

RAVEN: Supplementary Material

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1. Introduction

This supplementary material presents the complete RNA (Rapid Needs Assessment) outputs generated by different Large Language Models and Vision-Language Models in the RAVEN framework. Each subsection contains the full assessment report produced by a specific model configuration.

2. Qwen 3B VLM Output

UN Rapid Needs Assessment (RNA) — Kakuma Refugee Camp

Agency/Team: Refugee Analysis Team

Date: 30 November 2025

Location / GPS: Kakuma Region, Turkana County, Kenya

Population Estimate: ~288,206

Method: Direct Observation / Key Informants

2.1. Priority Life-Saving Concerns (Immediate 72 hrs)

2.1.1. Security & Protection Risks

Notable Incidents or Threats:

- Recent reports of armed presence and potential GBV incidents.
- Suspected child protection issues in the camp.
- Hazardous areas identified around the perimeter.

Safe Access to Communal Areas:

- Water points and latrines are accessible but poorly maintained.
- Latrines are often filled beyond capacity, leading to overflow.

Urgent Actions Required:

1. Deploy security personnel to monitor the perimeter and provide protection services.
2. Conduct awareness sessions on child protection and GBV prevention.
3. Improve maintenance and sanitation practices at water points and latrines.

2.1.2. Critical Gaps Affecting Survival

- **Lack of Shelter Coverage:** Approximately 50% of the camp has inadequate or damaged shelters.
- **Water Quantity ; 15L/person/day:** Access to water is sporadic, particularly during peak usage times.
- **No Food Distribution or Severe Ration Gaps:** Regular food distributions are scheduled but may not meet nutritional needs.
- **No Access to Emergency Health Care:** Primary health centers are functional but may struggle to meet demand.

Urgent Actions Required:

1. Establish additional water points and improve existing ones.
2. Increase food rations to ensure adequate nutrition.
3. Enhance health services and staffing at primary health centers.
4. Improve coordination with international aid organizations for emergency medical support.

2.2. Health Sector Snapshot

Reported Illness Trends:

- Diarrheal diseases and respiratory infections are common.
- Malaria rates are slightly higher than average.

Outbreak Risks:

- Suspected cases of meningitis.
- Environmental risks such as contaminated water and poor sanitation.

Health Services:

- Clinic and mobile teams are operational but understaffed.
- Medical supplies are adequate but in need of replenishment.
- Staff capacity is sufficient but requires ongoing training.

Public Health Concerns:

- Vaccination coverage is low, especially among children under 5.
- Nutrition screening programs are active but could benefit from expanded reach.
- Mental health and psychosocial support (MHPSS) needs are increasing due to ongoing security concerns.

2.3. WASH (Water, Sanitation & Hygiene)

Water Supply:

- Available water points but often insufficient to meet demand.
- Quality varies, with occasional contamination.

Sanitation:

- Latrine ratio is 1:300 (average).
- Fill levels are consistently high, leading to frequent overflows.
- Desludging is infrequent, contributing to sanitation challenges.

Hygiene:

- Soap availability is low, particularly in remote areas.
- Handwashing stations are scarce, especially outside of the main settlement area.
- Menstrual hygiene materials are available but not widely distributed.

Critical WASH Gaps:

1. Increase water supply and improve its distribution.
2. Improve sanitation infrastructure, including regular desludging.
3. Enhance hygiene promotion and distribution of necessary materials.

2.4. Shelter & Non-Food Items (S/NFI)

Shelter Conditions:

- Approximately 50% of shelters are damaged or inadequate.
- Exposure to harsh weather conditions is common, particularly in exposed areas.

NFI Status:

- Bedding, cooking sets, and lighting are generally available but in short supply.
- Winterization kits are needed to protect against colder temperatures.

Site Planning Issues:

- Fire risk is heightened due to overcrowded living conditions.
- Drainage issues are prevalent, leading to frequent flooding.
- Congestion is a concern in densely populated areas.

Urgent S/NFI Needs:

1. Distribute additional shelter materials to repair damaged structures.
2. Provide winterization kits to vulnerable groups.
3. Implement better site planning and drainage solutions.

2.5. Food Security & Nutrition

Food Access:

- Food deliveries are scheduled but may face logistical challenges.
- Market functionality is variable, with some areas experiencing shortages.

Nutrition Concerns:

- Child wasting rates are above the national average.
- Breastfeeding support is limited, particularly for women in non-traditional roles.
- Special diets are required for malnourished individuals.

Priority Needs:

1. Ensure regular food deliveries and address ration adequacy.
2. Expand nutrition screening programs and provide supplementary feeding where necessary.
3. Strengthen breastfeeding support initiatives.

2.6. Protection

Vulnerable Groups:

- Unaccompanied children, elderly, persons with disabilities (PwD), and female-headed households are particularly vulnerable.

Protection Services:

- Case management for vulnerable groups is currently insufficient.
- Safe spaces for community engagement are needed.
- Community mobilization efforts are ongoing but require reinforcement.

Risks:

- GBV incidents have increased, necessitating more robust protection services.
- Exploitation and discrimination are concerns in the camp environment.

Protection Actions Required:

1. Enhance case management services for vulnerable groups.
2. Establish more safe spaces for community engagement.
3. Conduct more comprehensive awareness campaigns on GBV and exploitation.

2.7. Access & Logistics

Road Access:

- Only one location has a paved road suitable for heavy vehicle access.
- Remaining areas feature narrow, unpaved dirt tracks that are eroded, seasonal, and impassable for conventional vehicles.
- Most routes follow natural topography and would require 4WD vehicles or significant preparation.

Transport:

- Bridge conditions are good but may require maintenance.
- Congestion is common, particularly during peak hours.
- Checkpoint delays are frequent, affecting movement within the camp.

Humanitarian Access:

- Restrictions and curfews limit movement within the camp.

- Permits and safety protocols are in place but can be challenging to navigate.

Supply Chain:

- Border delays are minimal but affect the arrival of aid supplies.
- Warehouse capacity is sufficient but may face logistical challenges during peak periods.
- Cold chain operations are functioning but could benefit from additional support.

Communication:

- Mobile network coverage is reliable.
- Radio and internet access are restricted but are being improved.

Logistics Constraints & Priorities:

1. Focus on improving road infrastructure and accessibility.
2. Enhance logistics coordination to streamline aid delivery.
3. Address communication barriers to facilitate effective coordination.

2.8. Weather & Environmental Conditions

Current Weather Impacts:

- Hazy sunshine, high temperatures, and breezy conditions.
- Potential for heat-related illnesses and dehydration.

Environmental Hazards:

- Contaminated water sources are a concern, particularly during heavy rains.
- Wildlife interactions pose a threat, especially for livestock.
- Landslides are rare but could become more frequent due to climate change.

Forecasted Risks:

- Rainfall and temperature shifts are expected to increase in coming months.

Weather-Related Actions:

1. Monitor weather patterns closely to anticipate and mitigate risks.
2. Enhance hygiene promotion and water conservation practices.
3. Prepare for potential landslides and other environmental hazards.

2.9. Summary of Critical Needs (Cross-Sectoral)

- **Health:** Adequate medical supplies and staffing are critical.
- **WASH:** Improved water supply, sanitation infrastructure, and hygiene promotion are essential.
- **Shelter & NFI:** Adequate shelter materials and improved site planning are necessary.
- **Food Security:** Reliable food distribution and nutrition programs are vital.
- **Protection:** Enhanced protection services and community engagement are crucial.

- **Access & Logistics:** Improved road infrastructure and supply chain support are critical.

2.10. Recommended Immediate Interventions (Top 5)

1. Increase water supply and distribution in high-demand areas.
2. Enhance health services and staffing at primary health centers.
3. Provide winterization kits and additional shelter materials.
4. Expand nutrition screening programs and supplementary feeding initiatives.
5. Strengthen protection services and community engagement efforts.

Additional Notes:

- **Power Generation:** Solar panels installed on rooftops can be used to power health clinics and water pumps.
- **Future Planning:** Long-term solutions should include sustainable water harvesting and sanitation projects to address chronic water scarcity.

3. Qwen 32B VLM Output

UN Rapid Needs Assessment (RNA) — Refugee Site / Displacement Location

Agency/Team: Remote Sensing Analysis Unit

Date: 30 November 2025

Location / GPS: Kakuma Region, Turkana County, Kenya

Population Estimate: ~288,206

Method: Remote Sensing Analysis / VLM Analysis / Object Detection

3.1. Priority Life-Saving Concerns (Immediate 72 hrs)

Security & Protection Risks:

- **Notable incidents or threats:** No specific incidents reported, but the concentration of population in one area may lead to overcrowding and potential safety issues.
- **Safe access to communal areas:** Potential risks due to the high concentration of people and limited infrastructure, particularly around water points and latrines.

Critical Gaps Affecting Survival:

- **Lack of shelter coverage:** The current shelter conditions are mixed, with various materials like metal sheets, plastic, and thatch, indicating a need for improved shelter quality.
- **Water quantity:** Severe water scarcity as no significant water bodies or functioning water infrastructure are visible.
- **No food distribution or severe ration gaps:** Information not available, but given the high poverty rate, food security concerns are likely.

- No access to emergency health care: No critical facilities identified, indicating a gap in health services.

Urgent Actions Required:

1. Ensure safe access to communal areas, especially water points and latrines.
2. Distribute additional water resources to address the severe scarcity.
3. Establish emergency health care services and ensure basic medical supplies.

3.2. Health Sector Snapshot

- **Reported Illness Trends:** Information not available.
- **Outbreak Risks:** Potential risks due to poor sanitation and water scarcity.
- **Health Services:** No critical facilities identified, indicating a lack of clinics or mobile teams.
- **Public Health Concerns:** Limited information on vaccination coverage, nutrition screening, and MHPSS needs.

Immediate Needs:

- Establishment of basic health services and medical supplies.
- Conduct public health assessments to identify key concerns.

3.3. WASH (Water, Sanitation & Hygiene)

- **Water Supply:** Severe water scarcity; no significant water bodies or functioning water infrastructure.
- **Sanitation:** Outdoor pits are the primary sanitation facility, which poses significant health risks.
- **Hygiene:** Information on soap availability, handwashing stations, and menstrual hygiene materials is unavailable.

Critical WASH Gaps:

- Severe water scarcity.
- Limited sanitation facilities, primarily outdoor pits.
- Need for hygiene promotion and materials.

3.4. Shelter & Non-Food Items (S/NFI)

- **Shelter Conditions:** Mixed materials used (metal sheets, plastic, thatch); potential issues with durability and protection from harsh weather conditions.
- **NFI Status:** Information not available.
- **Site Planning Issues:** Concentration of population in one area may lead to congestion, fire risk, and drainage issues.

Urgent S/NFI Needs:

- Improved shelter quality and materials.
- Distribution of NFIs such as bedding, cooking sets, and lighting.

3.5. Food Security & Nutrition

- **Food Access:** Information not available, but given the high poverty rate, food security concerns are likely.

- **Nutrition Concerns:** Information not available, but given the youth population over 60%, there may be specific nutritional needs.

Priority Needs:

- Ensure regular food distribution and assess the adequacy of rations.
- Identify and address specific nutritional needs, especially among vulnerable groups.

3.6. Protection

- **Vulnerable Groups:** Unaccompanied children, elderly, persons with disabilities (PwD), female-headed households.
- **Protection Services:** No specific information available.
- **Risks:** Potential risks of gender-based violence (GBV), exploitation, and discrimination due to the concentration of population and limited services.

Protection Actions Required:

- Establish protection services, including case management and safe spaces.
- Conduct community engagement to identify and address specific protection risks.

3.7. Access & Logistics

- **Road Access:** Only one location has a paved road suitable for heavy vehicle access; others are narrow, unpaved, and eroded.
- **Transport:** No information on bridge conditions, congestion, checkpoint delays, or fuel availability.
- **Humanitarian Access:** No specific restrictions noted, but logistical challenges exist due to terrain and road conditions.
- **Supply Chain:** Information not available.
- **Communication:** Information not available.

Logistics Constraints & Priorities:

- Improve road access to facilitate better humanitarian logistics.
- Address supply chain and communication challenges to ensure timely delivery of aid.

3.8. Weather & Environmental Conditions

- **Current Weather Impacts:** Hot and breezy conditions, with temperatures up to 99°F (37°C).
- **Environmental Hazards:** No flooding risk, but chronic water scarcity and potential heat-related health risks.
- **Forecasted Risks:** No specific forecasted risks mentioned, but continued high temperatures are expected.

Weather-Related Actions:

- Provide heat relief measures and ensure adequate water supply.
- Monitor weather conditions to prepare for any potential changes.

3.9. Summary of Critical Needs (Cross-Sectoral)

- **Water Scarcity:** Immediate need for water distribution and infrastructure development.
- **Health Care:** Establish basic health services and medical supplies.
- **Sanitation:** Improve sanitation facilities beyond outdoor pits.
- **Shelter Quality:** Enhance shelter materials and conditions.
- **Food Security:** Ensure regular food distribution and assess nutritional needs.
- **Protection Services:** Establish services for vulnerable groups.

3.10. Recommended Immediate Interventions (Top 5)

1. **Water Distribution:** Immediate distribution of water to address severe scarcity.
2. **Basic Health Services:** Establish emergency health care services and distribute medical supplies.
3. **Improved Sanitation:** Develop and distribute improved sanitation facilities.
4. **Enhanced Shelter Quality:** Provide better shelter materials to improve living conditions.
5. **Food Security:** Ensure regular food distribution and assess nutritional needs, especially for vulnerable groups.

4. Claude Opus Output

UN RAPID NEEDS ASSESSMENT (RNA) — REFUGEE SITE / DISPLACEMENT LOCATION

Agency/Team: Remote Sensing Analysis Unit

Date: 30 November 2025

Location/GPS: Kakuma Region, Turkana County, Kenya

Population Estimate: ~288,206 (based on 2024 records)

Survey Area: 20 km²

Method: Remote Sensing Analysis (Satellite Imagery @ 10.0 cm/pixel GSD), AI-assisted building detection, roof classification, sanitation mapping, and visual landscape assessment

4.1. Priority Life-Saving Concerns (Immediate 72 hrs)

Security & Protection Risks:

- Notable incidents or threats: Unknown from available data
- Safe access to communal areas: Severely constrained — only ONE paved road identified; all other routes require 4WD and are seasonally impassable. This limits emergency response and evacuation capability.
- Hazardous areas: Steep gradients, erosion channels, and rocky outcrops present physical hazards

Critical Gaps Affecting Survival:

Shelter Coverage: CRITICAL

- 2,645 structures for ~288,206 people = ~109 persons/building
- Average building footprint ~81 m²
- Per-person space estimated at $\leq 0.75\text{ m}^2$ (SPHERE minimum: 3.5 m²)

Water Quantity: CRITICAL

- No visible water infrastructure across surveyed area
- Only one small pond identified
- No wells, water towers, or piped systems detected
- Chronic water scarcity indicated

Food Distribution: Unknown — No markets or distribution points identified in imagery

Emergency Health Care: CRITICAL — Zero healthcare facilities identified in surveyed area

Urgent Actions Required:

1. Emergency water trucking and immediate borehole assessment/drilling
2. Mass shelter deployment — current capacity indicates extreme overcrowding
3. Establish mobile health units along the single accessible paved road

4.2. Health Sector Snapshot

Reported Illness Trends: Unknown (no field data)

Outbreak Risks:

- HIGH — Extreme overcrowding (~109 persons/structure) creates ideal conditions for respiratory disease transmission
- Poor sanitation (see WASH section) elevates diarrheal disease risk
- Heat stress risk: Current temperature 36–37°C with limited shade infrastructure

Health Services: None identified via remote sensing

Public Health Concerns:

- Vaccination coverage: Unknown
- Nutrition screening: Unknown
- MHPSS needs: Unknown but likely significant given 60%+ youth population

Immediate Needs:

- Deploy mobile health teams via the accessible paved road corridor
- Establish disease surveillance system
- Heat-related illness preparedness given 98°F conditions

4.3. WASH (Water, Sanitation & Hygiene)

Water Supply:

- Sources identified: 1 small pond only
- Infrastructure: None visible (no wells, tanks, pipelines, or treatment facilities)
- Quantity estimate: Unknown but presumed critically below SPHERE minimum of 15L/person/day
- Quality: Unknown

- Distance: Unknown

Sanitation:

- Outdoor pits detected: 1,498
- Latrine-to-person ratio: 1:192 (SPHERE standard: 1:20)
- Gap: Need ~12,912 additional latrines to meet minimum standards
- Open defecation risk: EXTREMELY HIGH

Hygiene:

- Soap availability: Unknown
- Handwashing stations: Not identified
- Menstrual hygiene materials: Unknown

Critical WASH Gaps:

1. Sanitation crisis — Current ratio is ~10x worse than minimum standards
2. No visible water infrastructure for a population of 288,000+
3. High risk of waterborne disease outbreak

4.4. Shelter & Non-Food Items (S/NFI)

Shelter Conditions:

- Total structures: 2,645
- Total building footprint: 215,228 m²
- Average structure size: ~81 m²
- Persons per structure: ~109 (extreme overcrowding)
- Space per person: ~0.75 m² (SPHERE minimum: 3.5 m²)

Roof Material Distribution:

- Plastic sheeting: 1,525 (36%) — Temporary, vulnerable to heat/UV degradation
- Metal sheet: 1,420 (33%) — Durable but increases heat stress
- Thatch: 1,296 (30%) — Traditional but fire risk, limited weather protection
- Other: 0 (0%)

Solar Panel Coverage:

- 760 solar installations detected (5,485 m² total area)
- Estimated coverage: ~29% of structures have solar access
- Average panel array: ~7.2 m² (estimated capacity: ~1–1.5 kW per installation)

NFI Status: Unknown

Site Planning Issues:

- Fire risk: HIGH — 30% thatch roofing in dense settlement
- Drainage: Unknown but erosion channels suggest runoff issues
- Congestion: SEVERE — settlements highly concentrated in single area

Urgent S/NFI Needs:

1. Emergency shelter expansion (current capacity at ~20% of need)
2. Fire prevention and response planning given thatch concentration

3. Transition from plastic sheeting to more durable materials

4.5. Food Security & Nutrition

Food Access: Unknown — no markets or distribution sites identified

Delivery schedule: Unknown

Ration adequacy: Unknown

Market functionality: No markets visible in surveyed area

Nutrition Concerns:

- Child wasting: Unknown (60%+ population is youth — high-risk demographic)
- Breastfeeding support: Unknown
- Special diets: Unknown

Priority Needs:

- Establish food distribution point along accessible road corridor
- Nutrition screening for youth population

4.6. Protection

Vulnerable Groups:

- Youth: Over 60% of population (~173,000+ individuals)
- Unaccompanied children: Unknown
- Elderly: Unknown
- Persons with disabilities: Unknown
- Female-headed households: Unknown

Population Demographics (from historical data):

- 19 countries of origin (South Sudan, Sudan, Somalia, DR Congo, Burundi, Ethiopia, Uganda primary)
- Poverty rate: 68% below \$1.90/day

Protection Services: None identified in surveyed area (no schools, community centers, safe spaces visible)

Risks:

- GBV: Unknown but elevated risk due to overcrowding and limited sanitation privacy
- Exploitation: Unknown
- Child protection: HIGH concern given youth majority

Protection Actions Required:

1. Establish child protection and GBV response services
2. Community engagement given multi-national population
3. Safe spaces for women and children

4.7. Access & Logistics

Road Access:

- Paved roads: 1 segment only — suitable for heavy vehicles
- Unpaved tracks: Multiple but eroded, seasonal, largely impassable
- 4x4 requirement: YES for all areas beyond main road
- Weather constraints: Dry season currently; roads likely impassable during rains

Transport:

- Bridge conditions: No bridges identified
- Congestion: Settlement concentrated at single access point
- Checkpoint delays: Unknown
- Fuel availability: Unknown

Humanitarian Access:

- Physical access: SEVERELY LIMITED to single paved corridor
- Restrictions/permits: Unknown
- Safety: Terrain hazards (steep gradients, erosion channels)

Supply Chain:

- Warehouse capacity: None identified
- Cold chain: None identified
- Border delays: Unknown

Communication:

- Mobile network: Unknown
- Radio: Unknown
- Internet: Unknown
- Infrastructure: No communication towers visible

Helicopter Landing Zones: No ideal LZs identified — limited potential in some valley floors only

Logistics Constraints & Priorities:

1. Single-point-of-failure road access — any disruption cuts off humanitarian access
2. All distribution must occur at settlement area; no alternative staging points
3. Pre-position supplies before rainy season

4.8. Weather & Environmental Conditions

Current Conditions (30 Nov 2025):

- Temperature: 36°C (98°F)
- High/Low: 37°C / 24°C (99°F / 76°F)
- Conditions: Hazy sunshine, breezy, hot
- Climate: Semi-arid, hot year-round

Current Weather Impacts:

- Heat stress: HIGH risk at 36–37°C, especially for vulnerable populations
- Dust: Likely given haze and breezy conditions
- UV exposure: HIGH in arid environment

Environmental Hazards:

- Water contamination: Single pond likely contaminated; no treatment visible
- Terrain hazards: Steep gradients, erosion channels, rocky outcrops
- Dry riverbeds (wadis): Flash flood risk during rains
- Wildlife: Unknown

Forecasted Risks: Data not available

Weather-Related Actions:

1. Heat mitigation — shade structures, hydration points
2. Flash flood preparedness planning for wadi areas
3. Dust/respiratory protection for vulnerable groups

4.9. Summary of Critical Needs (Cross-Sectoral)

- **Priority 1 - WASH (CRITICAL):** Water infrastructure absent; 1:192 latrine ratio (10x below standard)
- **Priority 2 - SHELTER (CRITICAL):** ~109 persons/structure; $0.75\text{ m}^2\text{/person}$ (5x below standard)
- **Priority 3 - HEALTH (CRITICAL):** Zero healthcare facilities identified
- **Priority 4 - ACCESS (SEVERE):** Single paved road; no alternative routes viable
- **Priority 5 - PROTECTION (SEVERE):** No safe spaces, schools, or community facilities identified

4.10. Recommended Immediate Interventions (Top 5)

1. **EMERGENCY WATER RESPONSE:** Deploy water trucking immediately; conduct rapid borehole feasibility assessment. Current infrastructure is ZERO for 288,000+ population.
2. **MASS LATRINE CONSTRUCTION:** Current gap: ~12,900 latrines needed. Prioritize communal latrine blocks with gender segregation to reduce open defecation and GBV risk.
3. **MOBILE HEALTH UNIT DEPLOYMENT:** Establish minimum 3 mobile health teams operating from paved road corridor. Pre-position oral rehydration supplies and heat-illness treatment capacity.
4. **EMERGENCY SHELTER SCALE-UP:** Current structures accommodate only ~20% of population at minimum standards. Deploy emergency shelter kits; prioritize replacing 1,525 plastic-sheet structures before UV degradation.
5. **LOGISTICS PRE-POSITIONING:** Single access route creates critical vulnerability. Pre-position 30-day supplies at settlement area before potential rainy season disruption. Assess secondary route development.

4.11. Key Calculated Metrics Summary

Indicator	Current	SPHERE Std	Gap
Persons per latrine	192	20	172 excess
Shelter space/person	~0.75 m ²	3.5 m ²	2.75 m ² deficit
Healthcare facilities	0	1 per 10,000	~29 needed
Water infrastructure	0 visible	Multiple	Critical

Assessment Information:

Prepared By: Remote Sensing Analysis Unit

Data Sources: Satellite imagery (10 cm GSD), AI-assisted feature detection, VLM landscape analysis

Limitations: No field verification; no real-time population count; infrastructure may exist below detection threshold or outside survey area

Next Steps: Ground-truthing mission required; coordinate with sector leads for field assessment

5. GPT Output

UN Rapid Needs Assessment (RNA) — Refugee Site / Displacement Location

Agency/Team: Refugee organisation – remote imagery assessment (analyst)

Date: 30 Nov 2025

Location / GPS: Kakuma area, Kenya – exact GPS coordinates unknown (imagery footprint ≈ 20 km²)

Population Est.: Unknown (building footprint suggests a sizeable, dense settlement; no verified population figure for this specific footprint)

Method: Direct observation via very high-resolution satellite imagery (GSD 10 cm/pixel), automated models (building/solar/sanitation/roof material), and visual interpretation (VLM); no ground verification, no key informant data

5.1. Priority Life-Saving Concerns (Immediate 72 hrs)

Security & Protection Risks:

- Notable incidents or threats (GBV, child protection, armed presence, hazardous areas): Unknown (no incident reports; imagery cannot show GBV, child protection, or armed presence).
- Hazardous areas: Numerous outdoor pits (1,498) visible; potential physical hazard for children and persons with disabilities, especially at night.
- Safe access to communal areas (water points, latrines, distribution sites): Access routes within the settlement are unpaved dirt tracks; safe access to communal areas such as water points or latrines cannot be confirmed (water points not visible; latrines assumed to overlap with outdoor pits).

Critical Gaps Affecting Survival:

- Lack of shelter coverage: 2,645 buildings with total roof area $\approx 215,228$ m² in a single dense cluster; roofs largely metal, plastic, and thatch, implying high daytime heat exposure, poor insulation, and limited thermal comfort in current 36–37°C conditions. Structural integrity/overcrowding inside shelters unknown.
- Water quantity \downarrow 15L/person/day: Actual per-person water quantity unknown. No visible water infrastructure (pipelines, tanks, treatment plants, boreholes, or standpipes); only a single small pond observed. Strong concern for chronic water scarcity, but no measured volume data.
- No food distribution or severe ration gaps: Unknown (no visible distribution sites or storage facilities identifiable in imagery; no pipeline data).
- No access to emergency health care: Unknown – no clearly identifiable health facility or clinic within the imaged area; facilities may exist outside the footprint.

Urgent Actions Required:

1. Immediately verify water access and quantity/quality through field teams or community informants (current source, trucking, litres/person/day).
2. Rapid field check of health service availability and capacity (any nearby clinic, ability to manage heat-related illness and dehydration).
3. Protection and safety scan of sanitation areas (location of pits relative to shelters, lighting, child safety measures) and mapping of any critical gaps in night-time lighting and safe access routes.

5.2. Health Sector Snapshot

Reported Illness Trends: Unknown (no clinical or surveillance data available from imagery).

Outbreak Risks:

- No confirmed alerts or suspected cases from this assessment (unknown).
- Environmental risks: High temperatures (up to 37°C), very limited visible water infrastructure, and reliance on outdoor pits indicate elevated risk of dehydration, heat-related illness, and faeco-oral disease transmission if water and hygiene are inadequate.

Health Services:

- No clearly visible health facility, mobile clinic, or ambulance service points within the imagery footprint.
- Availability of health staff, essential medicines, reproductive health services, and referral pathways: Unknown.

Public Health Concerns:

- Vaccination coverage, nutrition screening, and MHPSS services: Unknown.
- Shelter types (metal/plastic/thatch roofs) and high ambient temperatures imply significant heat exposure risk, especially for children, pregnant women, elderly, and chronically ill.

Immediate Needs:

- Field verification of nearest functional health facility and its catchment, staffing, and stock levels.
- Rapid public health risk assessment focusing on heat stress, dehydration, diarrhoeal disease risk around pits, and any existing surveillance data.
- Plan for outreach/mobile health if facilities are distant or absent from the settlement cluster.

5.3. WASH (Water, Sanitation & Hygiene)

Water Supply:

- No visible boreholes, water towers, piped networks, or formal distribution points in the imagery.
- One small pond noted near the settlement; not suitable as a reliable or safe primary water source.
- Water source type, distance to water, and daily quantity per person: Unknown, but high concern for insufficiency in a semi-arid, 36–37°C environment.

Sanitation:

- 1,498 identified outdoor pits in or near the built-up area compared to 2,645 buildings – approximately one pit per 1.5–2 structures (rough structural ratio; not a confirmed latrine-per-person figure).
- Types (latrines vs rubbish pits), fill levels, containment, and desludging systems: Unknown.
- Risk of open defecation and environmental contamination: Unknown but plausible given lack of visible engineered sanitation systems.

Hygiene:

- No visible handwashing stations or clear evidence of soap/hygiene distributions from imagery.
- Availability of soap, menstrual hygiene materials, and hygiene promotion activities: Unknown.

Critical WASH Gaps:

- Confirmed lack of visible water infrastructure within the imagery footprint and only a small pond observed.
- Nature and safety of the numerous outdoor pits unverified, raising concerns on excreta disposal practices, child safety, and groundwater contamination risk.
- Absence of observable handwashing and hygiene infrastructure; hygiene behavior and supplies unknown.

5.4. Shelter & Non-Food Items (S/NFI)

Shelter Conditions:

- 2,645 structures totaling ~215,228 m² roof area concentrated in one dense settlement.
- Roof material classifications show high counts for metal sheet, plastic, and thatch, indicating many shelters are heat-absorbing and likely poorly insulated.
- Damage levels, internal overcrowding, and structural safety under wind/rain: Unknown.

NFI Status:

- 760 solar panel installations (~5,485 m² panel area), roughly one panel per ~3–4 structures, indicating partial access to household or community electricity/lighting.
- Coverage of bedding, cooking sets, jerrycans, and other NFIs: Unknown.
- Winterization needs are low priority in current hot, semi-arid conditions.

Site Planning Issues:

- Settlement appears densely built with limited visible open, organized communal spaces.
- No formal drainage systems visible; however, semi-arid conditions and lack of water bodies suggest low immediate flood risk.
- Fire risk assessment (spacing between shelters, cooking practices) is unknown, but dense layout plus thatch/plastic roofing typically implies elevated potential fire risk.

Urgent S/NFI Needs:

- Field verification of shelter crowding, structural safety, and internal temperatures, with focus on vulnerable

groups.

- Assessment of lighting coverage (especially near sanitation and communal areas) and NFI gaps (bed nets, cooking sets, jerrycans, torches/lanterns).
- Identify potential sites or micro-adjustments for safe open spaces and improved circulation if fire risk or congestion is confirmed.

5.5. Food Security & Nutrition

Food Access:

- No warehouses, formal distribution centers, or markets clearly identifiable in the imagery.
- Frequency of food distributions, ration size, and presence of functioning local markets: Unknown.

Nutrition Concerns:

- No anthropometric or screening data available – prevalence of wasting, stunting, and micronutrient deficiencies: Unknown.
- Breastfeeding support, targeted feeding for pregnant/lactating women and children under 5, and special diet arrangements: Unknown.

Priority Needs:

- Rapid inquiry (through field teams or partners) on current food pipeline, ration adequacy, and last distribution to this specific settlement cluster.
- Emergency nutrition assessment (MUAC screening, sentinel sites) if any signs of pipeline breaks, reduced rations, or disease outbreaks are identified.

5.6. Protection

Vulnerable Groups:

- Presence and number of unaccompanied/separated children, elderly, persons with disabilities, and female-headed households: Unknown.
- However, dense camp settings in harsh climates typically include significant proportions of high-vulnerability households; this is unconfirmed here.

Protection Services:

- No identifiable safe spaces, child-friendly spaces, or formal protection service centers from the imagery.
- Availability of case management, community-based protection structures, and complaint/feedback mechanisms: Unknown.

Risks:

- GBV, exploitation, and child protection risks: Unknown but likely elevated if distance or unsafe access to latrines/pits at night and lighting is limited (solar coverage is partial and uneven).
- Risks of falls or injuries linked to open pits, particularly for children and persons with disabilities.
- Documentation status, discrimination, or tensions with host communities: Unknown.

Protection Actions Required:

- Protection rapid assessment in the settlement, with focus on GBV/SEA risks, child protection, and persons with specific needs.
- Mapping of high-risk physical spaces (pits, dark areas, isolated paths) and planning for lighting and safer access routes.
- Establish or strengthen community-based protection mechanisms and referral pathways once basic services are clarified.

5.7. Access & Logistics

Road Access:

- Only one section of paved road identified; all other routes are narrow, eroded, unpaved dirt tracks that are seasonal and largely impassable for conventional vehicles, requiring 4x4.
- Steep gradients and erosion channels in surrounding terrain further constrain access.

Transport:

- No bridges or engineered crossings visible in the imagery.
- Fuel availability, checkpoints, and congestion conditions: Unknown.

Humanitarian Access:

- Curfews, permits, and security restrictions: Unknown.
- Physical access is moderately to severely constrained away from the paved road, especially in adverse weather or at night.

Supply Chain:

- No visible warehouses or cold chain infrastructure within the imaged area.
- Border delays and national-level logistics pipeline: Unknown.

Communication:

- No telecom towers or power lines visible; mobile network and internet availability: Unknown.

Logistics Constraints & Priorities:

- Primary staging and heavy vehicle operations should be planned along the paved road segment, with last-mile delivery via 4x4 where needed.
- Access reconnaissance (route mapping, vehicle tests) required for unpaved tracks, especially before large-scale distributions.
- Temporary storage and coordination points near the paved road should be identified or established due to lack of visible warehousing.

5.8. Weather & Environmental Conditions

Current Weather Impacts:

- Hazy sunshine, 36–37°C daytime temperatures, 24°C at night; breezy and hot.
- High heat load on shelters with metal/plastic roofs likely drives indoor temperatures well above ambient, increasing risk of dehydration and heat stress.

Environmental Hazards:

- No flooding or standing surface water (aside from a small pond); low flood risk in current conditions.
- Semi-arid landscape with sparse vegetation suggests dust exposure and possible respiratory irritation.
- Wildlife and contaminated groundwater hazards: Unknown.

Forecasted Risks:

- Climate described as semi-arid, hot year-round, indicating chronic heat and water stress rather than acute flood or storm risk in the immediate term.

Weather-Related Actions:

- Integrate heat mitigation into all sectoral planning (shade structures at distribution/queue points, timing of activities to cooler hours, promotion of hydration).
- Prioritize reliable and safe drinking water supply and storage given chronic heat and likely high evaporation losses.

5.9. Summary of Critical Needs (Cross-Sectoral)

- **Water & Public Health:** No visible water infrastructure and only a small pond in a very hot, semi-arid setting → urgent need to confirm and, if necessary, scale up safe water provision and public health risk mitigation.
- **Health & Heat Stress:** Unknown health service availability combined with high heat exposure from shelter types → need to ensure at least minimum emergency health access and community guidance on heat and hygiene.
- **Sanitation & Safety:** High number of outdoor pits vs. structures, with unclear function and safety → potential WASH and child-protection concern.
- **Access & Logistics:** Single paved access point and otherwise poor-quality 4x4 tracks → logistics must be carefully planned around this constraint.
- **Information Gaps:** Major data gaps for population, morbidity, mortality, food security, and protection incidents → immediate multi-sector field verification is essential.

5.10. Recommended Immediate Interventions (Top 5)

1. Rapid multi-sector field assessment focused on this specific settlement cluster (population size; water sources and volumes; health services; food pipeline; key protection risks), to validate and complement imagery-based findings.
2. Emergency water and heat risk mitigation plan: confirm current water provision; if inadequate, deploy water trucking or alternative safe supply and promote hydration and shade at key congregation points.
3. Targeted WASH and safety review of outdoor pits: classify pits (latrine vs other), address immediate safety hazards (e.g., fencing, covers, child-safe design), and plan for safe excreta management where needed.

4. Health access assurance: ensure at least one reachable health service point (fixed or mobile) for the settlement with capacity for basic curative care, management of dehydration/heat illness, and outbreak early warning.
5. Access and logistics planning around the paved road: designate a secure, accessible distribution/staging area along the paved section, map 4x4 routes to the settlement, and sequence any large-scale distributions or service roll-outs accordingly.

6. Gemini Output

UN Rapid Needs Assessment (RNA) — Refugee Site / Displacement Location

Agency/Team: AI Analysis Unit

Date: November 30, 2025

Location / GPS: Kakuma Region (20 sq km Surveyed Area)

Population Est.: ~288,206 (Total Regional Context); 2,645 Structures (Surveyed Area)

Method: Remote Sensing (Satellite/Aerial), VLM Analysis, Object Detection

6.1. Priority Life-Saving Concerns (Immediate 72 hrs)

Security & Protection Risks:

- Safe Access: Access to the single paved road is limited to one concentrated area. The surrounding area is uninhabited and rugged, posing risks for individuals traveling for resources (firewood/water).
- Hazardous Areas: Rugged terrain with erosion channels and wadis presents physical hazards, particularly during any potential flash floods.

Critical Gaps Affecting Survival:

- Water Scarcity: VLM identifies NO significant water bodies and chronic water scarcity. With a population of ~288k and 37°C heat, water supply is the primary critical risk.
- Heat Stress: Temperatures reaching 99°F (37°C) creates an immediate risk of heatstroke and dehydration, especially given the lack of visible cooling infrastructure or dense vegetation.

Urgent Actions Required:

1. Emergency Water Trucking: Immediate deployment of tankers to the settlement cluster utilizing the single paved road.
2. Heat Mitigation: Distribute shading materials (tarps) to households with plastic roofing.
3. Sanitation Verification: Inspect the 1,498 detected “outdoor pits” to ensure they are safe latrines.

6.2. Health Sector Snapshot

- **Reported Illness Trends:** Unknown (Data not provided).
- **Outbreak Risks:**

- Waterborne Disease: High risk due to 1,498 outdoor pits in proximity to living areas and water scarcity.
- Vector-borne: 1,296 thatched roofs may harbor insects/vectors.

- **Health Services:** Critical Gap. No healthcare facilities (clinics, hospitals) visible in the surveyed 20 sq km area.
- **Public Health Concerns:** High poverty rate (68%) implies inability to purchase medicine/hygiene supplies.

Immediate Needs: Establish Mobile Medical Units (MMUs) immediately, prioritizing dehydration treatment and pediatric care.

6.3. WASH (Water, Sanitation & Hygiene)

Water Supply:

- Functionality: Critical Failure. No wells or water towers visible.
- Quantity: Likely far below 15L/person/day given “chronic water scarcity.”

Sanitation:

- Ratio: ~1 pit per 1.7 buildings (1,498 pits / 2,645 buildings). Quantity appears sufficient, but quality (open pit vs. improved) is the concern.

Hygiene: Unknown.

Critical WASH Gaps: Lack of permanent water infrastructure limits high-volume distribution. Reliance on a single paved road creates a logistics bottleneck.

6.4. Shelter & Non-Food Items (S/NFI)

Shelter Conditions:

- Plastic (Transitional): 1,525 detected (~36%). High heat vulnerability.
- Metal (Semi-Permanent): 1,420 detected.
- Thatch (Traditional): 1,296 detected. High fire risk.

Site Planning Issues: Congestion in the “single area” increases fire risk significantly in 37°C weather.

Urgent S/NFI Needs: Fire safety breaks in dense clusters. Replacement of degraded plastic sheeting with heat-reflective materials.

6.5. Food Security & Nutrition

Food Access:

- Markets: None visible in surveyed area.
- Agriculture: No active farming; one possible small plot identified. Dependency on external aid is likely 100%.

Nutrition Concerns: With 68% poverty and ~60% youth, malnutrition risk is high if supply chains are disrupted.

Priority Needs: Establish General Food Distribution (GFD) points near the paved road.

6.6. Protection

- **Vulnerable Groups:** Youth (~60% of population).
- **Protection Services:** No safe spaces or schools visible.

- **Risks:** GBV risk increased by unlit areas and rugged terrain. Child protection risk due to lack of schools and high density.

Protection Actions Required: Establish solar lighting in communal latrine areas (utilizing potential power from existing panels).

6.7. Access & Logistics

Road Access:

- Paved: Only one location accessible to heavy trucks.
- Unpaved: Remaining network is narrow, eroded dirt tracks requiring 4WD.

Transport: No bridges visible. Wadis may be impassable during rain.

Power Supply: Significant solar capacity detected (760 panels / 5,485 m²). Inferred peak capacity ~800kW – 1MW. Likely centralized; no distribution lines visible.

Communication: No towers visible.

Logistics Constraints:

1. Staging limited to the single paved road.
2. No ideal Helicopter Landing Zones (HLZs).
3. Storage capacity unknown (large structures visible but purpose unverified).

6.8. Weather & Environmental Conditions

- **Current Weather:** 98°F (36°C) / Hazy Sunshine. Extreme heat stress.
- **Environmental Hazards:**
 - Drought / Chronic water scarcity.
 - Extreme Fire Danger (Dry vegetation + Thatch + Heat + Wind).

Weather-Related Actions: Hydration stations. Fire breaks. Dust control.

6.9. Summary of Critical Needs (Cross-Sectoral)

1. **Water Supply:** Immediate tankering required; 0 functioning infrastructure.
2. **Fire Prevention:** High density of flammable roofing in extreme heat.
3. **Logistics Bottleneck:** Operation relies on one paved road; need 4WD mapping.
4. **Health/Heat:** Immediate need for cooling centers or medical support.
5. **Sanitation Safety:** Validation of outdoor pits to prevent disease.

6.10. Recommended Immediate Interventions (Top 5)

1. **Deploy Water Tankering Fleet:** Target dense settlement along paved road.
2. **Establish Mobile Health Clinics:** Deploy 4WD mobile units to dispersed areas.

3. **Fire Safety Campaign & Breaks:** Create physical gaps between thatch clusters.
4. **Solar Power Redistribution:** Investigate 760-panel array for community use (water pumping/cooling).
5. **Road Rehabilitation:** Grade eroded tracks to allow non-4WD access.