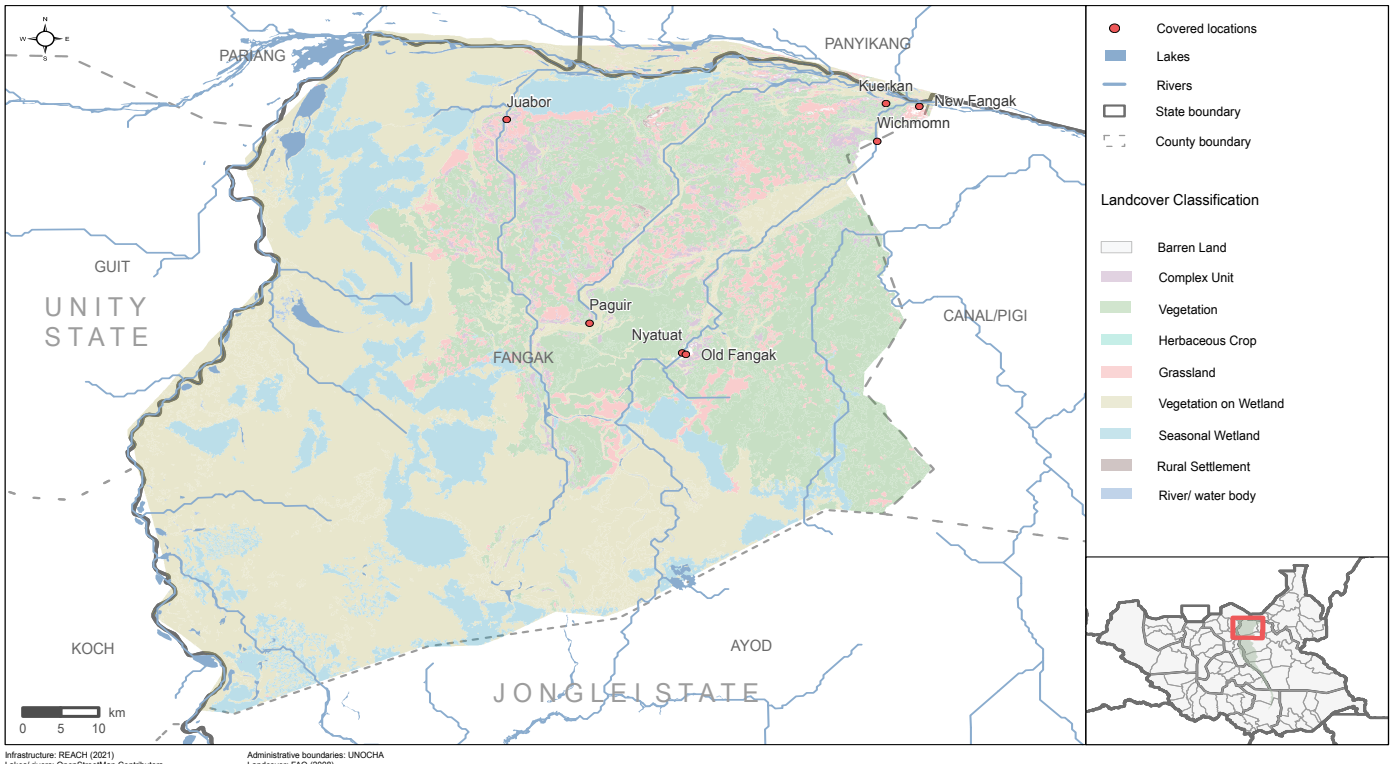
Fangak Shocks Verification Mission

Jonglei State, South Sudan, June 2021

Key Findings

- Fangak county has been affected by two years of consecutive flooding, with observed flood extent and severity much higher than in previous years. This has driven large-scale displacement. Unusually, flooding in January 2021 occurred outside of the rainy season, indicating that rainfall is not the only trigger for flooding in the county. Widespread livelihood collapse was reported, compounded by inability of households to depend on traditional coping strategies and income-generating activities. Flooding has prevented people from cultivating land since 2020, and has resulted in populations converging on highlands or moving further towards Sudan.
- In previous periods of the most severe flooding (1962-1970) in the county, it was reported that the local population was largely still able to cultivate since the flooding would only intensify after the harvest (September-October). Populations could reportedly still rely on traditional coping strategies such as selling cattle, or would have access to milk, meat and blood. However, since the end of the 2013-2017 crisis, cattle stocks have drastically reduced, with only a few households now owning cattle. Focus group discussion (FGD) participants report that access to cattle is also atypically low and unlikely to improve until the next rainy season (May – November) as most of the cattle migrated far away from flooded areas. As a result, FGD participants reported there is less opportunity for people to rely on cattle as a coping strategy.
- Reliance on wild foods, such as water lilies and lalup, is reportedly common during the dry season. However, availability and access has reportedly reduced during this period in recent years due to flooding. Fishing remains a common source of livelihood for the poorer households, although access to fishing nets remains low according to FGD participants.
- Compounding shocks such as flooding in 2020-2021 and insecurity incidents in 2021 have reportedly limited the ability of local populations to move around. This has reduced opportunities for people to collect wild food, impacted seasonal migration of both cattle and people, as well as complicated trade and transportation of goods and reduced functionality and supply of markets.
- Dykes reportedly remain the most preferred mitigation strategy against flooding used by both households and humanitarian actors. However, condition of dykes remain poor throughout Fangak, and the technical capacity to build or repair them remains limited. Whilst construction of dykes can be an effective method to prevent water from flowing into inhabited areas, excess rainfall or river overflow in the rainy season has reportedly also led to dykes being filled up with water. As a consequence, households reportedly have had to pump out water using diesel engines (a costly exercise that is beyond the average financial means of local households).
- Assessed households indicated that as cultivation is becoming much more difficult, alternative livelihood measures that are more suited to flooded environments (i.e fishing) need to be supported by humanitarian actors.

Map 1: Assessment coverage map



Infrastructure: REACH (2021)
Lakes/ rivers: OpenStreetMap Contributors
Administrative boundaries: UNOCHA
Landcover: FAO (2008)

REACH Informing more effective humanitarian action

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Methodology

To understand the extent, causes, and patterns of flooding in major settlements in Fangak county and its impact on livelihoods and mobility, REACH undertook a shocks verification assessment in Fangak. The assessment involved mapping of key infrastructure and verifying flood extent, along with conducting 6 focus group discussions (FGDs) with local communities affected by flooding and 8 key informant (KI) interviews with local NGOs, the Relief and Rehabilitation Commission (RRC), and community members.

In addition, flood water levels identified from remote sensing were verified through ground-truthing observations in the towns of Old Fangak, New Fangak, Jaibor payam, Whichmon payam and Nyantuak. The assessment also aimed to improve understanding of flood mitigation measures utilised in Fangak county.

Fangak county was chosen as the location for the assesment because it has been severely affected by the flooding across South Sudan in recent years, especially as the floods in Fangak have been unseasonal. As a result, data collected in Fangak may be indicative of conditions across other wetland areas in South Sudan, the changing nature of floods, and of future conditions in areas that have not historically been classified as wetlands but that currently remain inundated after consecutive years of flooding.

For the flood risk mapping, we split up the New Fangak town area into 10 m grid cells, whilst the county risk maps were split into 1km^2 grid cells. For each of the four indicators (flood frequency, elevation, population density, and infrastructure), we assigned values of 0 or 1, with one being more likely to flood.

We then used the equation risk = *vulnerability (population density + infrastructure + frequency) * hazard which in the context for this assessment is (flood frequency + elevation) * (population density + infrastructure)* to get a final score for each grid cell.

Flood frequency data was sourced from the United Nations Satellite Centre (UNOSAT) wet pixels dataset, elevation data was collected from NASA's SRTM 30m digital elevation model (natural breaks were used to classify the data and identify the top class of values), population density data was derived from GRID3 (we defined densely populated as >1 standard deviation above the mean for Fangak county), and infrastructure was derived from the built-up area identified in the Food and Agricultural Organisation (FAO) land cover dataset, along with ground-truthing exercises undertaken during the assessment.

Introduction and context

Floods in South Sudan occur annually. However, in 2019 and 2020, atypical flooding has been recorded, with abnormally high rainfall.[1,2] Within Jonglei state, Fangak county is one of the locations that has been affected most severely by the flooding. As a result, water levels in the Sudd landscape are unseasonably high and many locations along the White Nile that normally host settlements have remained uninhabitable during the rainy season (May-October).

Table 1: Different land cover classes in Fangak

Land use classes with reference to Map 1	Area in km^2
HCW - grasslands on wetlands	3246
HCO - herbaceous closed to open	1475
HCWs - seasonal wetland	1102
TO - area under open woody vegetation	577
HCS - grassland	408
OCW - open woody vegetation	341
CU - complex units	216
CCW - closed woody vegetation on wetland	153
TC - closed woody vegetation	150
WBP - water body (perennial)	66
RP - river (perennial)	16
BS - barren land	8
WBnP - water body (seasonal)	6
RA - rural settlement	4
BU - built-up area	3
RB - river bank	2

Fangak is located in the Sudd wetland, situated in the lower reaches of the White Nile or Bahr el Jebel in South Sudan, and is perhaps the largest tropical wetland in the world. Wetlands are affected by seasonal flooding and are responsible for the loss of large quantities of inflowing waters of the White Nile, here called the Bahr el Jebel.[3,4] Fangak is located within the lateral part of the Sudd wetland complex, along the Bahr el Jebel river. The topography in Fangak county is predominantly flat with heavy clay soil and few highlands, formed due to soil depositions by the continuously changing watercourses and sporadic rainfall. The wetlands represent a source of rich biodiversity, with large areas under vegetation and water being the most prominent ecological factor.[5] The lateral extent of the wetland is greatly shaped by flooding, which is the part where Fangak is located, indicating that flooding in Fangak seems to be an annual feature.

The Sudd has numerous smaller ecosystems ranging from open water and submerged vegetation, floating fringe vegetation, seasonally inundated woodland, rain-fed and river-fed grasslands and finally floodplain scrubland, as seen in the assessment coverage map. The Sudd wetland is regarded as both a giant filter that controls and normalizes water quality, and a giant sponge that stabilizes water flow.[6] It is a major source of water for domestic use and livestock, and provides ample grassland for grazing livestock.

Table 2: Flooding events in Fangak and area flooded in km^2

Date of flooding	Flooded area in Fangak county (km^2)
August 2017	247.63
August 2018	178.51
August 2019	76.14
August 2020	846.25
September 2020	1546.47
December 2020	439.29
January 2021	279.73
March 2021	38.54

Fangak county covers an area of over 7,655 km^2. The largest area (3,246 km^2) is covered by grasslands on wetlands, followed by herbaceous closed to open (1,475 km^2), seasonal wetland (1,102 km^2), open woody vegetation (577 km^2), grassland (408km^2) and open woody vegetation on wetlands (341 km^2). Detailed land cover types are listed in table 1. Mapping of land cover and land use can shed light on the hydrology of the area, determining how water behaves in the landscape. This can indicate where flood severity may be higher, or signifying the role of ecosystems in moderating floods (i.e. areas under open woody vegetation on wetlands would be considered being at lower risk due to their ability to absorb flood water when compared to built-up areas). Land use classification also gives a good indication seasonal function of landscapes (wetlands being saturated with water during the rainy season), understanding landscape functions using land use classification can help humanitarian actors to understand flood water extents, as what might be a natural function of the landscape might not necessarily be floods.

Similarily, a large area under wetlands can act as a natural buffer to floods in the landscape – absorbing excess rain and river overflows during the rainy season (May-October) and discharging the same water during dry months to meet the water needs of the communities.

In Fangak county, the largest settlements are Old and New Fangak. Old Fangak was the previous county headquarters but, due to frequent flooding, New Fangak was made the new headquarters. In a January 2020 market assessment in Old and New Fangak, as well as in other towns in the area, REACH found that flooding had greatly reduced the local harvest, whilst the supply of market goods remained limited due to access restrictions.[7] Since then, further abnormally high rainfall has occurred. Authorities in Fangak have appealed for humanitarian aid in response to the most recent floods in May 2021, and in subsequent months, indicating an increase in humanitarian needs.[8]

Flooding in Fangak

Fangak has suffered consecutive years of severe flooding, with devastating impacts on physical assets, peoples lives and livelihoods.[9] Flooding occurs annually during the rainy reason, which generally lasts from May to October. In recent years however, flooding in Fangak has been exceptional in terms of its intensity, geographic extent and duration.

In 2020-21, Fangak experienced flooding events in both August 2020 and January 2021. FGD participants reported that flood waters remained high up until December 2020, before flooding occurred again in January 2021, despite no observation of above-normal rainfall in this month. Given the timing of flooding in January 2021 which lasted up until May, it is unlikely that rainfall led directly to flooding. Rather, it is likely that excess water from upstream overwhelmed the absorbing capacity of the local swamps,[10] which may have still contained water from the previous rainy season.

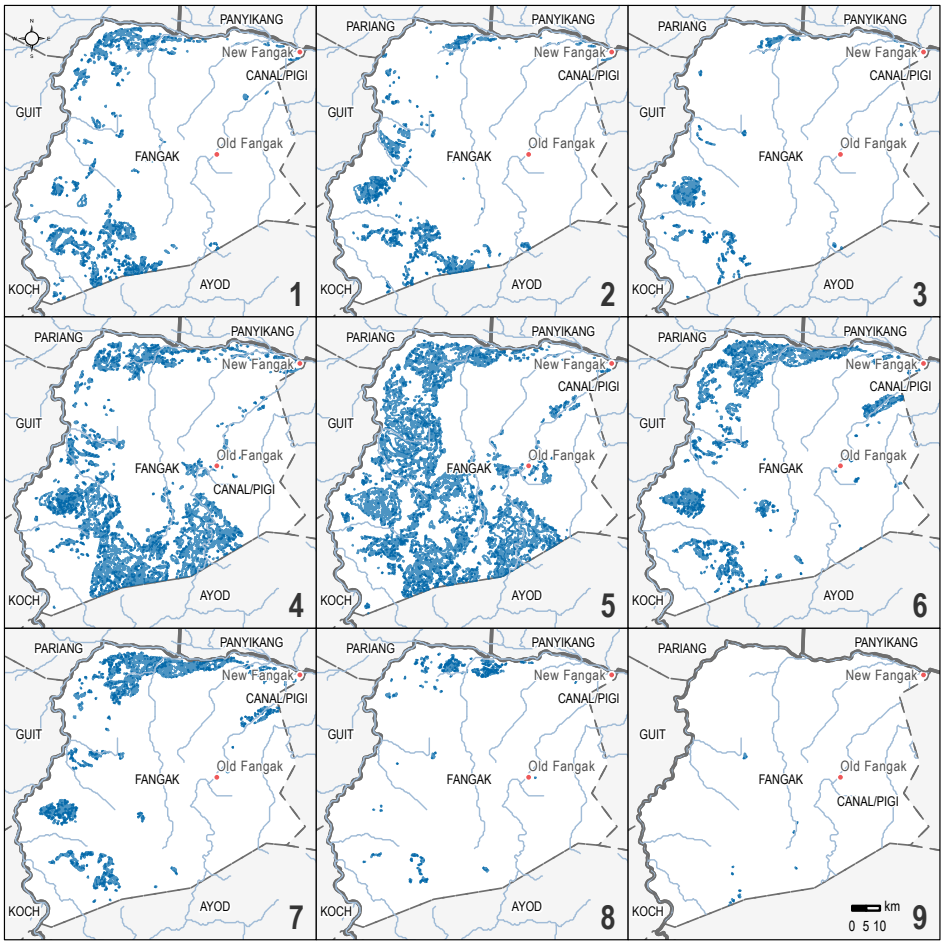
Perceptions on flooding

As floods remain a common phenomena in Fangak, communities have been adapting to floods. However given the nature of recent events perceptions of communities can shed light on their understanding of floods.

FGD participants reported that flooding in January first occurred upstream, before reaching Old Fangak and subsequently New Fangak. There were some disagreements between FGD participants over when water levels were highest, but it was largely reported to be towards the end of 2020, after the end of the rainy season. Additionally, FGD participants reported that flooding occurred earlier in Old Fangak compared to New Fangak, indicating that floodwaters were coming from upstream. Although water levels at the time of the assessment in June had receded somewhat, FGD participants reported that water levels are still much higher than normal and plantation would not be possible.

Flooded tukuls at the time of the assessment in June

Map 2: Time series analysis of floods in Fangak



FANGAK COUNTY:
SELECTED FLOOD EVENTS, 2017-2021

- Fangak & New Fangak
- Rivers
- Approximate flood extent
- State boundary
- County boundary

1 August 2017
2 August 2018
3 August 2019
4 August 2020
5 September 2020
6 December 2020
7 January 2021
8 March 2021
9 May 2021

From the responses of the FGD participants, it is likely that excess water from upstream overwhelmed the absorbing capacity of the natural reservoirs (wetlands), which may have still contained water from the previous rainy season. FGD participants perceived the cause of the flooding as a cross border issue in how the river waters are managed upstream and downstream. There is likely to be truth to the notion that the flooding has some association with high water levels upstream in Uganda, including in Lake Albert and Lake Victoria, as this was likely also a cause for the historically high flooding in 1962.[11]

Comparison with previous flood events

A historical context of flood events can indicate how severe the floods currently are. FGD participants reported that the only year that compares to 2020/2021 in terms of flooding is 1962. They reported that flood levels remained high for the 8 years that followed, before gradually tapering off, whilst most literature indicates 5 years of consecutive flooding from 1962 onwards[12]. As a result, FGD participants fear that current high water levels will last for many years once again.

In a normal year, flooding generally occurs at a smaller scale than observed in 2020/21, and lasts for a shorter period of time, meaning that most of the harvest normally survives. This type of flooding is called "luwar" in the local language. Flooding at the level of 1962 and 2020 is called "nyotch", and is characterised by large scale flooding and greater losses. The names given by respondents to floods further depicts the level of adaptation to flooding, as it shows awareness and understanding of seasonal floods. However, given the timing of floods in early 2021, the respondents referred to the flood event as "ruonjiek", which characterises an even more severe flood where the impacts are greater than "nyotch". A time series analysis of flooding in Fangak validates reports from the ground that the flooding is getting much more severe, with the area under flooding in 2020 significantly larger than in previous years. Floods

Table 3: Names given to flood events of selected years, according to FGD participants from across Fangak

2021	"Ruonjiek" – The year of the worst flood
2020	"Nyotch" – The year of big flood
2017	"Luwar" - The year of small flood
1962	"Nyotch" – The year of big flood

during the dry season of 2020-2021 are comparable to flooding during the rainy season in 2017, 2018 and 2019. See Table 2 for reference.

Most FGD respondents believed that the current floods of 2020-21 are worse than the floods reported in 1962. One contributing factor could be the 2013 civil war, which reduced the community's resources and capacity to deal with shocks. Additionally, there are aspects to the 2020-21 flooding that are more severe than flooding in 1962, such as reportedly higher water levels and water flows that were faster than normal. Furthermore some FGD respondents reported that people in 1962 could anticipate floods, and that dykes were better constructed, making them better prepared for flooding. Respondents in some FGDs also reported that the effects of flooding in 1962 were less severe compared to recent floods as people could move freely to higher grounds, flood water levels were lower and general security was better, reducing impacts on livestock and vulnerable people. Whilst recent flooding has reportedly been more severe, several improvements were noted by FGD respondents such as the availability of humanitarian assistance and materials for dyke construction. In the short term, humanitarian assistance has supported communities, however vulnerabilities to floods in the long term still linger.

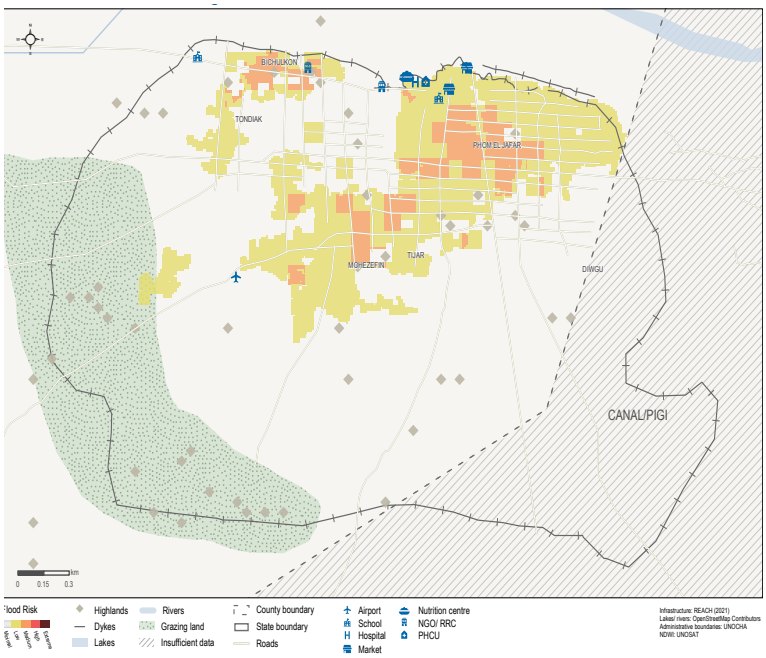
Flood risk mapping

Due to recent widespread flooding and large scale damage of crops, livestock and houses in the county, flood risk was mapped in both the town of New Fangak and in Fangak county using flood frequency data and based on ground-truthing exercises. The two different risk profiles can help shed light on risks in the county headquarters and across the county.

New Fangak is the most populous town in the county. Findings suggest areas close to the market remains at higher risk when compared with other locations in the town. This could be because the area is built on lower elevation compared with other places in town, as well as being where most of the critical infrastructure (health centre, relief and rehabilitation centre) is located, and where population density is higher (see Map 3 for reference). When planning for mitigation strategies, and response prioritisation, such risk profiles are important to take into account.

Based on the geospatial analysis conducted, flood risk in the lower and middle part of the county remained very high. This could be due to lower elevation, denser population and the occurrence of a number of flooding events in most recent years (see Map 4 for reference). Areas at medium risk are the highlands which still hold significant populations. Sparsely populated regions remain the least at risk from flooding as population is low in these areas and because this is where the maximum land cover under wetlands and grasslands is.

Map 3: Flood risk map for New Fangak town



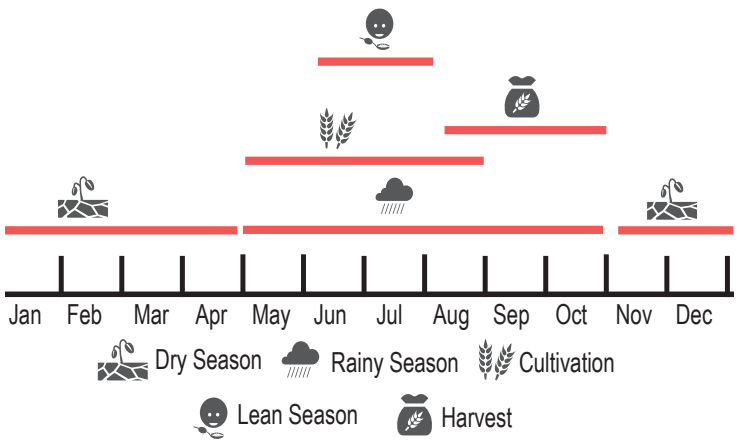
Flooding and livelihoods

The majority of the population in Fangak remains disproportionately vulnerable to flooding due to its location within the lateral extent of the Sudd wetlands. Future flooding events will likely have a detrimental effect on people's access to shelter, as the traditional style of houses, tukuls, are often constructed with mud and grass, and are unable to sustain longer periods of flooding.

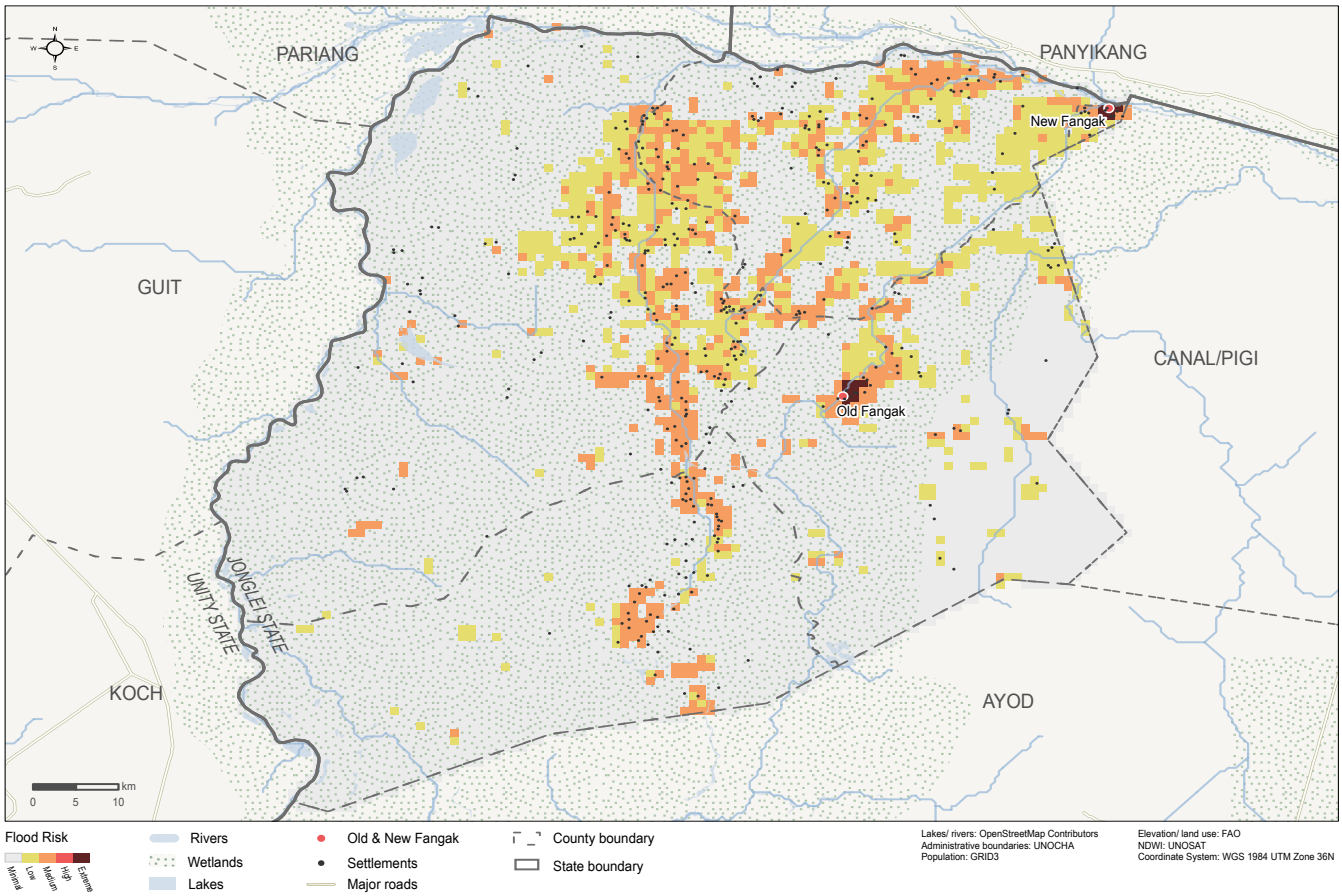
Impact on livelihoods

Fangak lies in the Nile Basin fishing and agro-pastoral livelihood zone.[12] The population here relies on a combination of livestock rearing, subsistence agriculture and trade to acquire food and income. Collection of wild foods is also widely practiced. In a normal year, both cultivation and cattle ownership are the key livelihoods in the area. Households mainly plant sorghum, maize, okra and

Figure 1: Livelihood Seasonal Calendar Fangak



Map 4: Flood risk map for Fangak County



onions, and harvest staple crops during the harvest season in October and November. Cattle ownership is normally widespread, and people can rely on livestock products such as milk and blood, without having to sell or slaughter cattle. However, it is plausible that cattle ownership prior to the 2020 flooding was lower than before the 2013 civil war due to cattle raiding. Numbers of cattle have been severely reduced. This is especially problematic as cattle has traditionally been a source of food or income for people in times of need. Reports of low cattle numbers were confirmed through observation in the locations we visited. FGD participants reported that even if people had the funds to buy new cattle, there would be limited locations for them to graze, which will ultimately lead to cattle deaths. Apart from cultivation and livestock, people reportedly engage in trade or work with NGOs. According to KIs collecting and consuming wild goods such as firewood, wild leaves, and fish is also considered normal, but not at current levels.

Key issues associated with flooding, as identified by FGD participants, include limited ability to harvest, leading to depletion of stocks early in the lean season. In addition, large-scale cattle deaths were reported due to loss of grazing land, as well as disease outbreaks related to the flooding.

Across the assessed area, respondents reported that standing water is making cultivation beyond small private gardens impossible, especially in Old Fangak. In some locations, residents were able to harvest some of their planted crops in 2020, but most of the harvest was reportedly damaged. As a result, food stocks ran out much earlier than normal, shortly after the harvest, with respondents reporting that no food remained in storage at the time of the assessment. In New Fangak and Jaibor, a number of respondents reported that the 2019 harvest was also compromised, and that there has thus not been a normal harvest in 2 years.

Compounding the impact of the loss of harvest and the reduced numbers of cattle, floods have led to a collapse of traditional livelihood systems in the area.

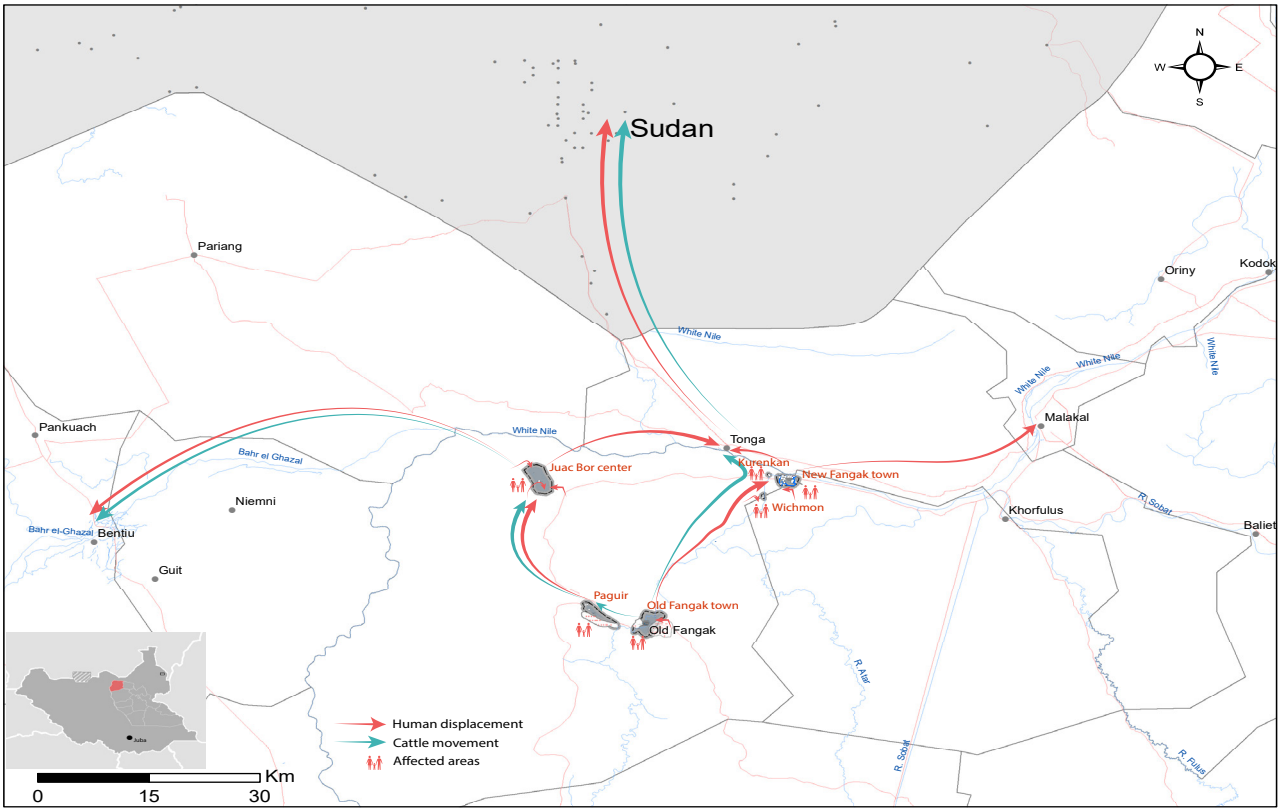
FGD participants reported that, at present, they are largely able to cope based on access to humanitarian food assistance (HFA), and by consuming water lilies and fish. However, these are not sustainable food sources in the long term because once the rainy season approaches, access to wild foods will reduce, especially for poor households without canoes.

Disrupted harvests, loss of cattle, and the use of unsustainable food sources are likely to drive acute food insecurity in the medium to long term.

Coping strategies

As a result of harvest disruption and loss of cattle, households were

Map 5: Displacement map for Fangak



reportedly relying on fish and water lilies for sustenance. Sorghum is mainly consumed when humanitarian food rations are available. This was considered sufficient for survival by respondents, but it is not a sustainable strategy. Water lilies are especially at risk of becoming unavailable due to fluctuating water levels. FGD participanted reported that although residents consume wild foods in a normal year as part of a varied diet, findings suggest the reliance on wild foods (especially fish and water lilies) has increased significantly. Households reportedly make some money by selling extra fish or by collecting firewood and making charcoal. However, both activities require tools such as canoes and fishing nets, which were reported as being in short supply by FGD participants.

Limited options for livelihoods is driving a high reliance on humanitarian assistance. Humanitarian food distributions have taken place on a regular basis, and were in progress at the time of data collection, as observed by the REACH team at the time of data collection. However, FGD respondents widely reported that the amount of food distributed was insufficient. In addition, the lack of recent registrations for newly arrived flood-affected IDPs, meant that people who were not present for the last round, or who were registered elsewhere, had to rely on others for access to distributed goods according to FGD participants. This meant that households receiving food assistance may have been sharing with more individuals than intended. Respondents widely reported that residents still rely on neighbours to share resources to an extent, but that households increasingly have nothing to share. Instances of begging were only reported near Old Fangak by NGO staff.

With limited harvests, minimal cattle and humanitarian food assistance (HFA), and wild food consumption reportedly insufficient to mitigate food consumption gaps, households have reported using more extreme strategies to cope with lack of food or money to buy food. Reportedly, this includes migrating further north, selling the few cattle they have left, and eating less (it is worth noting that we only started asking specifically about the number of meals people ate towards the end of the assessment, which gave us a better idea of the use of this strategy.). Selling cattle, especially given how few cattle were left, could be considered one of the most concerning strategies, since as it will presumably have a larger negative impact on future coping capacity.

In a normal year, food stocks are generally sufficient. However, with no harvest for two consecutive years and no plantation this year, it is likely that the food security situation will deteriorate.

Displacement

According to FGD participants displacement due to flooding has occurred both locally and further afield. FGD participants report many people from the surrounding villages have moved to Old and New Fangak, whereas others have moved north towards Paguir, Malakal, and Sudan. Due to conflict lines, mobility of people is reported to have been restricted. In Old and New Fangak, people

supplies such as plastic sheets, with host communities having to share homesteads with IDPs. Old Fangak remains a relatively cut off area in the middle of the wetland. However, KIs reported that this is a preferred location that people would move to if they were fleeing from conflict. If Old Fangak is flooded again, IDPs will have limited areas to move to due to insecurity.

Many community members and IDPs residing in Old Fangak reported that they wanted to stay in the area, as they consider other places outside of Fangak to be insecure for them. However, it is possible that distress migration might take place in the case of another flood event. Many FGD participants reported concerns that the area will flood again, but they plan to wait and see. Lack of certainty was a key issue highlighted by many FGDs, with respondents reporting community members are unable to plan for the future or invest in new cattle or crops because they do not know what will happen. It is important to note that a number of FGD respondents reported that conflict lines around Fangak still play an important role in determining where people can and cannot move when leaving the area, even though routes do remain available (predominantly the route via New Fangak to Paguir or Malakal and further north).

Mitigation

Findings suggest that households' ability to employ mitigation strategies have been limited by lack of assets and food to engage in such activities.

Almost all respondents reported that dykes are their main (and often only) strategy of preventing further flooding and keeping current high water levels away from settlements. Dykes have been built by community members, and tools are needed to maintain them. Importantly, a number of respondents also reported that community members were too weak to work on the dykes, and that more food is needed to increase their strength.

Moreover, respondents from New Fangak reported that a downside of dykes is that they allow rain water to accumulate inside them. With no drainage systems in place, this may affect settlements and create dangerous vectors for disease (substantiated by observations around the dyke in Old Fangak, where dead cattle were laying in the puddles). As a result, the majority of respondents reported the need for motor pumps and generators to run the motor pumps, as being a very high priority. Participants reported not having any alternative mitigation strategy to building dykes.

Given the amount of resources required to build adequate dykes, and the fact that they may still fail, further work is needed to assess realistic alternatives.

Safety and Security

The most commonly reported safety risks in the current situation pertain to wild animals such as snakes and crocodiles, which FGD participants reported encountering whilst collecting wild foods and firewood in flooded areas. Importantly, FGD participants reported that the medicines to treat snake bites are often unavailable.Whilst the security situation has otherwise remained calm according to FGD participants, overcrowding due to arrival of IDPs in Fankgak town from other settlements is something that could potentially develop more tensions in the coming months.

Sectoral needs and priorities

Some of the most commonly reported humanitarian needs by FGD participants include WASH infrastructure such as boreholes and latrines, some of which were destroyed during the flooding. Additionally, shelter support is reportedly needed for residents whose houses were affected by flooding, and for IDPs who have moved into towns. Respondents reported that educational and medical facilities were also affected by flooding, and that the availability of drugs and medical personnel remains a significant issue. It is important to note that women-led households were identified to be particularly vulnerable by the FGD respondents, since they may have to take care of a large network of dependents and they do not have the same opportunities as men to collect resources or engage in shelter rehabilitation.

The most commonly named priorities were construction of dykes and food assistance. Additionally, drugs, shelter items (primarily plastic sheets) and livelihoods-related NFIs (canoes, fishing nets) were named frequently.

Conclusion

Flood severity and risk in Fangak county has increased over the years. The extent of floods and the time it takes for flood waters to recede has increased exponentially. For two years now, flood waters have remained stagnant, which could be due to landscape fragmentation, limiting the natural ability of the landscape to absorb flood waters, and alterations in the drainage system (i.e. limiting flow of floodwater into rivers, impeding its natural function to drain). A follow-up assessment at a wider scale (i.e. moving beyond single counties and looking at the larger landscape) can further shed light on landscape fragmentation, which is the process when natural land systems are broken up due to changes in land-use patterns, resulting in contiguous natural areas/ecosystems breaking up into smaller isolated units.

As a result of unprecedented flooding, people's livelihoods, which are mostly related to pastoralism and agriculture, have been adversely affected due to flooding. Many households will now go two years without cultivation, whilst facing a reduction in access to cattle, whilst increased dependency on wild foods and other coping strategies have been limited due to the remaining flood waters. Continued provision of HFA can play a crucial role in reducing atypically severe food consumption gaps beyond the rainy season.

Endnotes

1. United Nations Office for the Coordination of Humanitarian Affairs (2021), South Sudan Flooding Situation Report Inter-Cluster Coordination Group – As of 31 January 2021

2. Station data Climate Hazards Group Infrared Precipitation with remote sensing (CHIRPS)

3. Ramsar RSIS

4. Petersen and Fohrer (2010): Flooding and drying mechanisms of the seasonal Sudd flood plains along the Bahr el Jebel in Southern Sudan

5. Ramsar RSIS

6. ibid.,

7. REACH Initiative (2020), Fangak Rapid Market Assessment, January

8. L. Mulai & K.P. Chang (2021), Fangak Appeals for Humanitarian Aid as Floods Engulf Areas. Eye Radio, 11 May.

9. Inter-agency Spot-Check Assessment Report to Floods Affected Communities in Northern Part of Jonglei State Fangak County

10. Nile Basin Adaptation to Water Stress Comprehensive Assessment of Flood & Drought Prone Areas, Pg 20

11. Water losses from Sudd

12. Seasonal Flood in Sudan and its Environmental, Health and Socieconomic Impacts on the Livelihoods

13. Famine early warnings system (FEWS NET). 2018. Livelihoods Zone Map and Descriptions for the Republic of South Sudan. Washington, DC: FEWS NET

14. ibid.,

15. Joint Market Monitoring Initiative South Sudan

16. Famine early warnings system (FEWS NET). 2018. Livelihoods Zone Map and Descriptions for the Republic of South Sudan. Washington, DC: FEWS NET

17 Seasonal Flood in Sudan and its Environmental, Health and Socieconomic Impacts on the Livelihoods

18. Famine early warnings system (FEWS NET). 2018. Livelihoods Zone Map and Descriptions for the Republic of South Sudan. Washington, DC: FEWS NET

19. ibid.,

20. Joint Market Monitoring Initiative South Sudan