

Assessment of Conflict-Damaged Civilian Dwellings in El-Fasher

2 May 2024

Yale SCHOOL OF PUBLIC HEALTH
Humanitarian Research Lab

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This report was independently produced by the Yale School of Public Health's Humanitarian Research Lab with the support of the Avaaz Foundation. Learn more at <https://medicine.yale.edu/lab/khoshnood/> and <https://secure.avaaz.org>.

The Faculty Director of the Humanitarian Research Lab (HRL) at the Yale School of Public Health is Dr. Kaveh Khoshnood. The analysis and production of this report was overseen by HRL Executive Director Nathaniel Raymond and Caitlin Howarth. Analysis and report production was conducted by the Humanitarian Research Lab's Conflict Analytics team.

Citation | Caitlin N. Howarth, Kaveh Khoshnood, Nathaniel A. Raymond et al. "Assessment of Conflict-Damaged Civilian Dwellings in El-Fasher" 2 May 2024. Humanitarian Research Lab at Yale School of Public Health: New Haven.

I. Key Findings

Damage Assessment, East El-Fasher: Yale HRL finds that 603 structures across a likely residential area of approximately 0.078 square kilometers have been damaged from burning on the east and northeast areas in El-Fasher between 31 March – 29 April 2024. This area is equivalent to 14.5 football pitches.ⁱ This damage has affected the Tijaniya and Masnaa neighborhoods on the east side and the Al-Thawra neighborhood on the north side. Half of the identified damage, approximately 330 buildings consisting of approximately 0.041 square km, occurred between 28-29 April 2024 in a single area in the Masnaa neighborhood. This single-day damage is equivalent to more than 7.5 football fields.

Attribution for this damage is varied: some instances of damage are consistent with open source reports that Sudan Armed Forces (SAF) is allegedly conducting aerial bombardments in the northern and eastern areas of El-Fasher where the Rapid Support Forces (RSF) is allegedly present.ⁱⁱ Imagery analysis has identified munition impacts present at instances of damage. Yale HRL is continuing to analyze unconfirmed reports that RSF is responsible for the burning that occurred in Masnaa between 28-29 April.ⁱⁱⁱ

Recently Razed Community: Yale HRL confirms an additional community, referred to here as “Unidentified Community 14,” between Mellit and El-Fasher has sustained widespread burn damage consistent with razing, potentially by RSF, between 25 - 30 April 2024. Additionally, a community which had reportedly previously been attacked, “Unidentified Community 13,” sustained further damage from likely a second attack in recent days.

As of 2 May 2024, Yale HRL has confirmed that a total of 23 communities in North Darfur have been damaged in a manner consistent with the intentional targeting and systematic razing of civilian structures since 31 March 2024, including:

- Nineteen communities between 21-55 km northwest of El-Fasher razed between 31 March to 30 April 2024 and
- Four communities 21-44 km west of Mellit (north of El-Fasher) razed between 20-30 April 2024.

The population of these communities and the number of people killed, injured, and/or displaced is not known.

II. Human Security Analysis

As of 30 April 2024, Médecins Sans Frontières (MSF) has found 30% of children in Zamzam Internally Displaced Persons (IDP) Camp are experiencing acute malnutrition and eight percent of children are experiencing Severe Acute Malnutrition (SAM).^{iv} Yale HRL analysis of these figures concludes that this is consistent with Integrated Food Security Phase Classification (IPC) metrics for food insecurity which are consistent with famine conditions.^v Yale HRL continues to assess that deprivation (food, water, medical

care, shelter), civilian casualties from crossfire, and mass atrocities are likely to have significant civilian impacts including fatalities and injuries in El-Fasher.

Deprivation-related fatalities and illness including acute malnutrition and SAM are already widespread and present in Zamzam IDP camp and likely across El-Fasher. Citing results from a rapid nutrition and mortality assessment in early January and a mass screening in March and April, MSF reports acute malnutrition (30% of children and 33% of pregnant or breastfeeding mothers) and severe acute malnutrition (eight percent of children and 11% of pregnant and breastfeeding women), a crude death rate of at least 2.5/10,000 people per day (February 2024), and 13 children dying per day in Zamzam IDP camp.^{vi} The United Nations system assesses food insecurity including emergency and famine conditions according to the IPC. An area is classified as IPC-5 Famine with Solid Evidence when:

- “1 in 5 households facing an extreme food shortage.
- Roughly 1 in 3 children acutely malnourished.
- At least 2 in every 10,000 people dying daily (or at least 4 in every 10,000 children under five years old dying daily) because of outright starvation or the interaction of malnutrition and disease.”^{vii}

The conditions reported by MSF appear to meet or exceed the threshold for an area classification of the IPC-5 Famine with Solid Evidence criteria.^{viii} The population of Zamzam IDP camp was reported to be approximately 400,000 people as of 29 February 2024.^{ix} In addition, the El-Fasher locality currently hosts an estimated 187,000 IDPs.^x

RSF is assessed to be controlling major north and east access points to El-Fasher and is reportedly preventing humanitarian and commercial supplies from entering El-Fasher, creating conditions of deprivation.^{xi} MSF reports that Zamzam IDP camp has not received official humanitarian aid for approximately a year, since May 2023. Yale HRL assesses that RSF control major roads to the north and east of El-Fasher.^{xii}

Combat-related injuries and deaths have been confirmed in El-Fasher. MSF reported treating 100 injured people including 11 children between 15 April – 1 May 2024, many of whom had gunshot wounds. These injuries are consistent with the effects of crossfire and/or skirmishes between RSF and SAF and their respective aligned forces.^{xiii} It is not known whether the people injured are civilians or combatants.

Mass atrocities have already occurred in North Darfur and may continue. The now 23 confirmed communities likely razed across North Darfur indicate at minimum documented forcible displacement. It is currently not known how many people were killed or injured or whether other potential atrocities occurred during these likely systematic and targeted arson attacks. At the moment, Yale HRL assesses that RSF controls major access to El-Fasher but does not assess that RSF has commenced a multipronged sustained ground invasion across El-Fasher.

Methodology

Yale HRL utilizes data fusion methodologies of open source and public and commercially available remote sensing data. Yale HRL produced this report through

the cross-corroboration of open source and remote sensing data, including satellite imagery and thermal sensor data.

Place names were identified using UN P-codes obtained via the United Nations Humanitarian Data Exchange (HDX) and International Organization for Migration (IOM)'s Displacement Tracking Matrix (DTM) Sudan. This baseline source of information was then verified and informed through open source analysis by Yale HRL's analysts with relevant cultural and linguistic skills. In some cases, communities may have names similar to other communities or may be known by multiple names.

Specific coordinates have been provided to support the further identification and disambiguation of specific place names and community locations. Human security concerns were accounted for as part of the decision to release specific coordinates; potential civilian risk was rated as minimal because these communities have already been visibly attacked, and in the case of combat activity it is assessed that the combatants are already aware of this situation.

Building damage was quantified by individually assessing structures for damage and summing structures identified as damaged.

ⁱ The definition of football pitches aligns with the FIFA standard football pitches.

ⁱⁱ Sudan Tribune, "الطيران يهاجم الفاشر والدعم السريع يستقبل تعزيزات جديدة", 30 April 2024, <https://sudantribune.net/article285053/>, archived at <https://perma.cc/73HC-YHWT>

ⁱⁱⁱ X (formerly known as Twitter), May 2, 2024, <https://twitter.com/sudanwarmonitor/status/1786074671609209303>, archived at <https://perma.cc/3Y93-Z5FG>

^{iv} "SUDAN: As fighting escalates around El Fasher, major malnutrition crisis persists in Zamzam camp; MSF is stepping up its activities and calls for an urgent scale-up of the humanitarian response in North Darfur," <https://prezly.msf.org.uk/sudan-as-fighting-escalates-around-el-fasher-major-malnutrition-crisis-persists-in-zamzam-camp-msf-is-stepping-up-its-activities-and-calls-for-an-urgent-scale-up-of-the-humanitarian-response-in-north-darfur>, archived at <https://perma.cc/83DG-JQ3X>

^v Integrated Food Security Phase Classification (IPC), "IPC Guidance Note: Famine Classification", https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC-Guidance-Note-on-Famine.pdf pg 11

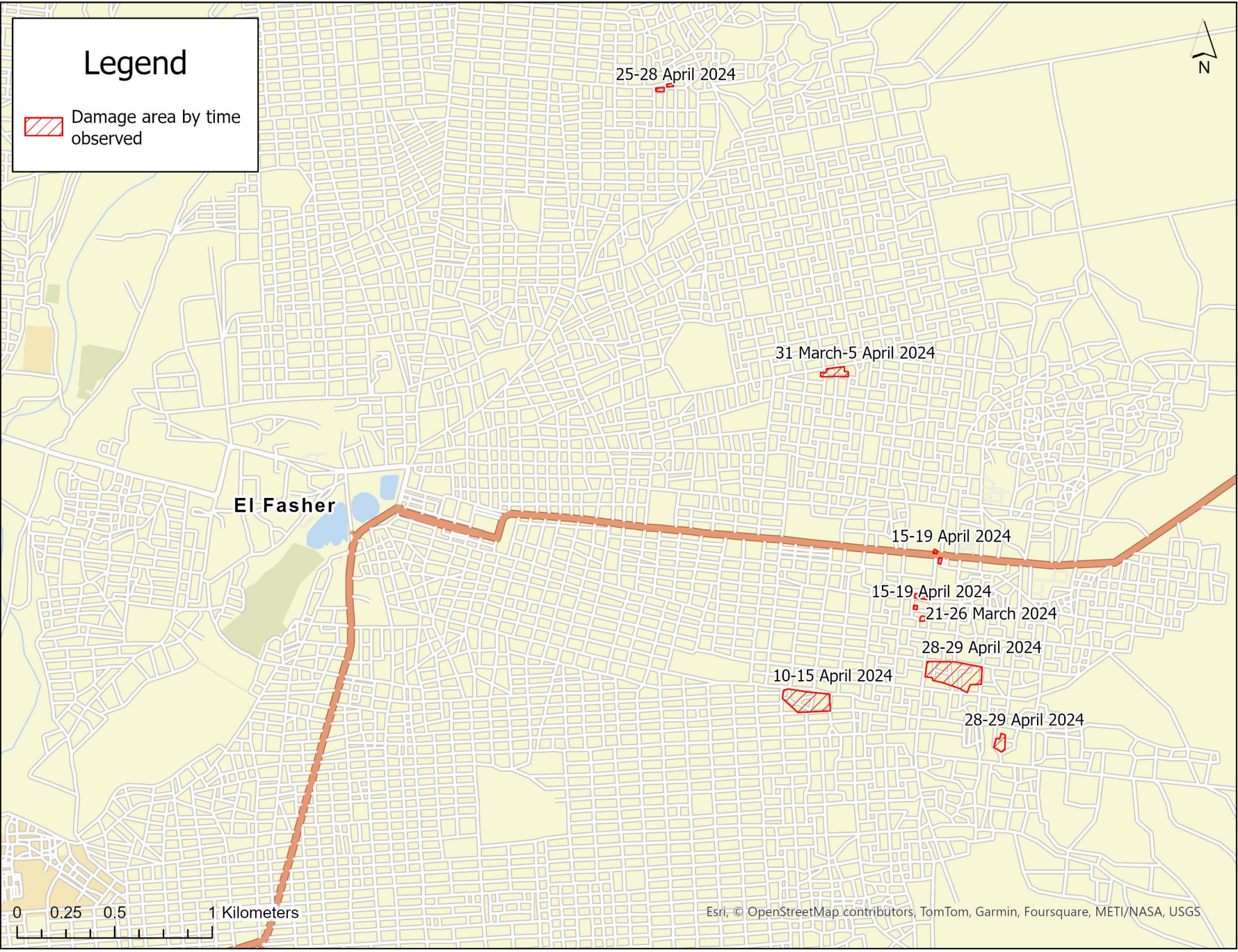
^{vi} Médecins Sans Frontières, "SUDAN: As fighting escalates around El Fasher, major malnutrition crisis persists in Zamzam camp; MSF is stepping up its activities and calls for an urgent scale-up of the humanitarian response in North Darfur," April 30, 2024, <https://prezly.msf.org.uk/sudan-as-fighting-escalates-around-el-fasher-major-malnutrition-crisis-persists-in-zamzam-camp-msf-is-stepping-up-its-activities-and-calls-for-an-urgent-scale-up-of-the-humanitarian-response-in-north-darfur>, archived at <https://perma.cc/83DG-JQ3X>; Médecins Sans Frontières, "Urgent response needed amid high death rates and malnutrition crisis in North Darfur," February 5, 2024, <https://www.msf.org/sudan-urgent-response-needed-amid-high-death-rates-and-malnutrition-crisis-north-darfur>, archived at <https://perma.cc/X3BG-7NMU>

^{vii} Integrated Food Security Phase Classification (IPC), "IPC Guidance Note: Famine Classification", https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC-Guidance-Note-on-Famine.pdf pg 11

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- viii Integrated Food Security Phase Classification (IPC), “IPC Guidance Note: Famine Classification”, https://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC-Guidance-Note-on-Famine.pdf pg 11
- ix Global Protection Cluster, “Protection Hotspots in Sudan, as of 29 February 2024”, February 29, 2024, <https://www.globalprotectioncluster.org/publications/1819/infographic/humanitarian-dashboard/protection-hotspots-sudan-29-february-2024>, archived at <https://perma.cc/Z4CU-9LBD>
- x OCHA, “Situation Report: Last updated 30 April 2024”, April 30, 2024, <https://reports.unocha.org/en/country/sudan/>, archived at <https://perma.cc/CT5P-UJ7B>
- xi Sudan Tribune, “الطيران يهاجم الفاشر والدعم السريع يستقبل تعزيزات جديدة”, April 30, 2024, <https://sudantribune.net/article285053/>, archived at <https://perma.cc/Z4PM-4YCS>; Sudan Tribune, “U.S. envoy warns RSF against attacking El Fasher,” April 23, 2024, <https://sudantribune.com/article284070/>, archived at <https://archive.ph/JWxat>; UN News, “Sudan: Under siege, El Fasher teeters on the brink of famine,” May 2, 2024, <https://news.un.org/en/story/2024/05/1149281>, archived at <https://perma.cc/XE8W-X9US>; Ayin, “الفاشر.. مخاوف وتحذيرات ما قبل المواجهة”, April 25, 2024, <https://3ayin.com/el-fasher-10/>, archived at <https://perma.cc/QDD9-3W7G>
- xii Ayin, “الفاشر.. مخاوف وتحذيرات ما قبل المواجهة”, April 25, 2024, <https://3ayin.com/el-fasher-10/>, archived at <https://perma.cc/QDD9-3W7G>
- xiii Medecins Sans Frontieres, “Sudan: As Fighting escalates around El Fasher, major malnutrition crisis persists in Zamzam camp; MSF is stepping up its activities and calls for an urgent scale-up of the humanitarian response in North Darfur”, 30 April 2024, <https://prezly.msf.org.uk/sudan-as-fighting-escalates-around-el-fasher-major-malnutrition-crisis-persists-in-zamzam-camp-msf-is-stepping-up-its-activities-and-calls-for-an-urgent-scale-up-of-the-humanitarian-response-in-north-darfur>, archived at <https://perma.cc/XL5W-GE5T>

Overview of damage at East El-Fasher

This assessment is based on Satellite imagery, VIIRS data and open source reporting.



Tijaniya District, El-Fasher

THERMAL SCARRING OBSERVED BETWEEN
31 MARCH AND 05 APRIL 2024

According to analysis of satellite imagery, thermal scarring was observed at the eastern section of El-Fasher within the Tijaniya neighborhood. The structures were most likely damaged between 31 March and 05 April according to sentinel imagery. At least 35 structures were razed or damaged. Approximately 6,006 square meters sustained thermal scarring.



20 March 2024 © 2024 MAXAR, USG-Plus



14 April 2024 © 2024 MAXAR, USG-Plus

Masnaa District, El-Fasher

THERMAL SCARRING OBSERVED BETWEEN 10 AND 15 APRIL 2024

According to analysis of satellite imagery, thermal scarring was observed at the eastern section of El-Fasher within the Masnaa district. The structures were most likely damaged between 10 and 15 April 2024. At least 159 structures were razed or damaged. Approximately 24,341 square meters sustained thermal scarring.



19 October 2023 © 2023 Skysat



16 April 2024 © 2024 GEOSAT

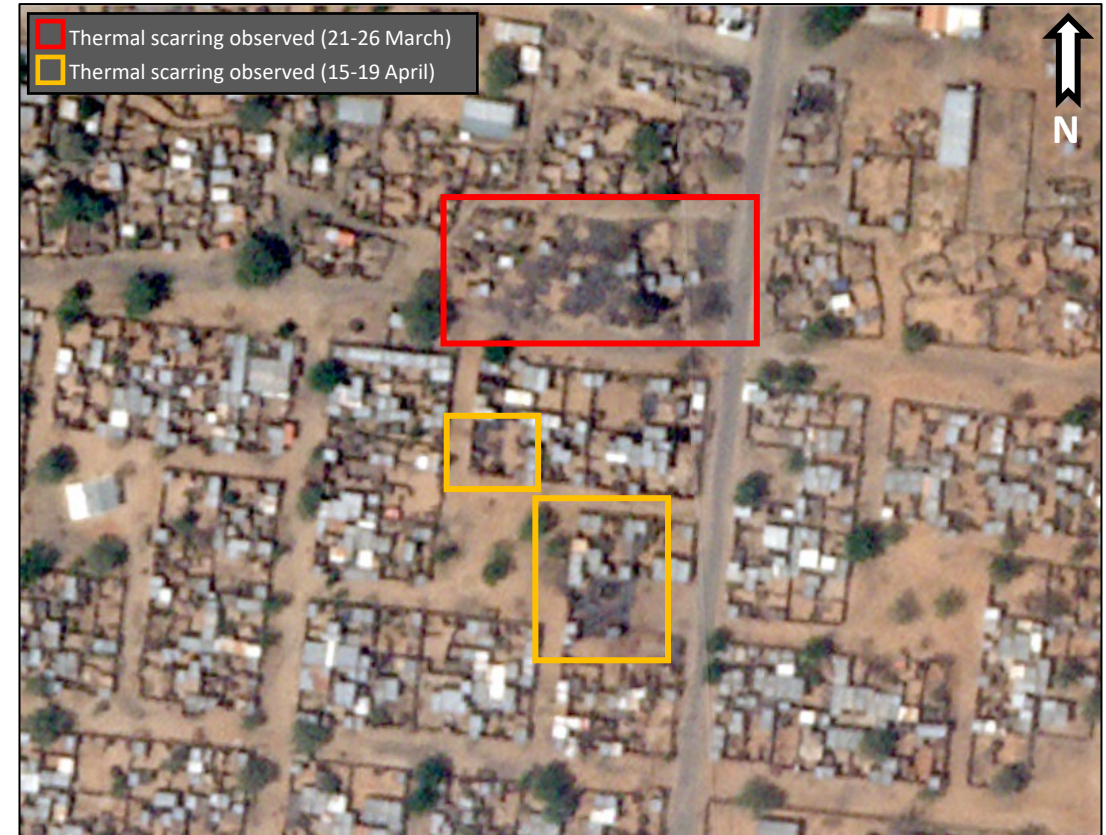
Masnaa District, El-Fasher

THERMAL SCARRING OBSERVED BETWEEN
21 MARCH AND 19 APRIL 2024

According to analysis of satellite imagery, at least 10 structures probably sustained damage and at least 40 structures were completely razed with thermal scarring observed at the eastern section of El-Fasher within the Masnaa district. The damage to the structures most likely occurred between 21 and 26 March 2024. Additionally, at least six structures were observed damaged between 15 and 19 April according to according to Sentinel imagery. Approximately 3268 square meters sustained damage and thermal scarring.



19 October 2023 © 2023 Skysat



24 April 2024 Imagery © 2024 Planet Labs

Masnaa District, El-Fasher

RAZED STRUCTURES OBSERVED BETWEEN 15 AND 19 APRIL 2024

According to analysis of satellite imagery, at least six structures were completely razed with debris observed at the eastern section of El-Fasher within the Masnaa district. The damage to the structures most likely occurred between 15 and 19 April. Approximately 860 square meters sustained severe to total damage.



15 April 2024 © 2024 MAXAR, USG-Plus



19 April 2024 © 2024 MAXAR, USG-Plus

Al- Thawra District, El-Fasher

THERMAL SCARRING OBSERVED BETWEEN 25 AND 28 APRIL 2024

According to analysis of satellite imagery, thermal scarring was observed at multiple locations at the eastern section of El-Fasher within the at North Al-Thawra neighborhood. The structures were most likely damaged between 25 and 28 April 2024 according to sentinel imagery. At least 17 structures were razed or damaged. Approximately 1,204 square meters sustained thermal scarring.



25 April 2024 © 2024 MAXAR, USG-Plus



28 April 2024 © 2024 MAXAR, USG-Plus

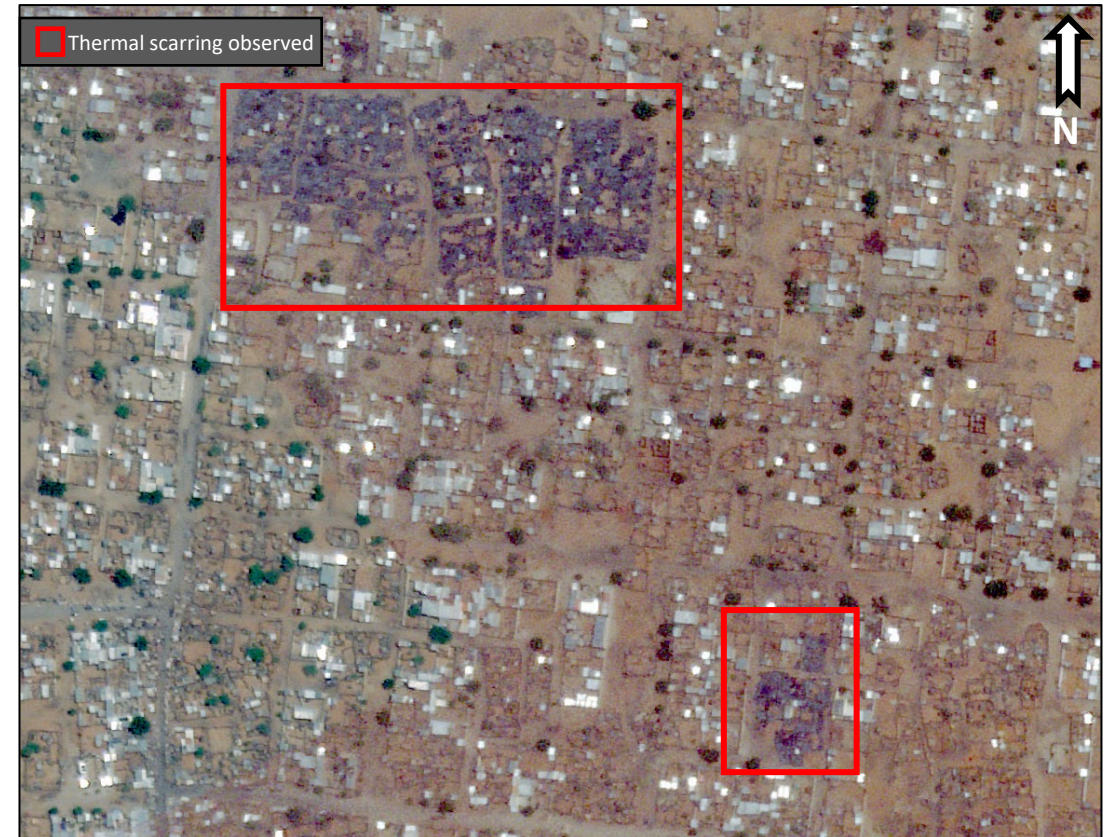
Masnaa District, El-Fasher

THERMAL SCARRING OBSERVED BETWEEN
28 AND 29 APRIL 2024

According to analysis of satellite imagery, thermal scarring was observed at multiple locations at the eastern section of El-Fasher within the Masnaa district. The structures were most likely damaged between 28 and 29 April 2024. At least 330 structures were razed or damaged. Approximately 41,028 square meters sustained thermal scarring.



28 April 2024 © 2024 MAXAR, USG-Plus



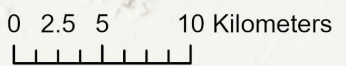
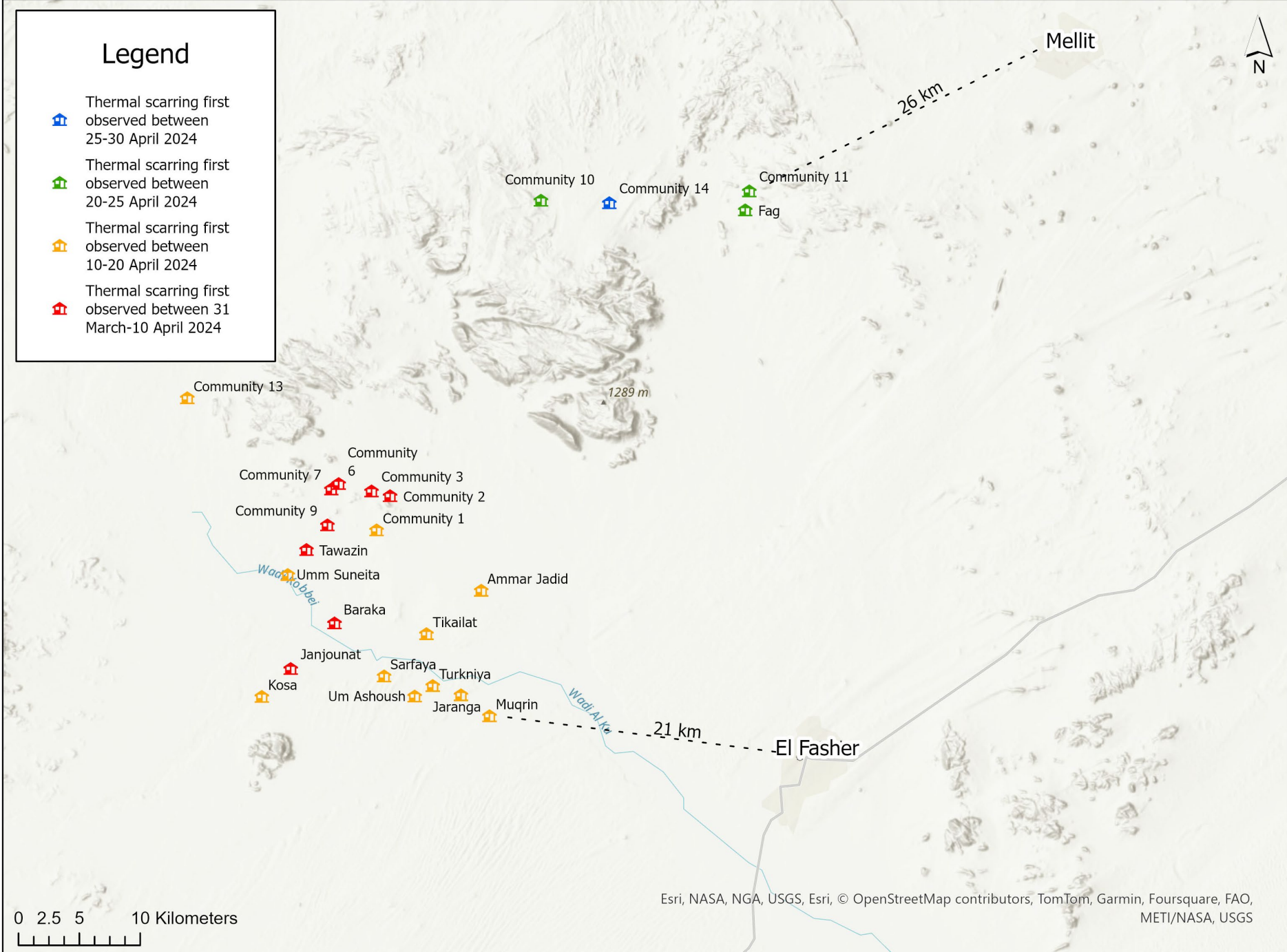
29 April 2024 © 2024 Planet Labs

Overview of Thermal Scarring West of El-Fasher

This assessment is based on Sentinel satellite imagery, VIIRS data and open source reporting. The radii represent the distance of the closest damaged communities to Mellit and El-Fasher. Overall, thermal scarring is observed at 23 communities within the timeframe of 31 March and 30 April 2024.

Legend

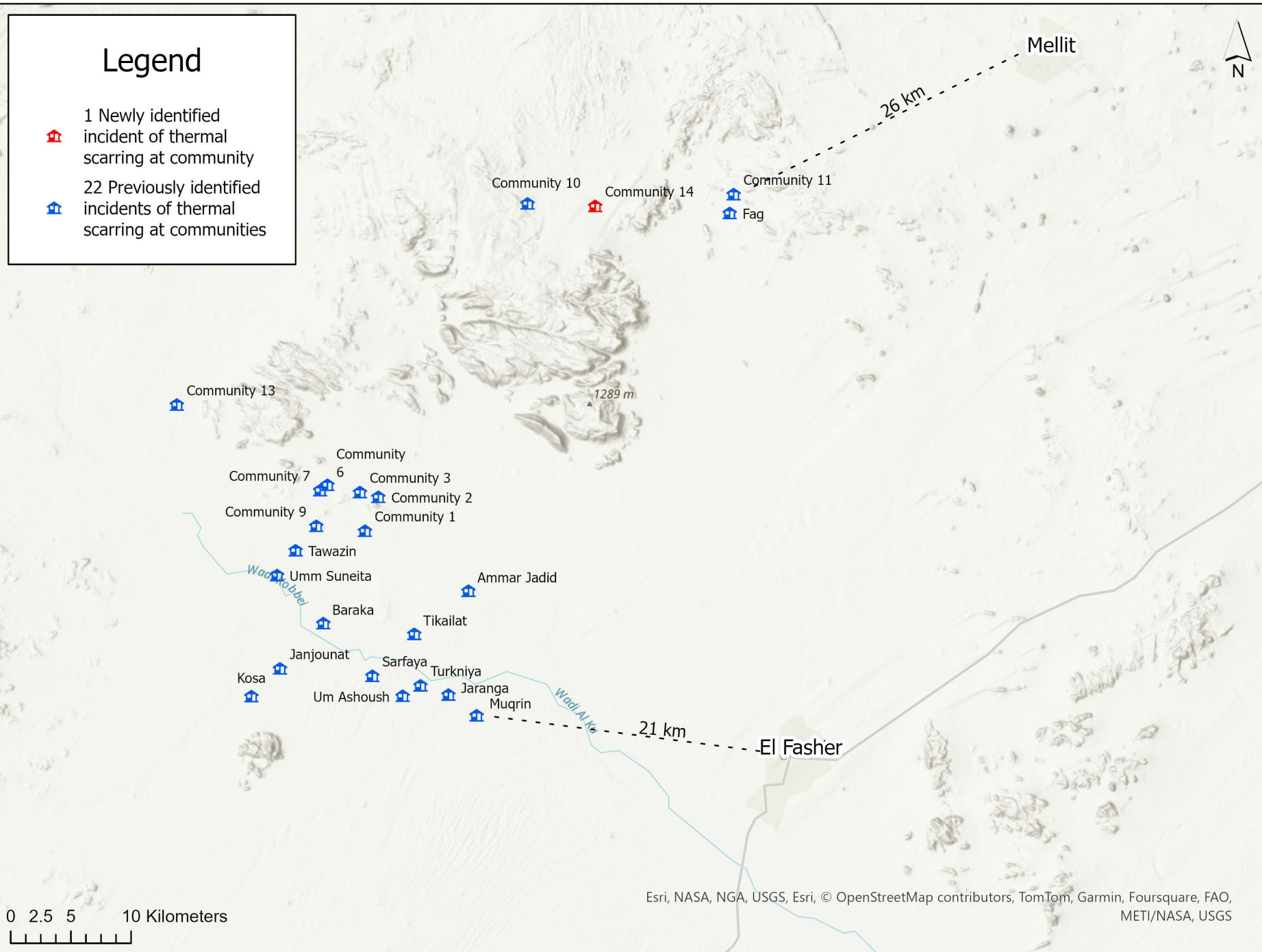
- 🏠 Thermal scarring first observed between 25-30 April 2024
- 🏠 Thermal scarring first observed between 20-25 April 2024
- 🏠 Thermal scarring first observed between 10-20 April 2024
- 🏠 Thermal scarring first observed between 31 March-10 April 2024



Esri, NASA, NGA, USGS, Esri, © OpenStreetMap contributors, TomTom, Garmin, Foursquare, FAO, METI/NASA, USGS

Overview of Thermal Scarring West of El-Fasher

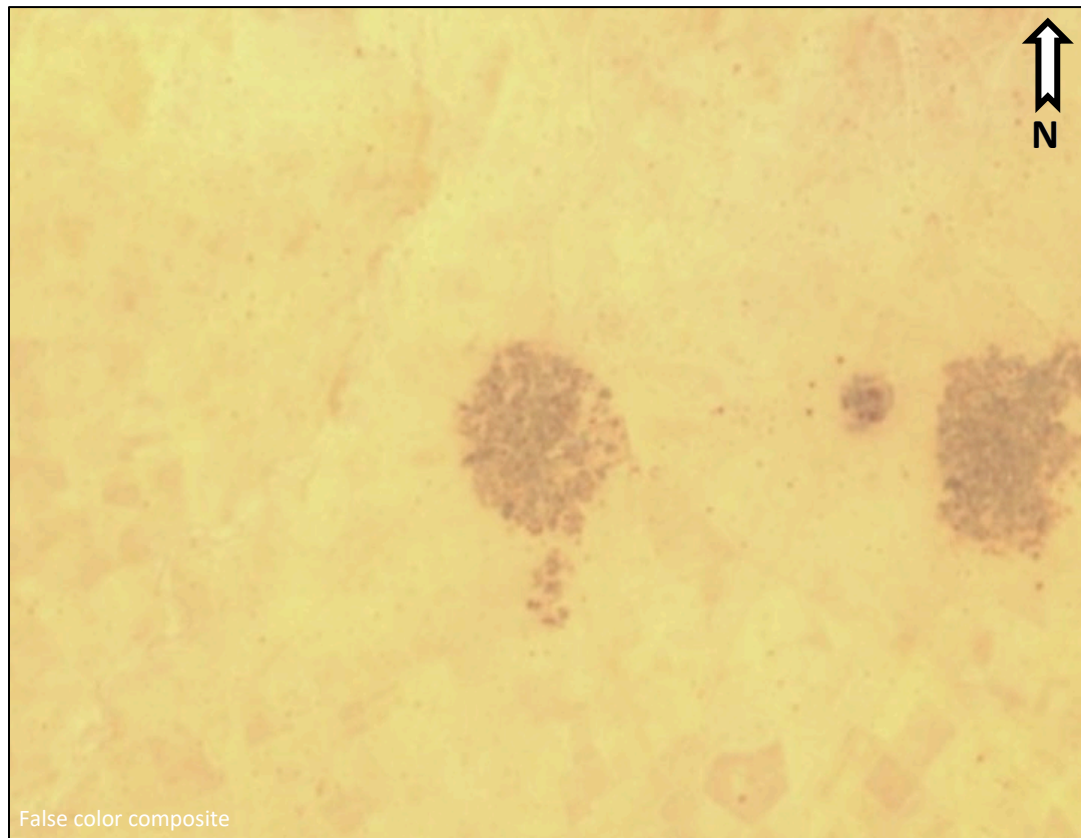
This assessment is based on Sentinel satellite imagery, VIIRS data and open source reporting. The radii represent the distance of the closest damaged communities to Mellit and El-Fasher. Overall, thermal scarring is observed at 23 communities within the timeframe of 31 March and 30 April 2024.



Unidentified Community 14, North Darfur

THERMAL SCARRING OBSERVED BETWEEN 25 AND 30 APRIL 2024

According to analysis of satellite imagery, thermal scarring was observed between 25 and 30 April 2024, within village 55 km north-west of El-Fasher. According to analysis of VIIRS data, the time of thermal scarring can be narrowed down to 29 April 2024.



25.2095315°E 14.0229603°N

25 April 2024 © 2024 Sentinel



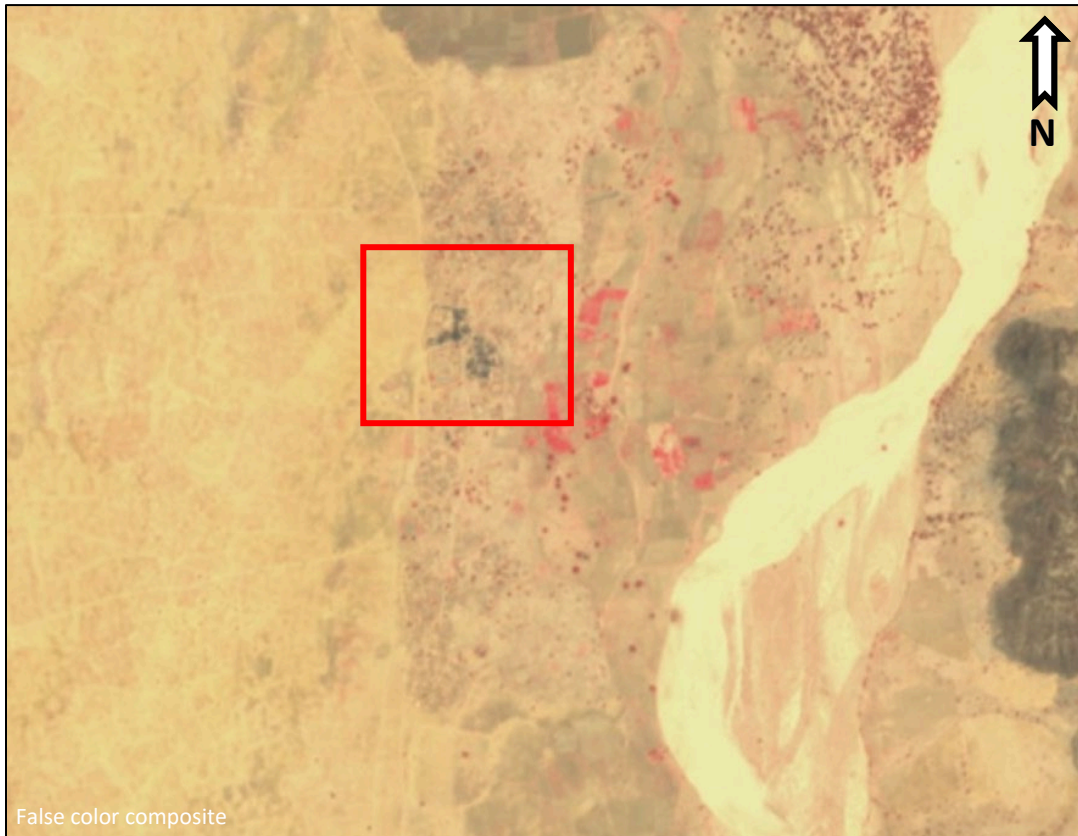
25.2095315°E 14.0229603°N

30 April 2024 © 2024 Sentinel

Unidentified Community 13, North Darfur

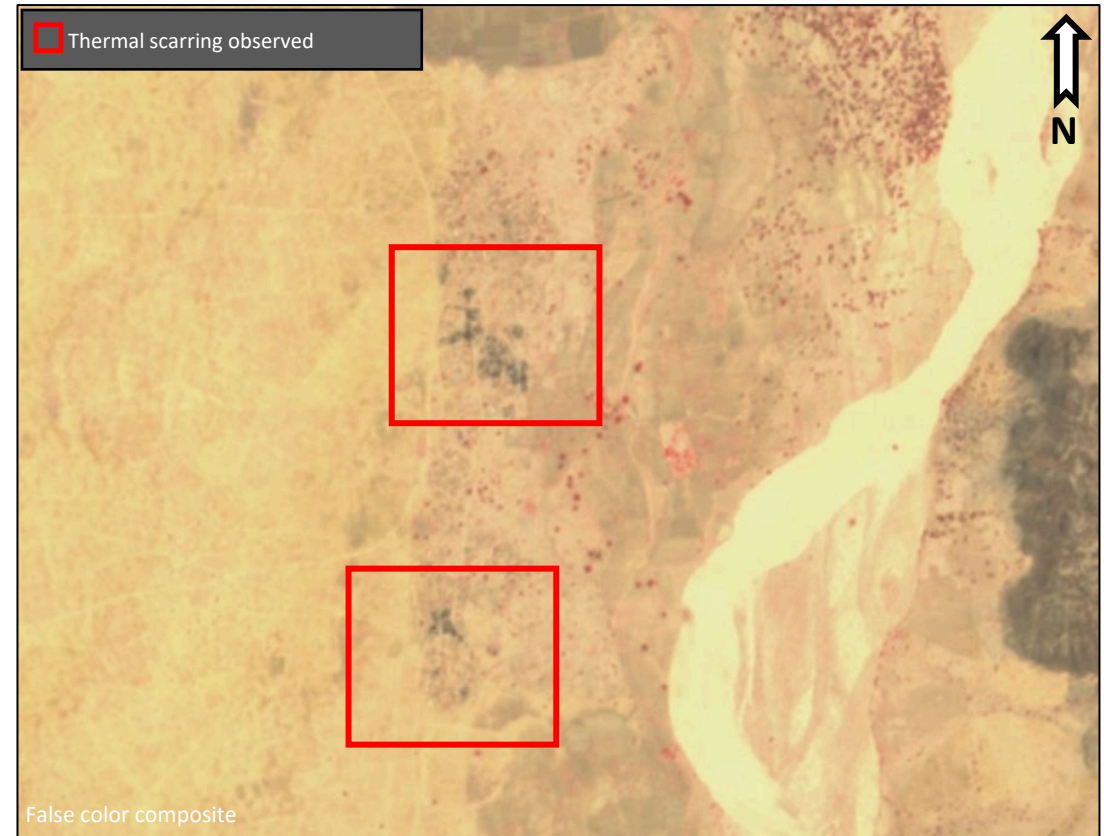
NEW THERMAL SCARRING CONFIRMED BETWEEN 20 AND 30 APRIL 2024

Second iteration of thermal scarring confirmed:
According to analysis of satellite imagery, thermal scarring was observed between 15 - 20 April 2024 and 20 - 30 April 2024, within village 55 km north-west of El-Fasher. According to analysis of VIIRS data the time of most recent thermal scarring can be narrowed down to 28 April 2024, confirming previous reporting.



24.8979452°E 13.8836349°N

20 April 2024 © 2024 Sentinel



24.8979452°E 13.8836349°N

30 April 2024 © 2024 Sentinel

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