Global Protection Cluster

Protection Cluster
South Sudan

SOUTH SUDAN FLOODS | Predictive analysis of people exposed to protection risks in areas affected by the floods[1]

21 September 2025

This analysis provides an initial estimation of protection risks intensifying in the aftermath of the August 2025 floods in South Sudan. Findings highlight a concentration of resulting needs where flood exposure overlaps with existing vulnerabilities. The combined impact of flooding and fragile baseline conditions is heightening protection risks, particularly in hotspot counties.

KEY FIGURES – AUGUST 2025 FLOODS

379K	250K	142K
POPULATION AFFECTED BY FLOODS IN 21 COUNTIES *	**PEOPLE EXPOSED TO PROTECTION RISKS IN 21 COUNTIES****	**PEOPLE EXPOSED TO PROTECTION RISKS IN 6 HOTSPOT COUNTIES****

** Figure from OCHA as of 17 September 2025.*
*** Ayod, Bor South, Canal/Pigi, Duk, Fangak, Fashoda, Juba, Leer, Longochuk, Malakal, Mayendit, Nyirol, Panyijiar, Pibor, Pochalla, Renk, Terekeka, Tonj East, Twic, Twic East.*
**** People exposed to protection risks, in 6 hotspot counties of Ayod, Duk, Twic East, Leer, Mayendit, Panyijiar representing 57% of the people exposed to risks.*

Overview and Context

South Sudan is facing a new wave of devastating floods at the same time as renewed conflict undermines a fragile peace, placing communities in some of the country's most flood- and conflict-affected states in the grip of a dual crisis.

In recent weeks, floodwaters have engulfed large parts of Jonglei, Upper Nile, and Unity states, *affecting 379,200 people* in 21 counties across five states and *displacing around 135,300 people*, many of whom had already fled their homes earlier this year due to escalating conflict since February 2025. Out of the affected population our predictive analysis estimates that about *250,400 people are exposed* to some form of *protection risks*. This underlines how displaced populations are bearing the brunt of climate extremes. The situation is especially alarming as these same areas are already suffering from acute food insecurity and continue to reel from the long-lasting effects of the devastating 2022 floods.

Map Explanation

The map on the next page highlights the overlap between flood-affected populations and protection risks in South Sudan as of 21 September 2025. In total, around 379,200 people across 21 counties have been affected by floods, and about 250,400 of them are estimated to face heightened protection risks. Within this, 142,000 people are concentrated in six statistically significant hotspot counties (marked in red), where flood exposure and protection risks group together, creating the highest priority areas for response.

The inset map shows the hotspot zone spanning Ayod, Duk, Twic East, Leer, Mayendit, and Panyijar counties. Although not all these counties report the largest absolute flood-affected populations, together they form a contiguous high-need system, where vulnerability is compounded by displacement, access cuts, and already high baseline protection risks. For example, Leer and Duk appear as hotspots despite low reported "people affected" because they lie within the group and face indirect impacts from surrounding areas. In simple terms: the red-shaded counties are the areas where floods and protection risks concentrate geographically, making high-priority for coordinated protection response.

[1] https://globalprotectioncluster.org/sites/default/files/2024-07/protection_cluster_flood_prepardness_plan_and_guidance.pdf

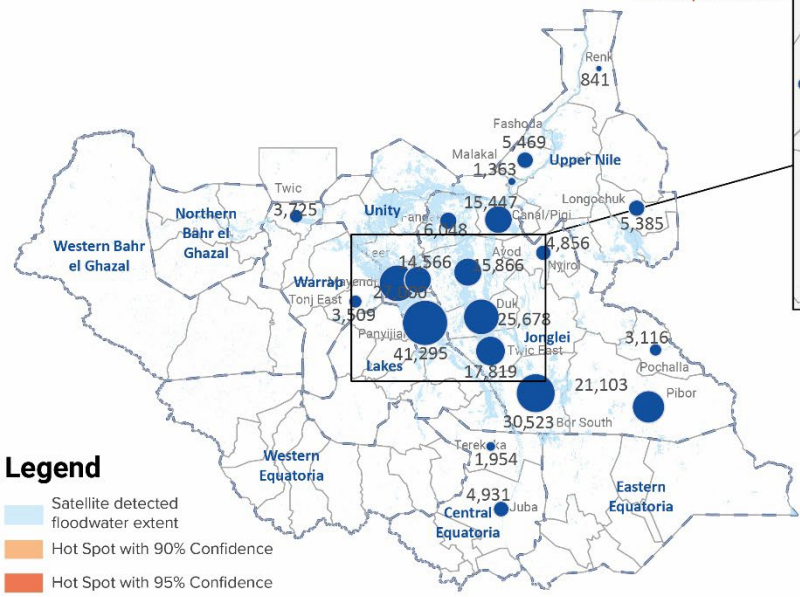
Global Protection Cluster

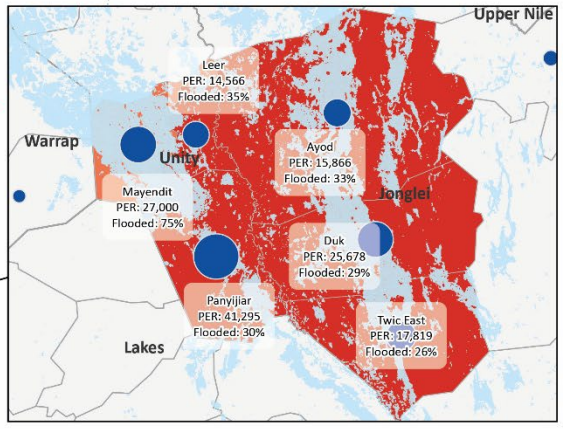
South Sudan - Flooding Situation
As of 18 September 2025

379K people affected by floods in 21 counties

250K people exposed to protection risks in 21 counties

142K people exposed to protection risks in 6 hotspot counties





Legend

- Satellite detected floodwater extent
- Hot Spot with 90% Confidence
- Hot Spot with 95% Confidence
- Hot Spot with 99% Confidence
- Number of People Exposed to Protection risks (PER)

The analysis identifies spatial clusters (groups) where flood exposure and protection risks coincide across neighboring counties. The red counties are not simply the highest single values; they are parts of a contiguous high-protection need system, making them the most important locations for coordinated, area-based prioritization. Notably, Ayod, Duk, Twic East, Mayendit, Panyijiar and Leer together hold 57% of the national risk-weighted exposure. Leer and Duk appear despite zero "people affected by floods" in this snapshot because they sit inside the statistically significant cluster (group) and carry elevated baseline protection risks, while indirect impacts (access cuts, displacement pressure, market/supply spillovers) from adjacent flooded counties raise their risk profile. Non-red counties may have exposed people, but they do not form a high-value cluster (group) and thus are better suited to targeted, county-specific follow-up rather than an area-based surge.

 Creation date: 21 September 2025 **Source:** VIIRS as of 6 September 2025, South Sudan Protection cluster, GPC, OCHA **Feedback:** rehmanka@unhcr.org

Why Some Counties Are Not Hotspots

- They may have high values individually but are surrounded by lower-risk counties (so not a group).
- They may have mixed or moderate values that don't pass the statistical threshold.
- Hotspot analysis measures **concentrated intensity**, not just the largest single numbers.

Key Conclusions

This predictive analysis is carried out to inform early actions and first response, while more precise assessments may provide a specific picture of the situation of protection and the urgent protection needs of the population. The following key insights can be driven from the analysis:

- Around 142,000 people are concentrated in six hotspot counties where flood exposure and protection risks overlap, making them the most urgent priorities for response.
- Six counties - Ayod, Duk, Twic East, Mayendit, Panyijiar and Leer account for 57 % of the national risk-weighted exposure.
- Hotspot analysis shows that protection risks are not just about the biggest single numbers, but about groups of high-risk neighbouring counties. This makes the case for coordinated area-based prioritization rather than isolated, county-by-county response.
- Leer and Duk demonstrate how counties with no directly flood-affected people can still emerge as priorities due to high baseline protection risks and indirect impacts from surrounding areas.
- Counties outside hotspots remain important but are better suited for targeted, localized follow-up rather than surge responses.
- These findings provide an evidence-based foundation for prioritization, coordination, and advocacy with donors and partners, while recognizing that field assessments will refine and validate the picture.

ANNEX 'A'

Technical Notes for IM

- Method
  - Flood extent: VIIRS 5-day composite, 2–6 Sept 2025
  - Boundaries: South Sudan Admin-2 (counties)
  - Protection risks: Severity scores (1–5) for 15 risks, PRMS Q3 data
  - People affected: Baseline counts by county, OCHA
- Metric
  - People exposed = baseline × % of county flooded
  - Average severity = normalized score across 15 risks
  - Risk-weighted exposure = people exposed × average severity
- Hotspot Analysis
  - Tool: Getis-Ord Gi* (ArcGIS), 8 nearest neighbors
  - Correction: FDR multiple-testing correction
  - Confidence levels: 90% (orange), 95% (red), 99% (dark red)
  - Interpretation: hotspots = groups of high values across neighboring counties; cold spots = groups of low values
- Results
  - National total risk-weighted exposure (21 counties): 250,492 (total people exposed to protection risks)
  - Share: 250,492 ÷ 379,154 (people affected by floods) = 66%
  - Hotspot total (Ayod, Duk, Twic East, Leer, Mayendit, Panyijiar): 142,223
  - Share: 142,223 ÷ 250,492 = 57%
- Why Leer and Duk counties matter
  - High baseline protection risks + statistically part of hotspot group
  - Indirect effects from neighbors (flood-driven displacement, access cuts, market spillovers)
  - Highlighted by Gi* despite low direct flood count

People Affected / Displaced / People Exposed to Risks

ADM1_PCODE	ADM1_EN	ADM2_PCODE	ADM2_EN	Flood Affected People	Displaced	Severity of Protection Risks	People Exposed to Risks
SS01	Central Equatoria	SS0101	Juba	16,000	-	4	4,931
SS01	Central Equatoria	SS0105	Terekeka	8,505	8,505	2	1,954
SS03	Jonglei	SS0302	Ayod	19,774	592	4	15,866
SS03	Jonglei	SS0303	Bor South	76,000		3	30,523
SS03	Jonglei	SS0304	Canal/Pigi	18,000	18,000	4	15,447
SS03	Jonglei	SS0305	Duk	-	-	3	25,678
SS03	Jonglei	SS0306	Fangak	6,810	6,648	5	6,048
SS03	Jonglei	SS0307	Nyirol	16,500		3	4,856

SS03	Jonglei	SS0308	Pibor	30,000	-	3	21,103
SS03	Jonglei	SS0309	Pochalla	9,421	567	3	3,116
SS03	Jonglei	SS0310	Twic East	31,000	11,000	3	17,819
SS06	Unity	SS0604	Leer	-	-	2	14,566
SS06	Unity	SS0605	Mayendit	28,328	-	2	27,000
SS06	Unity	SS0607	Panyijiar	82,548	82,548	2	41,295
SS07	Upper Nile	SS0702	Fashoda	7,090	1,900	2	5,469
SS07	Upper Nile	SS0703	Longochuk	15,000	-	4	5,385
SS07	Upper Nile	SS0707	Malakal	2,100	2,100	2	1,363
SS07	Upper Nile	SS0711	Renk	1,500	1,500	3	841
SS08	Warrap	SS0803	Tonj East	5,634		4	3,509
SS08	Warrap	SS0806	Twic	4,944	1,953	4	3,725
Total				**379,154**	**135,313**		**250,492**