustainable Development Goals, the country is attempting to tackle widespread poverty issues, whilst also dealing with a humanitarian and food security crisis. Through its ratification of the Paris Agreement, South Sudan has committed to contributing to the global goal of limiting increases in global average temperatures to less than 2°C.

Through the development of the National Adaptation Plan of Action[2] (NAPA) and the development and acceptance of the Nationally Determined Contributions (NDC), adaptation to climate change is now firmly on the national and political agenda. The NAPA process has allowed South Sudan, through in-depth consultation and discussion to define urgent adaptation needs at the national level. This process has been greatly enhanced by having a strong climate resilience programme running in the country at the same time, namely the Building Resilience and Adaptation to Climate Extremes and Disasters.

Taken by the BRACED consortium members, 2017.

1. Government of South Sudan, 2015. Intended Nationally Determined Contribution http://www4.unfccc.int/submissions/INDC/Published%20Document s/South%20Sudan/1/South%20Sudan%20Intended%20Nationally%20Determined%20%20%20%20Contribution.pdf
2. Government of South Sudan, 2016. National Adaptation Programme of Action (NAPA) https://unfccc.int/files/adaptation/workstreams/national_adaptation_programmes_of_action/application/pdf/south_sudan_final_napa_-_24th_nov-2016.pdf

1.2 Building Resilience and Adaptation to Climate Extremes and Disasters

The Building Resilience and Adaptation[3] to Climate Extremes and Disasters (BRACED) is a three year (2015-2017) project funded by the Department for International Development (DFID). BRACED aims to build the resilience of more than 5 million vulnerable people against climate extremes and disasters, through a 3-year programme supporting 108 organisations in 15 consortia across 13 countries in East Africa, the Sahel, and Asia. Fifteen projects are connected around the world through a Knowledge Manager, who leads programme- wide monitoring, evaluation and research, which feed into learning, uptake and communication activities to effect change across and beyond the BRACED focus countries.

In South Sudan, the BRACED programme has been known as Improving Resilience in South Sudan (IRISS) and has been an important climate resilience programme operating in the country. It was designed to tackle the combination of poverty, insecurity, disasters and climate extremes, targeting the extreme poor, especially women and girls. The consortium has functioned with Concern Worldwide and ACTED as implementing partners; and the Sudd Institute as a research partner. The United Nations Food and Agriculture Organisation (FAO), the United Nations Environment Programme (UNEP) and SNV Netherlands Development Organisation (SNV) have also been key consortium partners. Through a consortium approach the programme has blended national, regional and international work and learning that has contributed to increasing climate resilience in the country. This has included adaptation actions at community level; development of policy-relevant work, capacity building for government staff and locally driven climate related research.

The research has been principally undertaken by the Sudd Institute and has contributed to the learning that has arisen from the adaptation interventions undertaken. The Sudd Institute is an independent research organisation that conducts and facilitates research and training to inform public policy and practice, to create opportunities for discussion and debate, and to improve analytical capacity in South Sudan.

As the only South Sudanese member of the consortium, the organisation has brought an important voice to the programme. Their research typically involves utilising local South Sudanese expertise, reviewing key secondary literature nationally and internationally, understanding the risks in undertaking field assessments, data collection, collation, dissemination to key stakeholders and feedback and finalisation of reports. ACTED also initiated key research in flood management and ethnography of climate change perceptions that helped shape early outputs for the BRACED programme.

The research encountered a number of challenges. These included: a lack of available researchers, illness, human-wildlife conflict, insecurity, literacy issues for national staff, etc. These setbacks are normal in undertaking research in conflict affected areas (Ford et al.,1999)[4]

1.3 Climate Change Adaptation and Climate Resilience - Research to date in South Sudan

South Sudan is economically and politically distressed due to many years of civil wars from 1955-1972 and 1983-2005 and 2013–present. This has also affected the ability of the country to generate data, which helps with key national and local decision-making processes. Therefore, adaptation and climate resilience research in South Sudan is subsequently extremely limited. Weak institutions and economic mismanagement have hampered political processes and outcomes. Few studies or institutions have researched key areas related to natural resource management, environmental conditions, livelihood strategies, decision-making processes at the local level and/or climate related vulnerability. Furthermore, research carried out has tended to be short-term in nature.

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3. In this document, adaptation refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opport unities and climate resilience means the capability to maintain competent function and return to some normal range of function even when faced with adverse impacts of climate change (IPCC,2013). This contrasts with “Coping” which is a way of responding to an experienced impact with a shorter-term vision (for example, one season), whilst adaptation is the process of adjusting to change (both experienced and expected), which is longer term (for example, over a decade or longer).

4. Ford, N., Mills, E. J., Zachariah, R., & Upshur, R. 1999 *Ethics of conducting research in conflict settings* Conflict Health. 2009; 3: 7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2717053/

Traditional Flood Management	• Make dyke systems • Low levels of modern technology • Part of integrated fish management system
Traditional Drought Management	• Elders negotiate with elders on access to pasture and water during drought • Highland and lowland migration during dry and wet seasons (Transhumance)
Disaster Induced Migration	• Migration has continuously been an adaptation strategy for South Sudanese communities • Little is documented on how different groups (clans) react 'to different environmental shocks and stresses

Figure 1. Adaptation Strategies Employed by South Sudanese Population during Flood and Drought Events

The key conclusion of this work[5] was a call for political leadership support, modern technical expertise and financial resources to adapt to climate change.

Yet, there is also emergent thought around the convergence of climate change adaptation and disaster risk reduction in the research literature.

All of these research gaps have subsequent implications for the understanding of how climate change is affecting the lives and livelihoods of the citizens of South Sudan. BRACED has been an opportunity for the development of a nascent research community in this area and the foundation for further research. As part of the project preparation, Tiitmamer (2015) outlined some key adaptation strategies being employed by communities in South Sudan (See Figure 1). These revolved around coping with issues related to flood and drought.

From Figure 1, it is clear that many communities have utilized traditional systems to manage natural climate variation. These have often focused around physical infrastructure and migration. Yet, adaptation is becoming broader and tackling issues around gender, age, health, social status, and ethnicity of individuals and groups.

1.4 Climate Change Data in South Sudan

The central and eastern African climate system remains one of the most understudied areas in the world. This is due in part to a dearth of weather records, a lack of recognition of the importance of weather measurement systems, chronic under-investment and low levels of technical capacity. In South Sudan, this is very much the case and has serious implications for the study of climate change in the country. In the past few decades, changes in the management of meteorological services, alongside economic crises and political instability, have led to the breakdown of much of the network of weather stations. This is not unusual in the region.

5. Tiitmamer, 2015 Assessment of Policy and Institutional Responses to Climate Change and Environmental Disaster Risks in South Sudan

South Sudan's meteorological system is underdeveloped. However, there has been data accumulated since 1906 and detailed weather data collected since 1961. These datasets are maintained by the Department of Meteorology. The country currently has 5 synoptic stations, namely Juba, Malakal, Renk, Wau and Raja distributed in three states, with strong data records that started in 1906 for these sites. Since 2013, two of these stations have been damaged and are inoperable (Malakal and Renk). There are also a large number of automatic weather stations that need maintenance in multiple states in the country.

In South Sudan, any projects that aim to address climate related stresses and disasters are also greatly hampered by the lack of information and data that is currently accumulated in the country. In preparation for this research, the Sudd institute reviewed the availability and quality of this data and found it to be poor, inconsistent and largely uncoordinated.

The Department of Meteorology (SSMD) SSMD has responsibility for the observation, collection, archive and dissemination of weather and climate data, information and reception of synopses from meteorological stations in the country. They provide a daily forecast and a seasonal rainfall outlook for the country. This daily forecast is occasionally broadcast on television but reaches few people, especially those that would benefit greatly from receiving such information.

As a result, humanitarian and development actors rely extensively on the largely satellite based information produced by the regional body, the IGAD[6] Climate Prediction and Applications Centre (ICPAC) and other relevant regional institutions (e.g FEWSNET[7]). This information is then integrated into key humanitarian documentation for decision-making and food security updates. However, this information is rarely localised and importantly is not currently translated into relevant information for multiple stakeholders (e.g farmers, NGO's working on the ground, airlines).

Farmers, pastoralists and fishermen in South Sudan miss out on climate information products. No organisation currently provides localised and relevant information. The Department of Meteorology's seasonal weather forecasts are utilised and integrated into information for the humanitarian and development sector. However, there is little evidence that they reshape decision-making at the ground level – as people are uncertain what to do with such information.

The above scenario means that South Sudan will struggle to undertake quantitative climate change research. However, some of this could be mitigated. For example, by focusing on how data and information collection at the local level is currently used and whether it changes people's behaviour.

1.5 Climate Change Vulnerability and South Sudan

The latest report by the International Panel on Climate Change (IPCC, 2014b) highlights vulnerability to climate change can be due to gender and other factors, including class, ethnicity and age. It is now widely recognized that people who are socially, economically, culturally, politically, institutionally, or otherwise marginalised are especially vulnerable to climate change and also to some adaptation and mitigation responses (UN Women, 2017[8]).

Differences in vulnerability and exposure arise from non-climatic factors and from multidimensional inequalities. These differences shape differential risks from climate change.

This conception of the interrelationship between social dynamics and adaptation is new in South Sudan. Research reiterates the point that heightened vulnerability is rarely due to a single cause. Rather, it is the product of intersecting social processes that result in inequalities in socio-economic status and income, as well as in exposure to climate related events.

6. Intergovernmental Authority on Development is an eight-country trade bloc in Africa. It includes governments from Djibouti, Ethiopia, Eritrea, Kenya, Somalia, the Sudan, South Sudan and Uganda.
7. Famine Early Warning Systems Network www.fews.net
8. UN Women. 2016 *Leveraging Co-benefits Between Gender Equality and Climate Action for Sustainable Development* http://unfccc.int/files/gender_and_climate_change/application/pdf/leveraging_cobenefits.pdf

Ranked 5th lowest performing country by the Climate Change Vulnerability Index[9], the African Development Bank (AfDB) estimates that South Sudan may face climate damages-related GDP loss amounting to as much as 10 percent higher than the next exposed region (India). This is because the Government of South Sudan (GoSS) derives nearly 98 percent of its revenue and 60 percent of its GDP from oil resources[10]. High-dependency on oil also makes the South Sudanese economy vulnerable to external shocks, as well as climate-based resource conflict.

As climate change adaptation and resilience programming continue to grow in South Sudan – and linked to a growing acceptance globally – action to address vulnerability to climate change must recognize that it is driven by multiple and diverse social processes, such as dispossession of land, conflict and loss or lack of employment opportunities. Eriksen *et al.* (2017[11]) note that vulnerability can be viewed as a failure of entitlements linked to fundamental rights and access to resources and thus addressing it needs a wide range of approaches.

Taken by the BRACED consortium members, 2017.

1.6 BRACED Programme Research and Methodologies

Based on the identified gaps in evidence related to climate change adaptation and 'what works' in terms of promoting climate resilience in South Sudan, the BRACED programme included a research component to explore the following seven areas:

Research Area	Author/Team
Climate Change and Gender	Sudd Institute
Climate Change and Conflict	Sudd Institute
The Climate Information System	Sudd Institute
The Land Tenure System in South Sudan	Sudd Institute
Seed Systems for Climate Change	Sudd Institute
Ethnographic Research on Perceptions of Climate Change at the Local Level	Lisa Murray, ACTED
Assessing Flood Risk in the Greater Bahr El Ghazal Region.	ACTED/IMPACT Team

Table 1: Research topics and Teams

9. Climate Change Vulnerability Index 2017 by *Maplecroft*. Link: http://reliefweb.int/sites/reliefweb.int/files/resources/verisk%20index.pdf
10. OXFAM. *Country Profile: South Sudan*. p. 1-15.
11. Eriksen, S., Naess, L. O., Haug, R., Bhonagiri, A., and Lenaerts, L. (2017) *Courting Catastrophe?* Humanitarian Policy and Practice in a Changing Climate https://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/13141/48.4_10.190881968-2017.147.pdf?sequence=1254

These are nationally important research topics pertaining to understanding social dynamics, disaster risk reduction, food security and agriculture, conflict mitigation and meteorological services. Given the dearth of existing data, the BRACED research and the findings presented below, offer some initial insights and a starting point for future research in this area, which is urgently needed.

The methodologies employed included research approaches, tools, and techniques, such as qualitative and quantitative data collection, statistical analysis, experiments, field surveys, case research.

Taken by the BRACED consortium members, 2017.

2. Gender and Climate Change Adaptation in South Sudan

Key Findings

- Women are at the lower rung of social hierarchy in South Sudan, which produces inequities that are exacerbated by climate change shocks and stresses.
- There is very little gender-disaggregated data in the country, rendering correlations difficult between climate change impacts and its impact on men and women.
- Climate change related shocks (flood and drought) affects the lives of men and women, often differently. Women are more likely to be affected by climate change shocks as they depend more heavily on natural resources – water, firewood, etc.

2.1 Introduction

Although, the UNFCCC's 2002 Decisions28/CP.7 guidelines for the preparation of a national adaptation programme of actions (NAPAs) outlined gender equality as one of the guiding principles to drive the identification and the implementation of urgent and short-term adaptation needs, this was often poorly executed in practice. Thus, an important output for the BRACED programme has been to integrate gender into the NAPA in South Sudan.

The literature review carried out by the Sudd Institute on documented evidence on climate change in South Sudan, is an important contribution to the wider understanding of gender and climate change in South Sudan. It highlights issues around access to early warning systems, access to information, language and literacy, ability to swim, putting children ahead of their own safety and nutrition, loss of assets and status after disasters, loss of employment and particular impacts on unmarried and widowed women.

Currently ranked 38th as a Least Developed Country[12], decades of violence have exacerbated gender inequality in the patriarchal South Sudanese society. As the *Gender Country Profile* indicates, male head households dominate decision-making powers in their families, as well as in society more broadly[13]. The country has a sex ratio of: 52 percent male to 48 percent female[14] and the highest rates of maternal mortality in the world: one in seven women die from childbirth or pregnancy (2054 per 100,000). Women shoulder the burden of labor are responsible for caring for their homes and families, farming, fetching water as well as other tasks[15]. They also dominate the informal economy, and are subject to exploitation due to lack of education and training. These dynamics are intensified in the context of climate change.

2.2 Methodology

This research was undertaken through a comprehensive desk study alone with a detailed literature review.

2.3 Key Findings

2.3.1 Women are at the lower rung of social hierarchy in South Sudan, which produces inequities that are exacerbated by climate change shocks and stresses.

Women are on a lower rung of the social hierarchy, producing inequities, all of which get exacerbated during extreme climate events. They are on the low rung because of a number of factors which include: (1) high illiteracy rates, (2) early & forced marriage, and (3) gendered division of labor (Edward 2014, Mai 2015). Women fetch water, grass for thatching houses, grind and cook food, care for the children and the elderly, milk the cows, and take care of chicken while men herd cattle, goats, sheep, cut timber for house construction, hunt and go fishing. The National Gender Policy states that *"although women are the main producers of food, women and children are the most vulnerable to food insecurity because of traditional gender roles and limited access and control of productive assets"*[16] .

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12. UNCDP. (United Nations Committee for Development Policy). *List of Least Developed Countries*. June 2017. Link: https://www.un.org/development/desa/dpad/least- developed-country-category-south-sudan.html
13. SIDA. *Gender Country Profile South Sudan*, 2015. p.11. Link: http://orly.citylogic.co.za/wp-content/uploads/2016/10/SIDA-Gender-Profile-South- Sudan_Final-Draft-report.pdf
14. CARE. *Gender in Brief: South Sudan*. Link: http://www.care.org/sites/default/files/documents/Gender%20in%20Brief%20South%20Sudan%20.pdf
15. SIDA, 2015. p. 11.
16. Ministry of Gender, Child and Social Welfare (MGCSW), (2013). National Gender Policy. Juba: Government of the Republic of South Sudan, pg. 35.

For example, during flood events in South Sudan, the wood women collect (or have collected) to cook gets wet and unsuitable for cooking. Women are forced to walk long distances and spend a lot of energy to go to dry areas to source and collect firewood, which they carry on their heads with children tied on their backs. Based on the 2008's Sudan Census, 96 percent of households used biomass (charcoal and firewood) for cooking, a task performed in South Sudan by women. During flood events, increases in cholera, malaria and typhoid are normal putting additional pressure on women. During drought, fetching water for the household and livestock typically falls on women. In short, there is clear evidence that climate variability does bring additional burden to South Sudanese households, which typically is passed on to women and girls.

2.3.2 There is very little gender- disaggregated data in the country making correlations difficult.

Climate change related shocks (especially flood and drought) affects the lives of men and women. The research highlights the immense data gaps that exist in South Sudan and (as reiterated in this digest a number of times), defining clear correlations when such significant gaps exist requires a degree of caution when interpreting quantitative results

However, this does not mean that attempting to link existing but flawed data sets dismisses all of the suggestions or conclusions based on any analysis. With this in mind, The Sudd Institute team identified two household datasets - child mortality data and malnutrition data. However, child mortality data were not categorized on the basis of sex of head of the household, whereas the malnutrition dataset was. Thus, the child mortality dataset was abandoned and malnutrition data was examined.

The malnutrition data demonstrated that the proportion of malnourished children is slightly higher in households headed by females. However, the reason for wasting of children is not clear. Factors that contribute to malnutrition include, climate induced shocks such as floods and droughts and political and communal violence. Both factors lead to the failure of crops and looting of assets such as livestock and asset dispossession (e.g. land displacement).

However, no direct linkage between climate related shocks (for example, flood or drought) could be made from the sparse dataset. (See Annex 1 for malnutrition data).

2.3.3 Women are more likely to be affected by climate change shocks as they depend more heavily on natural resources – water, agricultural, firewood.

It is recognized by most actors that women in rural South Sudan dominate national food production. This is especially true in communities where there is a heavy reliance on small-scale farming or horticulture. It is subsequently recognized that climate shocks in such communities can have a serious impact, especially on the lives of women and subsequently the household. As Mai, Madut Jok & Tiitmamer, (2017, in press) point out it is these observations that necessitate the application of a gendered lens in climate change studies.

While Funk *et al.* (2011)[17] has documented climate changes since the 1970s, little is known about the extent to which it affects women compared to men in South Sudan. Understanding the extent of climate change and differences in terms of gender impacts is essential, especially in mitigating climate induced vulnerability in the country. Compiling potential areas of impacts on the basis of gender is crucial for further empirical studies and for policy decisions. Yet, it is recognised (again anecdotally) that flood has increased in frequency and intensity in South Sudan. These include increased incidence of flash floods, rivers overflowing or the bank bursting following a heavy rain. There has been a decadal shift in rainfall patterns and there have been reported increases of drought events.

While it is clear that there has been a change in climate variability in South Sudan, there is still a lack of robust evidence that this is currently having an impact on the gender dynamics within the country. As has been outlined in the study, since no resources have been devoted to look at the matter empirically, the nature of differentiated impacts means that climate change most likely has a greater negative impact on women than men, however, these remain hypothesis until an empirical link is established.

17. Funk, C., Eilerts, G., Verdin, J., Rowland, J. & Marshall, M.2011. A climate trend analysis of Sudan. US Geological Survey.

It is only with full knowledge of these differentials that policy responses to climate change can be gender-sensitive and equitable. Subsequently, the most appropriate responses to climate change, should involve the need for women-focused programming for development projects, the need for adequate participation of women in climate related negotiations as well as sufficient gender mainstreaming and gender analysis in policies and programs at local, national and international levels.

Surprisingly, this review demonstrated that although studies have been undertaken on environmental and climate change issues, there is no current evidence that empirically looks at how climate change affects men and women differently in South Sudan. However, there have been a significant number of studies on gender related issues in the country.

As Mai, Madut Jok & Tiitmamer, (2017)'s work as part of the BRACED programme highlights this issue requires an understanding of local level gender differentials, especially within the agricultural sector and how this plays out in the context of labour distribution and household food production.

2.4 Conclusion and Key Recommendations:

There has been a change in climate variability in South Sudan. It must be assumed that this is currently having an impact on the gender dynamics within the country. As has been outlined in the study, since no resources have been devoted to look at the matter empirically, the nature of differentiated impacts means that climate change most likely has a greater negative impact on women than men, however, these remain hypothesis until an empirical link is established.

It is recognized by most actors that women in rural South Sudan dominate national food production. This is especially true in communities where there is a heavy reliance on small-scale farming or horticulture. It is subsequently recognized that climate shocks in such communities can have a serious impact, especially on the lives of women and subsequently the household.

The draft gender action plan (GAP) of the UNFCCC outlines what are key areas that projects must undertake. These include, the need for systematic integration of gender perspectives / considerations in climate change actions at the global, regional, national and sub- national levels.

This study makes the following key recommendations:

1. Build technical capacity within key government institutions. For example, staff within the Ministry of Gender and Women need to broaden their knowledge on climate change.
2. Recognise that women are more likely to be affected by climate change shocks as they depend more heavily on natural resources. Thus, a greater research agenda in this area would help South Sudan.
3. Targeted adaptation actions need to have a good understanding of power and gender dynamics within local agrarian settings.

The photo shows a lake in Aweil West, South Sudan. Photo by BRACED, 2017.

3. Ethnographic Research on Perceptions of Climate Change at the Local Level

Key findings

- All interviewed community members perceive substantial changes in the climate.
- Communities rely heavily on traditional mechanisms to adapt and cope with a changed climate, some of which may not be relevant for today.
- Many respondents doubted their capacity to adapt and spoke of the need for divine or NGO intervention.
- Those with the greatest adaptive capacity were agro-pastoralists with larger herd sizes, those with salaried positions or were receiving remittances and those with support from kin.
- Widows, the elderly and the infirm are the most vulnerable to climatic shocks.

3.1 Introduction

Closely linked to understanding the gender dynamics of climate change in South Sudan, was the need to understand the cultural and social dynamic of how climate change is perceived by communities within the target areas. Using ethnography as a methodology, including participant observation are important tools in understanding the lives and the livelihoods of people who have lived in southern

Sudan for over a century. Cummin's (1904) study of the Sub-tribes of the Bahr El Ghazal Dinka[18] and Evans Pritchard's (1940) the Nuer of Southern Sudan[19] are classic descriptions of the people of this region.

This paper explores the perceptions and experiences of climate change, adaptation and resilience among agro-pastoralist and farming communities in Tonj South and Aweil West.

3.2 Methodology

This anthropological study explored the perceptions and experiences of climate change, adaptation and resilience among agro- pastoralist and farming communities in Tonj South and Aweil West. Data was collected in 6 IRISS BRACED target communities across the two regions focusing on experiences to the DInka Malual and Dinkya Thony (Rek) as well as the Bongo and Luo tribes. It utilised in-depth interviews, focus group discussions, key informant interviews, surveys and participant observation. South Sudanese ethnographic researchers were trained and undertook the data collection and data analysis.

3.3 Key Findings

3.3.1 All communities perceive substantial changes in the climate

Although the interactions with the community were limited, the results proved to be very meaningful. As such they should be recognized as a key contribution to understanding local level adaptation strategies. Utilising an ethnographic approach allowed for four key areas to be explored; perceptions of climate change, flood and drought, coping and adaptation strategies and access to/or perceptions of early warning or weather information. It is clear that this opened up a huge amount of opportunities for insights at the local level. These included: the lack of knowledge of the concept of climate change, its root causes and its potential long-term impacts.

All people interviewed as part of the study poorly understood the concept of climate change. Thus, discussing issues around the topic is challenging. In such contexts, there is a clear need to rephrase and clarify in order for the concept to be understood. Respondents reacted best to language around changes in rainfall, flood, drought and shifting seasonality. Yet, almost all participants had a clear understanding that a change had occurred in weather patterns. However, no one had a clear way to describe the holistic nature of climate change.

Detailed discussions with informants at the community level, revealed that there was a decrease in rainfall over time, especially by the elderly. This rainfall was often described as "bad" and insufficient to meet the needs of the community. It followed that many individuals

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18. Cummins S.L (1904) Sub-Tribes of the Bahr-El-Ghazal Dinkas. The Journal of the Anthropological Institute of Great Britain and Ireland, Vol. 34 (Jan. - Jun., 1904), pp. 149-166
19. Fortes, M. and Evans-Pritchard, E.E, (1940b) "The Nuer of the Southern Sudan". in *African Political Systems*. M. Fortes and E.E., eds., London: Oxford University Press., p. 272-296.

perceived a shift in seasonal rains from April to May in Aweil West. There were also many responses around the perceived loss of the "Deng Wall" (also known as the "grass rains" – short light rain that leads to grass growth), especially when speaking to agro-pastoralists. Yet, this was not always backed up in group discussions. This type of mixed messaging regarding climate variability is very normal at the ground level[20].

South Sudan is affected by drought yet this study showed that many people struggle to identify the exact timings of such events. However, it is generally recognized that there has been an increase in their frequency. This is then juxtaposed against the clear perception that flooding has changed. However, there is a difference in how younger and older participants anticipated and judged flood. Elderly people within the study frequently spoke of past floods as "bigger and better", bringing lots of fish, in contrast to more recent flooding which they described as smaller but more erratic. Whereas younger members of communities rarely described flooding as beneficial but all agreed that it was unpredictable. Most agreed that earlier onset heavier rains, which often led to flash flooding was more destructive, especially in damaging crops but not less productive as it usually led to the arrival of increased number of fish.

Taken by the BRACED consortium members, 2017.

One of the notable issues that seems to inhibit people's ability to attribute climate related events to specific time periods is the lack of instruments for measuring the passage of time (for example, calendars, watches). Events such as conflict or severe droughts are often the markers of time for people.

3.3.2 Communities rely heavily on traditional mechanisms to adapt and cope with a changed climate, some of which may not be relevant for today.

The introduction of money and markets at community levels can during times of stress, support households to sell assets or natural resources and indeed adapt to climate change. However, collective reliance on natural resources can lead to depletion of commons and ecosystem services for communities. However, in most cases, communities rely heavily on traditional mechanisms. These include ethno-meteorology, migration, building bigger livestock herds and traditional dyke and water channel building.

3.3.3 Many respondents doubted their capacity to adapt and spoke of the need for a higher power or NGO intervention.

For many respondents, 'God' (a higher power) was the most likely entity responsible for the changes in rainfall and climatic change. These changes were postulated to be as a result of God's anger at the on-going conflict.

3.3.4 The greatest adaptive capacity is found in agro-pastoralists with larger herd sizes, those with salaried positions, those receiving remittances and those with support from kin.

It is suggested that greater economic strength can lead to better climate resilience at the local level. Thus, supporting livelihood diversification, whether it is home-gardening, livestock management or crops can lead to a better ability to absorb post-disaster shocks.

20. Ulrichs M., Cannon T., Newsham A., Naess L.O., Marshall M. (2015). Climate Change & Food Security Vulnerability Assessment. Toolkit for assessing community-level potential for adaptation to climate change. CCAFS Working Paper no. 108. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

3.3.5 Widows, the elderly and the infirm are the most vulnerable to climatic shocks.

At the local level, spreading the burden of food security and safety often benefits from marriage and family ties. When these are lost, through death, migration, older age, it can result in higher levels of climate vulnerability.

3.4 Conclusion and Key Recommendations:

Although the ethnographic research could have been deeper, especially in terms of time, it is clear that this type of research offers huge insight into the lives of the people of South Sudan.

This study makes the following key recommendations:

1. There is a need to improve monitoring and early warning systems for climate induced shocks and stresses. This should include improving on dissemination and communication of climate change related information at multiple different levels.
2. There is a need to improve community response capability for climate related disasters. The development of Community Based Disaster Risk Management plans could be further enhanced in the country.
3. There needs to be a recognition that strengthening community institutional structures, enhancing collective actions and improving local government can contribute to climate resilience.
4. Development practitioners must build in sufficient time for sensitising communities to interventions that are occurring.
5. Support the ability of communities to have improved natural resource management at the ground level.

4. Climate information Services in South Sudan

Key Findings

- Most of the respondents used and trusted the climate information they received, which means if climate information is available – it will change people's behaviour.
- Traditional rainmakers are still influential (ethno-meteorology) and Traditional Ecological Knowledge (TEK) is strong.
- Many institutions are creating climate related data, however, they are not coordinating. Thus, key information is not reaching end users (pastoralists and farmers).
- Community members prefer to receive climate information through the radio and community meetings, which means oral communication is a key channel for delivering climate information services.

4.1 Introduction

A number of institutions are currently generating climate related information in South Sudan and for the East Africa region. These include: the South Sudan Meteorology Department (SSMD), FEWSNET, the UN system, ICPAC and some

NGO's. Each of these organisations has different reasons why they produce this information. For example, WFP and FAO, integrate weather information into assessments on food security in the country. SSMD produces information that supports the aviation sector daily and a seasonal forecast for various users in the country. Few producers of such information or those that utilise such information, have been systematically helping people to integrate climate information into decision- making at the local level. However, as climate change threatens food security, there is a greater recognition around the world, that climate information services (CIS) are helping people make better decisions in the short and longer term. See Table 2 for an example of how climate information is being used by farmers.

	Type of Information	Delivery of Information	Effect on Farmer/ Pastoralist/ Fisherperson
WEATHER Days to Weeks	• Observed rainfall and temperatures • Daily forecasts up to one week of time • Alerts on pests and disease • Early-warning of extreme weather events	• Mobile Phone • Radio • Television	• Timing of planting and harvesting • Timing of fertiliser application • Protecting lives and property from xtreme event
CLIMATE VARIABILITY Months to Years	• Probabilities for seasonal rainfall and temperature conditions • Seasonal climate variables for specific agricultural risks (e.g dry spells) • Historical climate variability and comparison with today	• Expert meetings • Conversations with agricultural extension workers	• Selecting appropriate crop variety or animal breeds • Intensifying or diversifying crops • Diversifying household income streams.
CLIMATE CHANGE Decades +	• Projection of future rainfall and temperature. • Historical climate trends for rainfall and temperature.	• Workshops with: researchers, farmers, agricultural extension agents, forecasters, national meteorological services staff	• Changing agricultural production strategies. • Major capital investments (e.g irrigation, purchasing land

Table 2: How Farmers around the World are Making Decisions based on climate and weather information (Adapted from CCAFS[21], 2016)

[21] Climate Services and Safety Nets https://ccafs.cgiar.org/themes/climate-services-farmers

4.2 Methodology

Stakeholders were invited to participate in a technical working group meeting held on 7 April 2017 at The Sudd Institute. The following organisations attended: Concern Worldwide, ACTED, Ministry of Environment and Forestry, South Sudan Meteorological Department (SSMD), FAO, SNV and the Ministry of Humanitarian Affairs and Disaster Management. The agenda items included: presentation of the Seasonal Weather Forecast Model Concept Note by The Sudd Institute, presentation of Simplified Seasonal Forecasts for March, April and May by South Sudan Meteorological Department and discussion and agreement on the mode of dissemination of the forecasts by all.

Seasonal forecasts, developed by ICPAC and the South Sudan Meteorology Department for the months of June, July, August and September, were modified into simple language by the Sudd Institute and distributed monthly by Concern and ACTED staff to communities in Aweil West, Aweil North and Tonj South. The Sudd Institute conducted an end user feedback survey to find out if the participants had:

1. Received the forecasts,
2. Applied the advice that accompanied the forecasts,
3. If the actual rainfalls were in line with the forecasts,
4. Trusted the forecasts,
5. Found the forecasts useful
6. The choice of the forecasts dissemination channels in the future.

4.3 Key Findings

4.3.1 Most respondents used and trusted the climate information they received. Which means if climate information is available – it will change people's behaviour

Having received the information at the local level, the question was whether people's behavior would change. Of 353 people interviewed in the three study sites, 62 percent said they used the information, roughly 23 percent said they did not use the information and 14 percent said they had simply not received it.

In terms of usefulness, it was found that most respondents used the forecasts to start planting agricultural produce (39 percent) followed by planting on higher ground to avoid flooding (13 percent), planting seeds that can do well during a flood (4 percent), moving cattle to escape flooding (2 percent), planting on low ground to minimize drought (2 percent) and preparing to irrigate crops (1 percent).

Although it is recognized that participants behaviour did change, it is noted by the authors that a seasonal forecast is just an indication of future weather. In this case, the forecast matched the resultant weather conditions. A varied forecast and resultant variable weather could lead to maladaptive practices if it is taken as "gospel".

4.3.2 Traditional rainmakers are still influential and Traditional Ecological Knowledge (TEK) is strong within the community.

Agro-pastoralists and farmers in South Sudan are ready to use weather forecasts to make decisions. In fact, this is in line with traditional ways of informing farming decision-making and can be built upon within rural areas. Traditional methods are not currently fully understood by outside actors in South Sudan. However, "rain-makers" can be particularly knowledgeable about environmental indicators that support their declarations on expected weather patterns and their intensity.

4.3.3 Many institutions are creating climate related data, however they are not coordinating. As a result key information is not reaching end users (pastoralists and farmers).

Based on the pre-meeting for the development of the methodology for this research, participants recognised that a number of institutions are already producing climate related information, including SSMD, FAO and WFP. BRACED has also been involved in collecting some climate related information. It was found out that little institutional infrastructure exists to bring the benefits of these efforts to end users, especially those involved in agriculture.

Much climate information generated is project- based and undertaken by development actors in South Sudan. This can mean that there are duplicitous methods in which information is passed to communities – including meteorological information and disaster (flood or drought) related information.

4.3.4 Oral communication is key to climate information services currently.

Participants of the climate information pilot study preferred to receive climate information through the radio and community meetings, which means oral communication is a critical channel for delivering climate information services. The key finding here relates to who receives information and how information is passed between members of the community. The majority of the study participants were woman. These women were predominantly illiterate. Yet, many had actively sought out the climate related information. This was communicated orally (from BRACED Field Officers). This means that climate information providers need to take this into account in the future.

The mostly widely regarded method for climate communication is the radio. Although, it is clear that not all community member in this study had access to a radio, it was acknowledged that information is sought out by members of the community. This means radio-owners almost have an expectation that they will pass on information to other community members.

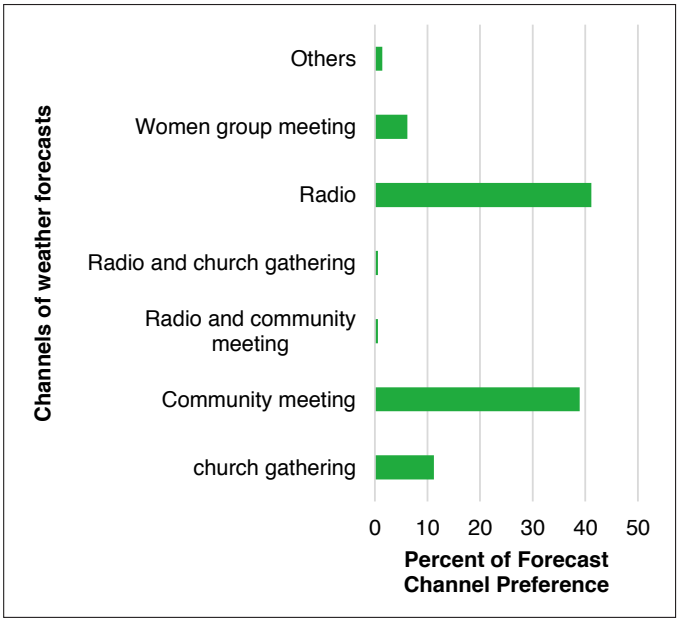

Figure 2: Preferred Climate Transmission Method

4.4 Conclusion and Key Recommendations:

This study makes the following key recommendations:

1. Establish a permanent national technical working group on climate and weather services to coordinate, review, translate and disseminate information to key users (e.g agro-pastoralists, farmers, airlines)
2. Develop a financial and meteorology strategy for long-term climate services in South Sudan.
3. Get buy in that all data producers of climate information should pass this to a centralized repository.
4. Increase weather measurement equipment that meet WMO standards.
5. All equipment purchased for climate information should be shared with SSMD.
6. Increase weather measurement equipment that meet WMO standards

w7. Traditional rainmakers are still influential and Traditional Ecological Knowledge (TEK) is strong within the community. However, the basis for this knowledge is poorly understood. Increasing our understanding of this could greatly benefit development actors. Further research in this area would be beneficial to South Sudan.

8. Increase national capacity on climate and weather generation (exchange visits with global forecasting centres, for example, NOAA's Africa Training Desk
9. Identify potential private sector role in weather information creation and dissemination.
10. A greater understanding of the best oral communication strategies for climate and weather related information is needed in South Sudan. This should be an area of research for development actors.

5. Flood Impact Assessment

Key Findings

- There has been a shift in seasonality, especially rains
- Crop damage and destruction is the most critical negative impact of flooding
- Flooding can be viewed as positive by members of the community
- Income-generating livelihood activities follow a clear seasonal pattern
- Dyke building is the primary disaster risk reduction activity
- Communities desire assistance with the construction of water channels and water storage facilities

5.1 Introduction

As a member of the BRACED consortium, ACTED contracted IMPACT Initiatives to conduct an assessment of flood vulnerability in the flood prone river catchments of Northern Bahr el Ghazal and Warrap. 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.

5.2 Methodology

This research undertook extensive secondary data reviews 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.

5.3 Key Findings

5.3.1 There has been a shift in seasonality, especially rains

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. Unreliable rains and floods hinder the ability of people to feed themselves and build their financial assets. This feeds into the continued violence, instability and fragility of the nation.

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 this can 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.

While some respondents in villages reported that no real changes have 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. As a result plants are more vulnerable to being destroyed by the typical floods.

5.3.2 Crop damage and destruction is the most critical negative impact of flooding

Crop damage and destruction is the most critical negative impact of flooding. This is followed by shelter damage and destruction, and disruptions in access to healthcare and education facilities. This is illustrated in Figure 3. Flooding is a regular part of existence in these areas of South Sudan, with both drawbacks and benefits. 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.

5.3. 3 Flooding can be viewed as positive by members of the community

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

5.3.4 Income-generating livelihood activities follow a clear seasonal pattern

Climate change adds continued destruction to the already devastated situation in South Sudan. The overwhelming majority of South Sudanese rely directly on the land for their livelihoods, with 85 percent of the population depending on farming, fishing or herding to meet their food and income needs. 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.

Overall, 62 percent 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 boom, 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

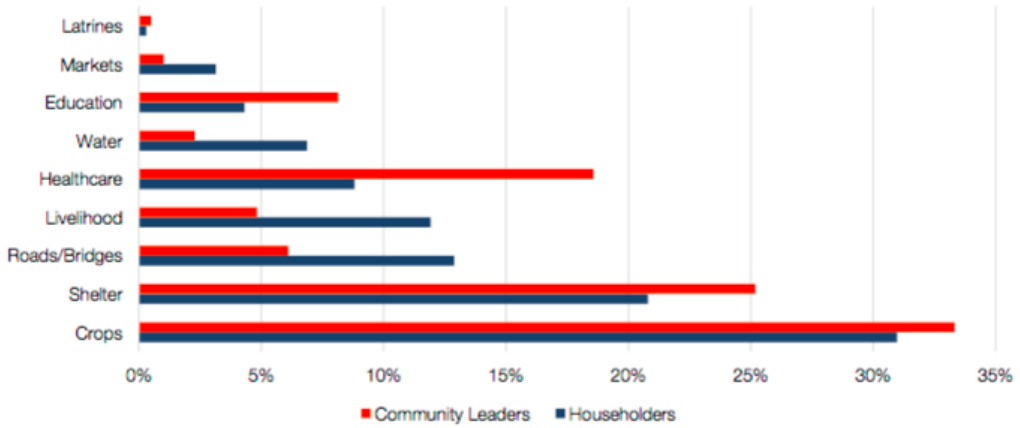

Figure 3: Most Important Services or Activities Impacted by Flood Destruction or Disruption

Taken by the BRACED consortium members, 2017.

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.

5.3.5 Dyke building is the primary disaster risk reduction activity

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 use. In the past, dykes would typically be built only around housing compounds. But now that floods increasingly arrive before harvest time, 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.

5.3.6 Communities desire assistance with the construction of water channels and water storage facilities

The construction of water channels and water storage facilities was 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.

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.

5.4 Conclusions and recommendations

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.

This study makes the following key recommendations:

1. Enhance sustainable livelihoods through the introduction of climate smart technologies for agriculture, livestock, natural resources management and livelihoods diversification. This should include working within the context of indigenous problem solving and belief systems.

2. Support easy migration. It is critical that programmes, policies and infrastructure support residents' continued ability to live the semi-nomadic lifestyle historically seen in the study area. 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. 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.

3. Avoid enabling development in land that will inevitably flood. 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.

4. 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. 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.

5. Promote effective policy, planning and learning, particularly on investment in agro-pastoral communities, climate change adaptation, disaster preparedness and gender specific risks. This can be done through various mechanisms. 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. 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.

6. Climate Change and Conflict

Key Findings

- Using a climate change lens on communal and political conflicts can offer insights in South Sudan.
- There has been a decrease in rainfalls and increase in temperature since 1970s yet historical data on climate extremes shows an increase in flood and drought episodes.
- Meteorological data demonstrate a statistically insignificant link between climate change and conflicts but historical records reveal conflict happens after a flood or drought.
- The movement of people after flood and drought increases the likelihood of conflict.
- Historical records and oral narratives do demonstrate linkages between climate variability and conflict.

6.1 Introduction

Climate change is expected to bring about major changes in freshwater availability, flooding, drought, the productive capacity of soils, and migration of people. However, considerable uncertainties exist with regard to the extent and geographical distribution of these changes. Making predictions on how climate-related environmental change may influence conflict is difficult. Raleigh and Urdal (2007) indicate that the effects of political and economic factors far outweigh those between local level demographic/environmental factors and conflict.

In South Sudan, the search for scarce resources has been in the form of invasions of nearby communities to raid cattle and other resources or migration to a new area to look for opportunities, which brings new arrivals into competition with the landowners, which has led to conflicts. Cattle-raiding has a long history in South Sudan Cattle and have been a source of communal violence for decades. Since 2005 there has been a significant escalation of these conflicts and it appears that the nature of cattle raiding has transformed from small scale to collective violence. Attacks now result in the massacre of hundreds of people, the razing of entire communities, and the destruction or theft of cattle and crops. Not only is there no end in sight for this violence, but it also appears to be increasing in frequency and intensity[22]. This is also hampered by the collapse of traditional rule based norms and dispute resolution mechanisms.

6.2 Methodology

This study composed of undertaking a comprehensive literature review. Random effect models were utilised to identify colorations between climate related shocks and conflict events.

6.3 Key Findings

6.3.1 Using a climate change lens on communal and political conflicts can offer insights in South Sudan

While Funk et al. (2011) have documented climatic changes in South Sudan since the 1970s, little is known about the extent to which these changes contribute to conflict in South Sudan. The unpredictability of climate variability makes it difficult for policy makers and households alike to plan accordingly in securing their livelihoods. Meteorological data analysed from Juba, Wau and Renk indicate temperature increases by roughly 0.5 and 1 Degree Celsius since 1970. This suggests that droughts or famines in the region could be a manifestation of climate change.

6.3.2 Meteorological data demonstrate statistically insignificant link between climate change and conflicts but historical records reveal conflict happens after a flood or drought

The findings show mixed empirical evidence on the connection between climate change and conflicts. However, lack of evidence does not mean lack of connection (Detges 2016)[23]. Lack of connection or statistical significance could be attributed to the inadequacy of the data due to the low numbers of meteorological stations, particularly in areas where most of the conflicts and climatic hazards occur.

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22. Richardson, T. 2011 *Pastoral Violence in Jonglei* http://mandalaprojects.com/ice/ice-cases/jonglei.htm

23. Detges, A. 2016. Local conditions of drought-related violence in sub-Saharan Africa The role of road and water infrastructures. Journal of Peace Research. Volume: 53 issue: 5, page(s): 696-710

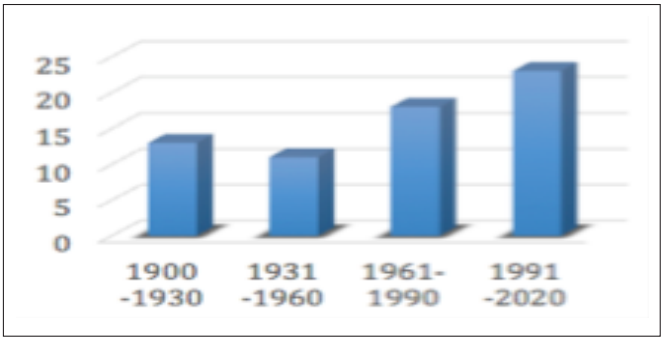

Figure 3: Flood Occurrences Grouped 1900-2017 in 30-year intervals

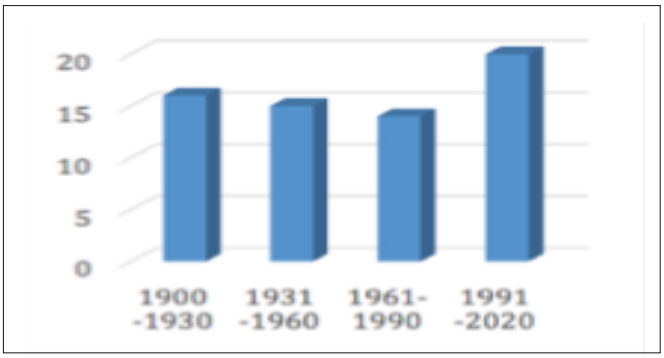

Figure 4: Drought Occurrences Grouped in 30-year intervals

The study demonstrates the need to refine variables and improve data records to capture the full picture of the relationship between climate shocks and conflicts. While data using random effect models suggest insignificant evidence, a look at historical record reveals that conflict happens after the flood or drought has displaced people.

For example, Johnson explains that four major recorded floods of the 19th century, namely, Amol Magook, Nyoc Bor Mogogh, Nyoc Mut Roal and Nyoc Mut Mandoang were associated with battles between Nuer and Dinka in the areas around Khor Fulluth, Pading and Duk Ridges. These battles occurred after displacements caused by competition over scarce resources like water and pastures. Interviewees in Aweil and Tonj told us also that communities clash after displacements by droughts or floods.

It is clear that climate induced disasters play a key role in exacerbating and potentially initiating conflict in South Sudan. However, a much greater level of analysis is needed. Historical records of flood and drought and their relationship with conflict demonstrate that conflicts occur after such events. In short, regions that are prone to such disasters are prone to conflicts.

6.3.3 There has been a decrease in rainfalls and increase in temperature since 1970s yet historical data on climate extremes shows an increase in flood and drought episodes.

To determine the extent of change in the incidents of floods and droughts over time, the Sudd Institute reviewed literature and compiled records of incidents of floods and droughts since 1900. This identified 65 large flood events and 65 drought events. These were further grouped into 30-year periods, 1900 – 1930, 1931 -1960, 1961 – 1990 and 1991 – 2017 to analyse which periods have witnessed increases or decreases in flood and drought occurrences.

Based on these records, the frequency of floods has increased in the last 60 years, with the last 30 years witnessing the highest number of floods (See Figure 3).

In addition, the periods from 1900 -1930, 1931 - 1960, 1961 -1990 and 1991 – 2017 witnessed 16, 15, 14 and 20 incidents of droughts respectively (see Figure 4). Like the flood, drought incidents have also increased in the last 30 years even though the previous 30 years, unlike the flood events, have seen a decrease in the drought frequency.

Nevertheless, this shows the trend is moving in the same direction, indicating the increase in the incidents of climate-induced disasters in South Sudan.

6.3.4 Historical records and oral narratives demonstrate linkages between climate variability and conflict.

Major floods of the 20th century have also been associated with conflicts. There are a number of cases of conflicts associated with floods and droughts worth mentioning. These include: the Pastoralist–Farmer Conflict in Equatoria, the Dinka – Nuer Conflict, among others. While these conflicts have been caused by other factors, climate induced stresses and shocks in the form of floods and droughts have played significant roles either in triggering or exacerbating the hostilities. Getting to the root causes of such conflicts is difficult. However, historical analysis through the creation of oral narratives could help in this process.

Case Study: 1991 flood, Nuer – Dinka Conflict and re-emergence of pastoralist- farmer conflict

Salehyan & Hendrix (2014) and Uexkull (2014) demonstrate that the chances of a flood or drought causing conflict are higher with communities that depend on rain-fed agriculture and livestock and even the highest with a community that traditionally carries out cattle raids against its neighbours compared to communities that do not carry out cattle raids

While the catastrophic Dinka – Nuer Conflict of 1991 was caused by multiple political and historical factors, including the SPLM/A split, one important climate related factor is worth mentioning as having played a multiplier effect. It is argued that the devastating flood of 1991 that destroyed crops and livestock in most parts of Upper Nile played a role. The destruction of crops and livestock left the civilians vulnerable and therefore incentivised recruitment, especially for younger men to join with the warring sides. For many, joining was viewed as an opportunity to compensate flood losses through cattle raiding.

Indeed, thousands of civilians joined the SPLM/A Nasir Faction as the White Army and marched to Bor, Duk and Twic in November 1991. The "spoils of war" resulted in taking livestock but tragically resulted in murder and destroyed communities. The interests combined at this point in time: civilians wanted to get livestock and SPLM/A factions wanted to get recruits to defeat their political opponents. When, this convergence of interests broke down, this White Army deserted after the invasion of Bor, Duk and Twic in 1991.

Any White Army that remained in these areas continued cattle raiding and maintained the inter-tribal rivalry between the Dinka and Nuer. Yet, the invasion in Bor, Duk and Twic lead to displaced people migrating to Equatoria states Not only did the communities migrate, remnants of the their "cattle camps" escaped to Mongolla and crossed to the western side of Bar el Jebel. Untouched by the White Army incursion, these cattle camps formed the nucleus of the many Dinka groups that would cause tensions in Equatoria in the 1990s, 2000s and 2010s.

While various effects have been made to return pastoralists to their original homelands, these efforts have been generally futile because of a combination of factors which include shrinking of pasture land in original areas and the widespread cattle raiding which occurs in these original lads. Ultimately, the pastoralists prefer Equatoria because of access to water and greener pastures year round and because tribes in Equatoria do not conduct cattle raiding.

For example, in the paper *Reconstructing a History of Local Floods in the Upper Nile Region of the Sudan*, Douglas Johnson (1992)[24] used both oral and written histories to account how ecological change manifested in social change. He concluded that floods greatly influenced the timing of the battles between various tribes in the region.

24. Johnson, D. H. (1992). Reconstructing a history of local floods in the Upper Nile Region of the Sudan. The International Journal of Historical African Studies, Boston University.

6.4 Conclusions and Key Recommendations:

This study makes the following key recommendations:

1. Investment in climate services, especially in areas of protracted conflict, is urgent.
2. Promote a better understanding of rain-fed agriculture/pastoralism/conflict nexus.
3. Cultivate communal dialogue around natural resource management at local levels. A significant amount of time needs to be allocated to understanding this process.
4. Integrate climate change into peace processes (e.g. National dialogue, revitalization process).
5. Build communal assets (e.g dykes) that prevent the flood/drought/migration nexus.
6. Increase the amount of conflict data in South Sudan and what are its key drivers.

Taken by the BRACED consortium members, 2017.

7. Seed Systems for Climate Resilience in South Sudan.

Key Findings

- The best locally selected varieties also proved the most vigorous in the University of Juba tests.
- Flood and drought resistant sorghum is very well understood at the local level.
- There can be a strong informal seed sharing system, but this is not a market-based system.
- Community seed banks are non-existent in study sites.

7.1 Introduction

This study explored the existence of flood and drought resistant seed varieties in the study areas of Aweil North, Aweil West and Tonj South. It aimed to try to understand how communities in the study areas have been able to store and preserve seeds, during and after climatic shocks and lend insights into ways of improving seeds storage and preservation measures. It also analysed the existence of community seeds banks and supply chains for use after climate change induced disasters such as floods and drought shocks.

7.2 Methodology

A comprehensive desk review of literature was undertaken. This was complemented by interviews with key informants and surveys at the community level. In the field, trials with local sorghum varieties were undertaken with communities and at the University of Juba.

7.3 Key Findings

7.3.1 Flood and drought resistant sorghum is very well understood at the local level.

Interviews were carried out at Agro-Pastoralist Field Schools (APFS)[25], established in Tonj South, Aweil North and Aweil West. Respondents outlined a detailed knowledge of flood and drought resistant sorghum during these sessions. In all study areas, it was found that there were drought and flood resistant sorghum landraces (varieties) available. The table below gives a brief local name (taxonomy) of these.

25. Organised by BRACED partner FAO.

State / Payam	Boma/ APFS	Drought tolerant Sorghum Varieties	Flood tolerant Sorghum Variety
Tonj South/ Tonj	Malual muok (Khartoum Jadit)	Jang, Kuolmeth, Awou, Luel, Matwet, Balek, Aruomror, Gak,	Jang, Luel, Aher, Nyandak,, Awou,
Tonj South/ Manyangok	Basal group - Pinybarkou	Abal , Aher, Achol- kol, Matwet, Kuolmeth, Machot, Nyandak	Jang, Matwet, Machot , Achol-kol, Luel& Anyang jang
Tonj South/ Agouka	Agouka –basal group	Beeno, Abeel	Uluello,
Aweil North /Malwal North	Adhal/ Muorriil	Malwal, Raap chol, Rapher, Gadam el hamam,	Malwal, Raapchol, Yar, Lueel, Rapher,
Aweil North /Malwal North	Panyior/AkutLuoi	Yaar, Gadam Elhamam, Malou, Malwal, Rapher, Rapchol	Yaar, Malou, Warabor, Malwal, Rapchol, Rapher
Aweil North / Malwal North	KakLuol/Nhier	Rapchol, Malwal, YaarRapher	Raapchol, Malwal, Rapher
Aweil West/ Gumjurcentre	Ayakhoong/ Matkuruot	Rapchol, Rapher, Yar, Malwal Anyath, Macot,	Malwal, Rapher,
Aweil West/ Gumjurcentre	Amodhic/ Matkuhookcin	Najat, Munasamat, Rapchol, Warabor, Machot, Gadam el hamam, Yar	Warabor, Malwal, Rapher, Rapchol, Lueel Jang.
Aweil West/ Gumjurcentre	Angol/Purku	Rapher, Malwal, Yar, Malwal -anyueth, Wedakar, Lueel, Rapchol, Kuolmeth	Kuolmeth, Malwal, Rapher, Warabor,
Aweil West/Gumjurcentre	Ayaktiik/Hai referendum	Malwal, Yar, Rapchol	Malwal, Lueel

Table 3: Flood and Drought Resistant Sorghum Varieties in Study Sites

7.3.2 The best locally selected varieties also proved the most vigorous in the University of Juba tests.

From the results six sorghum varieties namely, Yar, Malwal, Rapher and Aher stood out with superior yields in comparison to Luel and Achol kol. These findings from the field trials confirm the results obtained from the survey study. Thus, the results from the two studies support the existence of several droughts and flood tolerant /resistant sorghum varieties in the three areas of Tonj South, Aweil North (Gog Machar) and Aweil West (Nyamliel) covered by the study.

7.3.3 There can be a strong informal seed sharing system, but this is not a market- based system.

All respondents indicated they keep their own seeds in the houses for security. They also indicated that in the event of shocks (e.g conflict, flood etc) if seeds of certain crops were lost they partook in crop seed exchanges. For example, exchanging groundnut seeds with either sesame seeds, sorghum or vice-versa with those individuals within the community who happen to have some of these crops seeds. However, if all is lost or eaten in the face of the perennial hunger conditions in the areas of study, the individual families can sell livestock (mostly goats) with the proceeds being used to purchase the crop seeds from neighbouring communities.

Exchanging with other communities requires traveling varying distances and is usually undertaken using bicycles or motorcycles. Thus, this appears to be the only indirect seed chain(s) linkages available. The communities in the target study areas all indicated that they do not add any additives to preserve seeds during storage, except for the addition of wood ash in quantities of about 1kg per 20L jerry can plastic containers.

7.3.4 Community seed banks are almost non-existent in study sites.

In the target study areas, there was no evidence of any form of community-based seedbanks or definite seed value chains. The community is almost totally dependent on their individually kept seed reserves and what is exchanged. These are protected in the household and utilized for planting if conditions are appropriate (e.g correct weather conditions and no conflict). In times of extreme shocks (e.g conflict, flood) seeds may be eaten. On occasion even livestock (goats) can succumb to the effects weather shocks.

In the interviews, 90 percent of the respondents explained they don't have any community seed stores in their community. The 10 percent who confirmed the availability of community seed stores were asked who administers the stores, 50 percent of them said it is managed by the church, while 25 percent of them stated the government as being responsible and another 25 percent mentioned NGOs. The participants were asked if the seeds are given out only after drought/floods or famine outbreak. 73 percent of the participants responded positively and only 27 percent of them said that seeds are not only given out during disaster outbreaks.

7.4 Conclusions and Key Recommendations:

This study makes the following key recommendations:

1. Further investigation in identifying crop varieties with tolerance or resistance traits to drought and floods is needed. This could include introducing and testing new climate suitable seed – from within South Sudan or from other parts of the world.
2. To improve seed storage, research should fill the gaps in the use of wood ash, dried neem Azadiractha indica L. leaves, to include other plant materials e.g. to include (=neem seed or kernel powder, Balanites aegyptiaca (Laloob) seed materials and oil, Eucalyptus camaldulensis and other Eucalyptus. spp. leaf materials) and establish the exact and accurate doses of these materials to be used per quantity of crop produce available for storage.
3. Increase local knowledge on new pests arriving. Particular emphasis should be put on upcoming attacks of Fall Armyworm that is having a devastating impact on crops.
4. The seed system should be reinforced and the following recommendations in the long term could be added to achieve that:
    - Establish collaborations with research centres in country (better) to further improve the traits of the varieties already identified and tolerant to drought and floods
    - Work with farmers groups to multiply those seeds varieties for further distribution to farmers
    - Engage with research/MoA to get seeds certified as "Quality Declared Seeds" and label/pack them appropriately
    - Engage the private sector and local market actors, small agro-dealers to sell the seeds at reasonable price
    - Explore the seeds banks system already in place, how do they work, challenges, and try to pilot in some communities.

8. Land Tenure in South Sudan: Does it Promote Climate Change Resilience?

Key Findings

- Land tenure systems in the three counties studied follow both customary and statutory regimes.
- Formal arrangements for ensuring land tenure security stipulated in the Land Act
- 2009 have barely been enforced.
- Statutory and customary land laws grant women most land rights, except the right to inherit land from husbands in the event of divorce.
- The customary system mandates community leadership to regulate the usage of land and in accordance with traditional norms of land access.
- Preferential treatment is given to conflict displaced persons over climate disaster displaced persons.
- Communities respond to floods and drought differently and the response depends on the nature of disaster.
- There is a strong communal reciprocity system in place, which allows the displaced communities to have free access to land for crops, pasture, fishing, hunting and firewood

8.1 Introduction

Little is known about the extent to which the current land tenure system in South Sudan allows people to adjust to climate shocks and stresses. This study examines the land tenure system-climate change nexus in South Sudan's three counties of Aweil North, Aweil West, and Tonj South. The paper contributes to the growing academic literature and policy debates investigating land tenure and climate change. Studying the climate change – land tenure nexus is crucial because climate change-induced floods and droughts have huge impacts on communities, particularly in terms of access to land for several uses, including settlement, grazing, water, crop production and fishing, among others. The ultimate aim of this research was to determine how the current land tenure system allows individuals, families, and communities to mitigate or adapt to climate shocks and stresses.

8.3. Methodology

A desk review of literature and key informant interviews with agro-pastoralists and farmers in the three counties of Aweil North, Aweil West and Tonj South in former Warrap and Northern Bhar el Ghazal States was carried out. Key aspects that were examined included customary and statutory laws governing access to land in South Sudan, and how these are responsive to land access issues arising due to climate change shocks and stresses.

8.3 Key Findings

8.3.1 Climate change –land tenure nexus

Climate change has become a global threat. This has prompted an urgent need to understand its link with land tenure, with the hope to design land tenure systems as a resilience tool. If a land tenure system is weak, it worsens climate displacements and can lead to loss of land based livelihood opportunities, exacerbation of land conflicts or eruptions of new ones, food insecurity and vulnerability.

However, if the land tenure system is strong, it can contribute to climate change resilience measures. In the case of in South Sudan, these could include: recognizing the communal reciprocal system of social relations, communal dialogue and conflict resolution, communal land boundary demarcation and communal land titling, reserve land for the vulnerable groups, land protection and management measures.

8.3.2 Land tenure systems in the three counties studied follow both customary and statutory regimes.

The results show that land tenure systems in the three counties studied follow both customary and statutory regimes. Customary land tenure is dominant in rural areas while the statutory land tenure is most prevalent in urban areas, particularly in areas within 7 miles of modern towns. Governed by government institutions instead of traditional authorities, the statutory structure is more recent and it is supposed to ensure tenure security through formal, legal and administration recognition.

8.3.3 Formal arrangements for ensuring land tenure security stipulated in the Land Act 2009 have barely been enforced

While the Land Act 2009 provides for formal arrangements for land tenure security in form of land

surveys, demarcations, registration and titling, they have barely been enforced. For example, in rural areas, there has not been any land survey, demarcation of communal land boundaries, issuance of communal land certificates and cadastral administration. While those formal processes have been started in towns (e.g. Tonj, Nyamlell and Gok Machar), they have not been completed due to cost and other challenges. For example, only about 25 percent of land in Tonj town has been surveyed. This poses a serious tenure security issue for urban residents.

While formal land tenure security processes have not been enforced in rural settings, customary norms provide tenure security through social recognition. For example, an individual's land ownership within a community is affirmed through active land usage via crops, houses/ homes and trees one has planted, among other uses. In addition, a particular community's ownership of the land is also recognized by other communities. It is this recognition that provides tenure security for communal land through which its members and allies can have continuous access. However, if another community also claims ownership, it can create a communal land dispute that often results in communal violence if it is not managed well. There have been a number of catastrophic communal land disputes in the study areas, including a dispute between Muok and Thony Sections of Rek Dinka in Tonj South, which resulted the deaths of about 100 people in 2016. A fair demarcation and registration of communal land can minimize disputes between communities over land, which are actually exacerbated by climate displacements.

Land Tenure Security Aspects	Customary				Statutory			
	Towns		Rural areas		Towns		Rural areas	
	In practice	In the law	In practice	In the law	In practice	In the law	In practice	In the law
Land survey	P	Y	N	Y	P	Y	N	Y
Communal boundary demarcation	P	Y	N	Y	P	Y	N	Y
Communal land title deeds	P	Y	N	Y	P	Y	N	Y
Individual land title deeds	P	Y	N	Y	P	Y	N	Y
Season rights recognition	P	Y	Y	Y	P	Y	Y	Y
Social norms recognition	P	Y	Y	Y	P	Y	Y	Y
Communal reciprocal support	N	N	Y	N	N	N	Y	N
Land administration & management approaches	P	P	P	P	P	P	P	P

Table 4: Land Tenure in Study Sites

Interpretation: P= partial or inadequate, N=no or not existing, Y= yes or available.

8.3.4 Statutory and customary land laws grant women most land rights except the right to inherit land from husbands in the event of divorce

Looking at the land tenure – gender nexus, statutory and customary land laws grant men and women equal rights to use, control, own, rent, lease and sell, inherit from spouses, as well grant protection (see table 5). However, these do not grant women the right to share land with husbands. However, divorced women can still get land through either their natal families or communities under the customary tenure system or new husbands. But in cases where divorced women have either no relatives, or have not remarried, especially women in urban areas, they often have no access to land. Married women have more rights than those in other categories. Women's loss of membership and access to land in the marital community through divorce is worsened if they have no children of their own. However, if the divorced women have their own male children, their children inherit the land to which they can still have access. Women and girls are treated as community members in transit. This sometimes limits access to land because there seems to be uncertainty with married women, with the suspicion that they can decide to divorce or remarry if the circumstances permit. In these cases, if women were to share the land with husbands, it can result in the families and communities losing part of their land inheritance.

Land right category	Customary Law		Statutory Law	
	Male	Female	Male	Female
Right to use	√	√	√	√
Right to control	√	√	√	√
Right to own	√	√	√	√
Right to inherit from father	√	X	√	X
Right to inherit from spouse	√	√	√	√
Right to get a share of the land after divorce	√	X	√	X
Rights to rent, lease or sale,	N/A	N/A	√	√
Right to protection	√	√	√	√
Residuary right	N/A	N/A	√	√

Table 5: Gender access to land rights under customary and statutory laws in the study areas

8.3.5 The customary system mandates community leadership to regulate the usage of land and in accordance with traditional norms of land access.

The customary system mandates community leadership to regulate the usage of land and in accordance with traditional norms of land access. These traditional norms include open access and communal land property rights exclusive to community members on the basis of ancestry, even though non-ancestral members can still get access through social relationships.

8.3.6 Preferential treatment is given to conflict displaced persons over climate disaster displaced persons.

Climate displaced persons are treated differently from conflict displaced persons because climate induced shocks such as floods are viewed as temporary disasters and the victims are often expected to go back to original areas. However, while climate change induced displacements are temporary, they have become frequent, almost happening every year, which should prompt a need for a shift in attitude and policy approach for a long term solution.

Taken by the BRACED consortium members, 2017.

This has a policy implication. The study found respondents who had to move to Tonj town because of flooding. They were told to go back to their villages instead of being assisted with land. In contrast, those displaced by conflicts in Rumbek were allocated land to live on. However, the implications are that there is no difference anymore, as floods are happening almost every year. So allocating climate displaced people land in areas not prone to floods would be a sustainable solution.

Climate Hazard	Adaptation Strategy
Severe and long term flood	• Those with cattle trek long distances to escape flood waters. • Others migrate to towns or unaffected distant villages, particularly those who do not have livestock. • Elders negotiate with elders from other communities for access to land. • Communities preserve and store seeds (often at the household level)
Short-term flood	• Move to anthills or highland areas several kilometres away and return after the flood. • Practice fishing rotation to ensure people do not overfish in one place for fear of depleting the fish in the longer term carry. • Traditional dyke-building to prevent water from destroying crops and pastures,
Drought	• People migrate with cattle to wet areas near rivers. • Farmers wait for the rains and only migrate when the drought has induced quite severe famine at times. (For example, this happened in 1998 when the drought- induced famine hit the whole of the greater Bahr el Ghazal region.) • Elders negotiate with elders from other communities for access to land. • Communities preserve and store seeds (often at the household level) • Shifting grazing between dry and wet season pastures and within seasonal grazing areas to allow pastures to replenish

Table 6: Adaptation Strategies engages in study sites

8.3.7 Communities respond to floods and drought differently and the response depends on the nature of disaster.

There are multiple ways in which communities around the world are adapting to climate change. The framing of adaptation is also changing, moving from biophysical vulnerability to the wider social and economic drivers of vulnerability and people's ability to respond (IPCC, 201326). We thus see few examples of these broader adaptation strategies currently happening at the local level from this study.

8.3.8 There is a strong communal reciprocity system in place, which allows the displaced communities to have free access to land for crops, pasture, fishing, hunting and firewood

Seasonal access rights, communal land rights and social reciprocal relationships under customary land tenure provide land access during climate induced displacements and environmental scarcity, something that statutory land tenure does not provide.

However, some of these adaptation mechanisms have been overwhelmed by the magnitude of climate change. Previously there was a strong communal reciprocity system in place, which allows the displaced communities to have free access to land for crops, pasture, fishing, hunting and firewood, among other needs. Communities typically accommodate each other in the times of need because they believe it may be their turn tomorrow to be in need. This has been a long term adaptation strategy for these communities.

However, communal reciprocity systems and social relationships diminish in utility with displacements to urban centres, as access to land in urban areas is shaped by land limitation and cost of land access, among other factors. In short, social relationships formed through intermarriages and other interactions combined with communal reciprocal systems allow people to stay resilient to flood or drought with regards to access to land.

8.4 Conclusions and Key Recommendations:

Two systems of land tenure are running concurrently in South Sudan, namely a customary and a statutory system. This is played out more between rural and urban settings. In rural settings, customary rules and norms influence how land is managed and who controls resources.

Whereas the statutory system is enforced by government agencies at National and subnational levels that have multiple concurrent priorities. One of the key issues for climate change adaptation is to recognise how land tenure governance and laws either benefits or negatively impacts free movement of people and livestock. As the country transitions from customary systems to statutory systems, how this change influences social relationships at community levels will come more into focus. Migration can obviously help farmers and pastoralists to access farming and grazing land in other communities, a key contribution to resilience building. Thus, land tenure laws must be cognisant of these issues.

A number of recommendations came out of this research:

1. The government should strengthen and implement land tenure laws. This should be seen as an opportunity to look at land ownership and movement across commons – whilst also discussing peace dividends that could come from this process. This should be done alongside improving techniques for land survey in the country.
2. Investigate and properly demarcate communal lands and register them as community property. This should be as inclusive a process as possible and can be an opportunity for community level discussions.
3. Urban land should be surveyed and certification issued as soon as possible.
4. Land management, both rural and urban, needs greater policy recognition.

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[26] Noble, I.R., S. Huq, Y.A. Anokhin, J. Carmin, D. Goudou, F.P. Lansigan, B. Osman-Elasha, and A. Villamizar, 2014: Adaptation needs and options. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 833-868. https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5- Chap14_FINAL.pdf

Conclusions

The BRACED programme has undertaken climate change research under difficult circumstances. However, they have been able to garner valuable insights into climate change resilience in South Sudan.

The capacity to adapt is dynamic and influenced by economic and natural resources, social networks, entitlements, institutions and governance, human resources, and technology. The majority of individuals and groups within South Sudanese society currently have insufficient capacity to adapt to climate change. A greater research agenda around these key areas needs to grow over the next number of years in South Sudan.

There are opportunities to identify local best practice and integrate more modern science and engineering. Research on the design and

implementation of these practices, plans and the lessons that can be extracted is needed. Further analysis of underlying stressors of hazards, the drivers of vulnerability, and opportunities for connecting sectoral pressures and climate change can lead to better humanitarian and development outcomes.

Ultimately, research of this nature is to inform better adaptation planning (including for defensive infrastructures) and at the same time incorporating other actions seeking to reduce social vulnerability.

Adaptation planning and implementation can ultimately benefit from holistic approaches afforded by linking adaptation to development; by coupling adaptive improvements in infrastructure with ecosystem services, governance, and community welfare; by improving community resilience through enhancing local ownership; and by creating organisations able to respond to climate change issues through increased adaptive capacity. All of these offer up potentially significant areas of research in the years ahead.

Annex 1

Table 1: Proportion of wasting children by Sex of household head in Greater Equatoria (Source: Data Source: Food Security and Nutrition Monitoring System, collected by FAO, UNICEF and WFP).

		Sex of the household head			
		Male		Female	
Timing of the FSNMS	Basis for nutrition assessment	Count	% Wasting	Count	% Wasting
Mar-15	WHZ	88	7.6%	16	8.0%
Jul-15	WHZ	72	6.7%	12	7.4%
Jun-16	WHZ	102	8.6%	19	10.1%
Jun-16	MUAC	70	5.8%	14	7.2%
Dec-16	WHZ	15	6.0%	79	8.7%
Dec-16	MUAC	12	4.6%	51	5.3%

Table 2: Proportion of wasting children by Sex of household head in Greater Upper Nile (Source: Data Source: Food Security and Nutrition Monitoring System, collected by FAO, UNICEF and WFP).

		Sex of the household head			
		Male		Female	
Timing of the FSNMS	Basis for nutrition assessment	Count	% Wasting	Count	% Wasting
Mar-15	WHZ	188	19.6%	152	24.3%
Jul-15	WHZ	80	21.9%	32	16.2%
Jun-16	WHZ	184	21.3%	176	27.7%
Jun-16	MUAC	118	13.2%	106	16.0%
Dec-16	WHZ	66	12.6%	155	14.0%
Dec-16	MUAC	50	8.4%	133	10.7%

Table 3: Proportion of Wasting Children based on Sex of the household head in NBEG *(Data Source: Food Security and Nutrition Monitoring System, collected by FAO, UNICEF and WFP).*

		Sex of the household head			
		Male		Female	
Timing of the FSNMS	Basis for nutrition assessment	Count	% Wasting	Count	% Wasting
Oct-10	MUAC	21	14.5%	18	14.0%
Jun-11	MUAC	15	10.8%	12	6.3%
Oct-11	MUAC	10	9.9%	9	5.3%
Oct-12	MUAC	6	8.2%	40	11.8%
Jun-13	MUAC	27	9.9%	10	15.2%
Oct-13	MUAC	33	11.3%	10	11.6%
Aug-14	WHZ	56	14.8%	6	9.7%
Dec-14	WHZ	62	13.7%	17	16.7%
Jul-15	WHZ	114	23.0%	38	33.0%
Dec-15	WHZ	89	18.5%	24	26.4%
Jun-16	WHZ	138	30.0%	36	41.9%
Jun-16	MUAC	68	14.3%	15	17.0%
Dec-16	WHZ	51	11.1%	120	15.8%

Table 4: Proportion of Wasting Children based on Sex of the Household in Warrap (Data Source: Food Security and Nutrition Monitoring System, March and July 2015 and December 2016 collected by FAO, UNICEF and WFP).

		Sex of the household head			
		Male		Female	
Timing of the assessment	Basis for nutrition assessment	Count	% Wasting	Count	% Wasting
Oct-10	MUAC	14	18.7%	62	38.5%
Jun-11	MUAC	36	23.5%	12	31.6%
Oct-11	MUAC	32	13.1%	5	15.2%
Oct-12	MUAC	5	4.8%	28	8.2%
Jun-13	MUAC	35	15.1%	4	19.0%
Oct-13	MUAC	12	8.1%	8	18.6%
Aug-14	WHZ	83	24.3%	23	26.1%
Dec-14	WHZ	55	15.9%	17	20.2%
Jul-15	WHZ	73	20.2%	27	25.0%
Dec-15	WHZ	60	16.7%	27	31.8%
Jun-16	WHZ	69	20.9%	24	27.6%
Jun-16	MUAC	42	12.2%	14	15.7%
Dec-16	WHZ	186	13.9%	85	13.6%

BRACED Building Resilience and Adaptation to Climate Extremes and Disasters

Cover Image: The photo shows women taking firewood back to their homesteads, Aweil West, South Sudan. Photo by BRACED, 2017.

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 and working with ACTED, the FAO, the Sudd Institute, UNEP and SNV

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