ARTIFICIAL INTELLIGENCE FOR SYRIA:

APPLICATIONS WITHIN THE SYRIAN HUMANITARIAN RESPONSE.

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Artificial intelligence (AI) has begun to feature across multiple domains of Syria's humanitarian response, yet its adoption remains fragmented, uneven, and insufficiently institutionalised.

A range of initiatives, from civilian early warning systems and displacement forecasting models to climate hazard prediction platforms, immunisation tracking applications, AI-enabled chatbots, and satellite-based damage assessments, demonstrate that advanced analytics and machine learning can operate even in highly fragile, conflict-affected environments. However, these applications have largely emerged as discrete pilots or project-based innovations rather than as components of a coherent, system-wide strategy. Structural constraints, including infrastructure degradation, fragmented governance, inconsistent data ecosystems, funding volatility, and limited technical capacity, have constrained scale, sustainability, and integration into humanitarian coordination and decision-making frameworks. As a result, AI's transformative potential within Syria's protracted crisis remains only partially realised.

This AI landscaping assessment seeks to provide a comprehensive overview of the current ecosystem of AI use within Syria's humanitarian response, examining where and how AI tools are being deployed, what gaps they aim to address, and why their impact has remained limited or uneven. The study will analyse sectoral applications across protection, displacement, climate, health, legal access, coordination, infrastructure recovery, and explosive ordnance detection, while also identifying cross-cutting challenges related to data governance, infrastructure, ethics, localisation, and operational uptake. By mapping existing initiatives alongside systemic constraints, the assessment aims to clarify not only what AI is doing in Syria, but what it is not yet achieving and what would be required to move from isolated innovation toward strategic, accountable, and context-appropriate integration within the humanitarian system.

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SYRIA-SPECIFIC DEPLOYED AI INITIATIVES

Civilian protection & early warning

Sentry Syria - AI-Powered Airstrike Early Warning System (2017-2024)[1]

Sentry Syria, developed by Hala Systems, was an innovative AI-driven early warning system operating in Northwest Syria from 2017-2024. Designed to protect civilians from aerial bombardment during the Syrian conflict, the system combined acoustic sensors, human observers, and AI algorithms to predict airstrikes 7-10 minutes in advance. Warnings were disseminated through multiple channels, including social media, local radio, and sirens, reaching over 2.1 million people and issuing on average 140 alerts per day. Independent verification indicated a 10-30% reduction in casualty rates in areas where the system operated.

Beyond immediate protection, Sentry Syria integrated blockchain technology to record attacks, supporting war crimes documentation and contributing to the world's first ICC Article 15 dossier based on sensor-verified evidence. AI and Machine Learning were used to verify attacks, and validate reports across a range of input types, including social media, acoustic sensors, and human sources. The system exemplified collective crisis intelligence, blending community reporting, advanced analytics, and distributed data integrity to enhance situational awareness in conflict zones.

Key hallenges included data scarcity, evolving conflict tactics, infrastructure constraints, and ensuring civilian trust and safety. Despite these barriers, Sentry Syria demonstrated the potential of technology-enabled early warning systems to save lives and provide credible evidence for accountability, offering a model for future humanitarian applications in high-risk environments. While aerial bombardment is no longer a significant risk to Syria's civilians, this tool exemplified an innovative use of AI to forecast airstrikes and inform civilians of increased risks.

Sources: Hala Systems; Nesta Case Study

Displacement forecasting and population movement

Machine-Learning-Based IDP Migration Forecasting Models

Huynh and Basu developed a machine learning model to forecast monthly internally displaced person movements between governorates in Syria. The model draws on a range of socio-economic and conflict related inputs, including food prices, fuel prices, wages, geographic location, time variables, and conflict event reports. By integrating

1. While large-scale airstrikes have declined following December 2024 political transition, Sentry demonstrates proven AI impact in Syria and offers infrastructure lessons for future humanitarian alert systems (explosive ordnance, earthquakes, floods, disease outbreaks).

these diverse datasets, the approach captures the complex drivers of displacement more effectively than simpler baseline methods, such as trend assumptions. The study found that by combining market, temporal, and security indicators significantly improved the accuracy of IDP predictions and could support the pre-positioning of funding and resources in a context of significant localised displacement.

However, machine learning based IDP forecasting models face several limitations. In protracted conflict situations, input data such as market prices, wages, conflict reports and displacement figures may be incomplete, delayed, biased, or unevenly distributed geographically, undermining predictive accuracy. These models tend to extrapolate from historical patterns, and may struggle to anticipate sudden political shifts, ceasefires such as the one agreed in January 2026, major and sporadic escalations, or policy changes that can significantly alter displacement dynamics. There is also the risk of overfitting to past trends, reducing reliability over time, and limited transparency through academic publication can make results difficult for humanitarian actors to interpret, trust, and operationalise.

Source: Huynh and Basu, 06/2020

MEACAM (Middle East Anticipatory Climate Action Model) - Mercy Corps

The Middle East Anticipatory Climate Action Model (MEACAM) is an online climate hazard forecasting platform designed to enhance early warning and anticipatory action for climate-related risks, specifically flooding and agricultural drought, in Iraq, Syria, and Yemen, three countries facing acute climate stress and complex humanitarian crises. At its core, MEACAM uses satellite imagery and climate analytics to generate near-real-time predictions of flash floods and agricultural drought, with flood forecasts updating multiple times per day and drought forecasts on a regular cycle, supporting stakeholders with timely situational awareness. It also includes geographic and demographic estimates for communities likely to be affected, facilitating anticipatory decision-making for humanitarian and development actors.

The platform is intended to serve as a foundational component of a multi-hazard early warning system (EWS). By aligning with the early pillars of EWS, such as risk knowledge, hazard monitoring, and forecasting, and through a series of related research reports and technical documentation, MEACAM provides both the data and the analytical basis for improved risk communication, early action triggers, and disaster risk reduction planning. These research outputs explore how MEACAM's forecasts can be integrated with Early Action Plans (EAPs) and other preparedness measures, and how the information can be communicated effectively within emergency response frameworks.

Despite its promise, MEACAM's implementation faces barriers typical of AI driven anticipatory climate tools in fragile settings. These include the need for robust integration with existing national early warning infrastructure, the challenge of ensuring consistent data quality, and the requirement for sustained collaboration between governments, aid actors, and local communities.

Source: MEACAM Mercy Corps

Mental health and trauma identification

Machine-Learning-Based Psychological Trauma Detection - Syrian Refugee Children

The Machine-Learning-Based Psychological Trauma Detection project in Jordan applies Least Absolute Shrinkage and Selection Operator (LASSO) regression to analyse 2,480 digitised drawings produced by Syrian refugee children, with the aim of identifying markers of psychological trauma. The approach leverages computational feature extraction from children's drawings, such as colour usage, spatial organisation, object representation, and symbolic content, and correlates these features with validated trauma assessment instruments and reported exposure to violence. By statistically selecting the most predictive drawing characteristics, the LASSO model reduces dimensionality while retaining interpretable predictors associated with trauma symptomatology. The project responds to a profound service gap: an estimated 2.5 million children have been exposed to severe forms of violence across the Syrian crisis context, while access to specialised Mental Health and Psychosocial Support (MHPSS) services in refugee settings remains extremely limited. As a rapid, low-cost, and non-invasive screening tool, the model is designed to support early identification and triage in resource-constrained environments where trained clinicians and culturally validated assessment tools are scarce.

However, important limitations remain. Correlational findings do not establish diagnostic validity, and the risk of false positives or negatives raises ethical concerns if screening results are used without appropriate clinical follow-up. The model's performance may also be context-specific, limiting generalisability beyond the Jordanian refugee population without retraining and validation. Additionally, digitisation and standardisation of drawings introduce procedural variability, while algorithmic opacity and potential cultural bias in feature interpretation may affect reliability. As such, the approach is best conceptualised as an adjunctive triage tool within integrated MHPSS systems rather than a standalone diagnostic mechanism.

Source: Baird, Panlilio, Seager, Smith and Wydick, 05/2022

AI chatbots for services and information access

Children Immunization App (CIMA) - Zaatari Camp, Jordan

The Children Immunization App (CIMA) is a mobile tool developed by UNICEF and the Jordanian Ministry of Health to enable timely and effective vaccination follow up of Syrian children in a refugee camp setting. It stores records in both Arabic and English, sends reminders to families to update vaccines, and alerts for missed appointments. In a 2019 trial with 936 young children, it demonstrated a 26% improvement in vaccine adherence in controlled trials, a significant reduction in the duration of delayed or missed vaccine follow up. It was later updated in 2021 for COVID 19 with support from UNODC and the Japanese Government, enhancing its utility by amalgamating health educational resources, schedule registration, and multi-lingual prompts. This update was assessed using a Kaplan-Meier survival analysis, which further corroborated CIMA's effectiveness, and highlighted the application as a prospective scalable tool for refugee health systems.

However, while CIMA markedly enhances vaccine adherence, its efficacy hinges on smartphone usage and digital literacy amongst refugee populations, potentially excluding illiterate or deviceless families.

Data privacy risks are also prevalent, as storing sensitive health data on mobile devices risks potential breaches amid unstable camp security conditions and limited cybersecurity training. These are compounded by potential biases in reminder scheduling that overlook cultural vaccine hesitancy prevalent in Syrian populations.

Source: El-Halabi, Khader, Kheidr, Hanson, Alfvén and El-Khatib, 2023; Abu Mahfouz, 01/2026; Schmidgall, Harris, Essien, et al. 10/2024

SignpostChat (IRC, Mercy Corps, Internews Consortium)

SignpostChat is a generative AI chatbot developed by a consortium including the International Rescue Committee (IRC), Mercy Corps, Internews, and local partners. Building on IRC's signpost project launched in 2015 to aid migrants in Europe, it provides tailored information on services and essentials via digital help centres staffed and supported by local organisations in Syria and surrounding regions. It speeds up curation, answers routine questions, and provides rapid and engageable assistance to displaced persons and NGO beneficiaries, enabling a quicker addressing of humanitarian needs.

However, SignpostChat faces limitations regarding generative AI's proneness to hallucinations, potentially disseminating incorrect real time guidance, despite human in the loop moderation. It also relies heavily on internet accessibility in remote areas, faces ethical dilemmas regarding data consent for vulnerable populations, and moderation bottlenecks that curtail scalability in wider contexts.

Source: UKHIH 12/2024

Adala-Bot (Med Dialogue for Rights and Equality)

The Med Dialogues Programmes Adala Bot is an AI powered legal information chatbot launched in March 2022designed to support Syrians inside Syria and refugees by providing accessible guidance on property rights and civil status issues.

It covers a wide range of practical legal topics, including real estate protection, title deeds, inheritance inventory, judicial agency, civil registration procedures, marriage and divorce documentation, birth and death registration, and property restitution.
By focusing on populations affected by political oppression, displacement, dispossession, and documentation loss, Adala-bot seeks to empower users with knowledge of relevant legal provisions and administrative processes necessary to reclaim rights and navigate complex bureaucratic systems. Its accessibility in Arabic, 24/7 availability, free-of-charge service model, and privacy-protective guest mode, where no personal data are stored and conversations are deleted within 24 hours, constitute key design features and success indicators aligned with protection-sensitive programming.

The platform's innovation lies in lowering informational barriers in a context where legal aid access is constrained by cost, insecurity, and limited-service coverage. However, significant risks remain. Chatbots, such as Adala, that provide legal information may inadvertently offer outdated, incomplete, or oversimplified guidance in a highly fluid legal and political environment, potentially exposing users to procedural errors or protection risks. Digital exclusion may limit access for the most vulnerable, particularly women, elderly individuals, or those without reliable connectivity. Additionally, despite privacy safeguards, perceived surveillance risks in the Syrian context may deter usage, and there is a broader ethical concern that automated legal advice could substitute for, rather than complement, professional legal assistance. Mitigating these risks requires regular content updates, clear disclaimers, referral pathways to qualified legal actors, and robust user trust-building measures.

Sources: Med Dialogue 02/2022; Justice Innovation 01/2024

Crisis response & coordination tools

UNDP RAPIDA & Crisis Response Hub

The UNDP Rapid Digital Assessment (RAPIDA) initiative is an AI-enabled crisis analytics platform designed to accelerate situational awareness immediately after disasters by integrating satellite imagery, social media signals, and night-light data to map damage and identify vulnerable populations at scale. RAPIDA builds upon geographic information system (GIS) tools to synthesise diverse real-time data streams, aiming to reduce the time required to assess the scope of destruction and humanitarian need to within days of an event rather than weeks, thereby informing prioritisation of relief planning and resource allocation. This tool is part of a broader Crisis Response Hub that includes AI chatbots and co-pilot systems to assist response teams in accessing guidance, co-creating strategic plans, and speeding decision-making processes. The deployment of AI-powered EVA.ai workforce matching has supported UNDP's mobilisation of thousands of personnel to crisis offices, leveraging machine learning to match expertise, language capabilities, and availability with organisational needs as part of Syria and other responses.

Despite its innovative use of multi-modal data sources and support tools, RAPIDA and associated AI components face several limitations. Integrating satellite imagery with textual and social media inputs can introduce noise and bias, particularly where network connectivity or data coverage is sparse, potentially skewing the representation of affected areas. AI chatbots and co-pilot systems may struggle with contextual nuances or incomplete data, raising concerns about the reliability of automated guidance without human oversight. Workforce matching platforms like EVA.ai, while efficient, may inadvertently favour profiles with more digitally visible experience, potentially overlooking essential but less documented local expertise. Moreover, ethical and operational challenges persist around data privacy, cultural sensitivity, and the validation of AI-generated insights against ground-truth assessments, underscoring the need for robust governance frameworks in AI-assisted humanitarian operations.

Sources: UNDP AI Crisis Response, 01/2026; **DFS 08/2025**

2023 Turkey-Syria Earthquake Response

While not a standalone tool, the 2023 Turkey-Earthquake is a prime example of how a range of AI driven tools can be used in emergency responses. The earthquakes on February 6, 2023, generated catastrophic seismic events causing widespread structural collapse, tens of thousands of fatalities and injuries, and massive displacement across both countries. In the humanitarian response that followed, technology played a significant supporting role in complementing traditional search and rescue and relief efforts. Independent technological initiatives and civilian apps used machine learning to detect audio signals from under rubble, assisting in locating survivors in collapsed structures. In parallel, machine learning driven satellite imagery and remote sensing helped relief actors visualise the scale of destruction and coordinate logistics and debris removal, a critical need given the extensive damage to infrastructure. Mercy Corps' Nightlight analysis is a good example, deploying machine learning algorithms on night light reflectance to estimate damage, electricity provision, and other key context dynamics in support of response efforts.

However, while such tools are often used in earthquake responses, the use of AI and advanced analytics in this setting had inherent limitations. Formal seismic aftershock prediction using machine learning was not systematically documented as part of the mainstream humanitarian response, and much of the AI-related analysis remained at the research or pilot level rather than fully integrated into operational command structures. Data from satellite and social media sources required careful validation against on-the-ground assessments to avoid misinterpretation of damage severity, given challenges such as cloud cover, resolution limits, and biased reporting from crowdsourced platforms.

Sources: MIT Technology 02/2023; Mercy Corps Crisis Analysis; SAM 12/2025

Water safety optimisation

SWOT - Safe Water Optimisation Tool (York University/MSF)

The Safe Water Optimization Tool (SWOT) is a machine learning and numerical-modelling platform developed collaboratively by researchers from York University's Dahdaleh Institute for Global Health Research and Médecins Sans Frontières (MSF) to improve water safety in crisis-affected populations, including in Syria. Designed as a low-bandwidth, web-accessible platform, SWOT harnesses routinely collected water quality monitoring data, such as residual chlorine levels, to model post-distribution chlorine decay and generate site-specific chlorination guidelines tailored to local conditions instead of relying on universal global standards. It addresses a critical "last-mile" challenge in humanitarian water provision, where water that meets quality standards at distribution points can become recontaminated during household storage and use, posing serious public health risks in displaced-populations settings.

Despite the conceptual and practical relevance of SWOT for humanitarian water safety, the tool's deployment reveals a number of potential issues. First, it assumes consistent, high-quality routine data collection, but in many field settings, data may be incomplete, delayed, or collected under variable protocols, which can compromise the integrity of model outputs and recommendations. The tool's reliance on numerical modelling and machine learning requires adequate training for field staff to interpret and implement outputs appropriately, raising concerns about usability in Syria and similar contexts without technical support.

Source: ELRHA, 01/2026

RECOMMENDED AI INITIATIVES TO ADDRESS CRITICAL GAPS IN SYRIA

Based on sector priorities, there are some possibilities for the use of AI that can be explored.

Food security early warning and prediction

Syria's food security crisis, affecting an estimated 12.9 million people, compounded by a reported 70% wheat production deficit following the worst drought in 36 years impacting 8.1 million people, has reinforced the importance of anticipatory early warning systems capable of moving beyond reactive needs assessments (Humanitarian Action 12/2025). Existing food security monitoring mechanisms in Syria include the Whole of Syria Food Security and Livelihoods (FSL) Cluster assessments and MSNA data collection, WFP's Vulnerability Analysis and Mapping (VAM) system, FEWS NET regional outlooks, and satellite-based agro-climatic surveillance.

AI and machine learning approaches can build on these foundations by analysing longitudinal household survey data, covering demographics, livelihoods, land and livestock assets, and exposure to shocks such as drought, floods, crop disease, or illness, to forecast household food insecurity one to two months in advance. In other contexts, including Somalia and Yemen, machine learning models combining climate indicators, commodity prices, and conflict event datasets have improved short-term projections of IPC phases and acute food insecurity prevalence, enabling more proactive targeting and resource pre-positioning (World Bank 05/2024). AI can enhance Syria's early warning architecture by integrating market price volatility, rainfall anomalies, vegetation indices (NDVI), displacement patterns, and conflict dynamics into predictive risk models that identify geographic and household-level deterioration before it manifests in severe coping strategies (Food Crisis Watch). Community-enumerator-based data collection models further align with localisation commitments, reducing costs while improving contextual sensitivity.

However, in Syria such AI-enabled predictive systems have largely remained at pilot stage, constrained by fragmented data governance, limited interoperability between agencies, political sensitivities around data sharing, and insufficient sustained investment to institutionalise predictive analytics within national and cluster-level coordination mechanisms. Moving beyond pilots would require embedding AI forecasting within established FSL coordination structures, ensuring transparent validation against IPC classifications, and linking predictive outputs directly to anticipatory financing triggers and operational response frameworks.

Case studies:

- **WFP VAM:** Utilises AI to analyse satellite data, market prices, and nutrition indicators to monitor food security at global scale.
- **GIEWS (Global Information and Early Warning System):** FAO initiative monitoring food supply and demand globally.
- **Mercy Corps CROP-ID:** Utilises satellite imagery, machine learning, and field validation to identify crop types in Syria, a key precondition for crop yield estimation.

Climate monitoring, prediction, and early warning

Syria is increasingly exposed to both long-term climate stressors, such as prolonged drought, rising temperatures, and declining water availability, and short-term rapid-onset events, including flash floods and extreme rainfall, which exacerbate humanitarian vulnerabilities, disrupt livelihoods, and contribute to food insecurity. These climate pressures intersect with fragile infrastructure, displacement patterns, and socio-economic fragility, making timely and accurate climate monitoring and forecasting essential for anticipatory humanitarian action. Existing climate monitoring in Syria relies on regional meteorological data, satellite-based rainfall and vegetation indices, and FAO/FEWS NET drought and crop monitoring systems, but these approaches are often limited in spatial and temporal resolution, and predictive capacity is constrained by fragmented datasets.

AI-driven approaches offer the potential to enhance both long-term climate impact modelling and short-term shock prediction. Machine learning models can analyse historical climate data, satellite imagery, soil moisture, vegetation indices (NDVI), hydrological records, and socioeconomic indicators to predict drought intensity, flood-prone areas, and seasonal yield reductions. In humanitarian contexts, these models have enabled proactive allocation of water, food, and emergency resources, as well as early evacuation planning for flood-prone populations.

In Syria, AI-based climate early warning systems remain largely at pilot stage, hindered by limited high-resolution meteorological and hydrological data, fragmented institutional coordination, and insufficient technical capacity for operationalisation. Scaling AI-enabled climate prediction would require integrating satellite-derived environmental data with in-situ measurements, hydrological and agricultural models, and displacement and infrastructure datasets. Embedding predictive outputs into national disaster risk management, humanitarian coordination, and anticipatory funding mechanisms could enable timely pre-positioning of resources, targeted protection measures, and more resilient adaptation planning in the face of both chronic and acute climate hazards.

Case studies:

- **Google Flood Hub:** This platform uses Deep Learning (specifically Long Short-Term Memory (LSTM) networks) to provide riverine flood forecasts up to 7 days in advance
- **Global Flood Awareness System (GloFAS):** Operated by the Copernicus Emergency Management Service (CEMS), it provides global flood monitoring and probabilistic forecasts. It is particularly useful for large-scale river basins like the Euphrates.

Explosive ordnance detection

The presence of explosive ordnance (EO) remains a critical protection and development challenge in Syria, with an estimated 15.4 million people exposed and over 1,500 casualties recorded between December 2024 and December 2025, 60% of which occurred in agricultural areas (UNMAS; HI 03/2025). AI-enabled solutions, particularly deep learning systems, offer transformative potential for EO detection by analysing drone-captured imagery, including thermal, optical, and multispectral data, to identify landmines and unexploded ordnance with reported accuracies of 80–90% or higher. These systems drastically reduce processing time, with analysis occurring in under 0.2 seconds per image compared to several minutes for traditional manual review and generate precise GPS coordinates to guide safe clearance operations. In Syria, where agricultural land is heavily affected and food insecurity impacts 12.9 million people, rapid, accurate EO identification could directly support the restoration of livelihoods and food production while reducing civilian casualties.

AI tools for explosive ordnance (EO) detection have not yet been fully deployed in Syria due to limited access to contaminated areas, fragmented or incomplete mapping data, and insufficient local technical capacity to operate and maintain AI systems. Additional challenges include coordination gaps between mine action authorities, humanitarian actors, and security stakeholders, as well as the need for strict safety, legal, and accountability mechanisms given the high-risk nature of EO clearance. Successful implementation would require reliable geospatial and incident datasets, secure operational access for drones and field verification, trained personnel, and integration with national mine action programs to translate predictive outputs into safe and effective clearance operations.

Case studies:

- **Safe Pro AI SpotlightAI:** Safe Pro AI's SpotlightAI platform, implemented in Ukraine in collaboration with HALO Trust, Norwegian People's Aid, and UNDP, demonstrated the ability to detect over 150 types of landmines and UXO with over 80% accuracy.
- **Cambodian Mine Action Centre:** In Cambodia, NEC Corporation and the Cambodian Mine Action Centre conducted a proof-of-concept using AI to predict high-risk contamination zones, achieving a match rate exceeding 90% against verified landmine locations.

Infrastructure damage assessment and reconstruction planning

Syria's post-conflict reconstruction needs are immense, with an estimated 3 million returnees (including from neighbouring countries and IDPs returning to their areas of origin) since December 2024 navigating environments where roughly 50% of infrastructure has been destroyed or damaged and 77% of returnee communities report poor access to basic services (UNHCR 12/2025; UNDP 02/2025; Islamic Relief 12/2024). Rapid, accurate assessment of infrastructure damage is therefore critical for coordinating humanitarian support, prioritising safe shelter, and planning reconstruction interventions. Existing tools for damage monitoring in Syria include traditional field assessments conducted by cluster actors, supplemented by satellite imagery analysis through initiatives like the Humanitarian OpenStreetMap Team (HOT), yet these methods are often slow, resource-intensive, and limited in geographic coverage.

AI and machine learning approaches, such as semantic segmentation of high-resolution satellite imagery, have demonstrated the ability to dramatically accelerate damage assessment, reducing analysis time from weeks to hours while maintaining 85–90% accuracy. Platforms like xView2, used previously by the UN, World Bank, IFRC, and WFP during the 2023 Türkiye-Syria earthquake response, generate pixel-level, color-coded severity maps that visually highlight levels of building and infrastructure damage, enabling prioritisation of rescue efforts and reconstruction planning. Complementary tools, such as HOT fAIr, rapidly map intact buildings, roads, and water infrastructure to support operational planning for service delivery and reconstruction. By integrating these AI-generated maps with field data and cluster coordination systems, actors can more effectively identify functional versus damaged infrastructure, optimise resource allocation, and inform evidence-based planning for Syria's returnee populations. However, in Syria such AI-enabled infrastructure assessment systems have largely remained at pilot or ad hoc stages, constrained by fragmented satellite data access, limited local technical capacity, and the need for interoperability with national and humanitarian mapping frameworks. Scaling these tools would require sustained investment, standardised data pipelines, and integration with reconstruction and shelter coordination mechanisms to ensure predictive and operational insights translate into safer, more resilient communities.

Case studies:

- **xView2:** previously used by the UN, World Bank, IFRC, WFP during February 2023 Türkiye-Syria earthquake response, utilising ML semantic segmentation to identify damaged buildings with 85-90% accuracy.
- **HOT fAIr:** open-source AI system rapidly mapping intact buildings, roads, and water infrastructure from satellite imagery.

CHALLENGES AND LIMITATIONS WITH AI IN THE SYRIAN CONTEXT

Infrastructure and digital divide

Syria's infrastructure challenges present particularly acute barriers to AI implementation, reflecting the compound effects of over a decade of conflict on the country's technological foundation. Limited internet connectivity, unreliable power supply, and equipment scarcity create a cascading effect that fundamentally undermines the viability of AI systems requiring consistent data transmission and computational resources. In Syria's context, these infrastructure deficits are not merely technical inconveniences but represent systematic barriers rooted in destroyed power grids, damaged telecommunications infrastructure, and supply chain disruptions caused by ongoing conflict and international sanctions.

Furthermore, digital inequality becomes especially pronounced in a country where geographical access varies dramatically, from relatively connected urban centres like Damascus to remote areas in northern and eastern Syria where internet penetration remains minimal. This disparity means that AI-driven humanitarian interventions risk inadvertently reinforcing existing inequalities within the humanitarian system, by primarily serving populations and organisations with better connectivity while excluding the most vulnerable communities who may be in greatest need of humanitarian assistance. The high procurement and maintenance costs for IT equipment critical to AI's deployment are further exacerbated by Syria's economic crisis, currency devaluation, and restricted access to international markets, making advanced AI technologies financially prohibitive for most national humanitarian organizations operating in the country.

Data quality and technical constraints

Syria's fragmented governance structure and ongoing conflict create unique data quality challenges that severely compromise the effectiveness of AI systems in humanitarian operations. National-level coordination bottlenecks are particularly problematic in a country where multiple authorities control different territories, making standardized data collection nearly impossible and creating silos of information that cannot be easily integrated or cross-referenced. The funding cuts have perpetuated already fragmented data collection efforts, and are especially damaging in Syria, where international donor fatigue has reduced humanitarian funding precisely when comprehensive data is most needed to address complex, evolving needs.

Weak data-sharing protocols and the scarcity of country-wide datasets reflect not only technical limitations but also political sensitivities, security concerns, and territorial divisions that make organizations reluctant to share sensitive information across different zones of control. The problem of incomplete datasets excluding vulnerable populations, women, children, and persons with disabilities, is magnified in Syria where traditional social structures, security restrictions, and displacement patterns make these groups particularly difficult to reach and document systematically. Additionally, the challenge of non-stationary data is particularly relevant in Syria's context, where unprecedented events such as major displacement waves, changing conflict dynamics, earthquake disasters, and economic shocks regularly occur outside the scope of AI training datasets, fundamentally limiting the predictive accuracy of AI systems that rely on historical patterns to forecast future humanitarian needs (ACAPS 28/01/2026).

Capacity and human resources

The AI literacy landscape in Syrian humanitarian operations reveals a critical disconnect between technological innovation and operational capacity that reflects broader challenges in the country's fragmented aid ecosystem. The dominance of private companies and startups in driving AI initiatives, rather than traditional NGOs, creates a structural gap where cutting-edge technological solutions may not align with established humanitarian protocols, local knowledge, or long-term sustainability requirements. This private sector leadership, while innovative, often operates with different incentives and timelines than humanitarian organizations, creating challenges in ensuring that AI solutions address the most pressing humanitarian needs rather than the most technically interesting problems.

The weak linkage between tech providers and humanitarian organizations is particularly problematic in Syria, where operational security requirements, access limitations, and complex coordination mechanisms require deep understanding of local context that technology companies may lack. The severe shortage of healthcare workers that limits AI system supervision is especially acute in Syria, where medical professionals have been systematically targeted during the conflict, leading to massive brain drain and leaving remaining healthcare infrastructure understaffed and overwhelmed. The lack of training on AI interpretation among existing humanitarian workers compounds these challenges, as Syrian humanitarian operations often rely on local staff who may have limited exposure to advanced technologies while international staff frequently rotate, preventing the development of sustained AI expertise within organizations. Furthermore, the limited local technical expertise for system maintenance and troubleshooting means that AI systems deployed in Syria may become obsolete or non-functional when technical problems arise, creating dependency relationships that undermine the sustainability and local ownership that effective humanitarian response requires.

Knowledge and epistemological concerns

The epistemological challenges of AI implementation in Syria's humanitarian context reveal fundamental tensions between technological capabilities and the complex, context-dependent nature of crisis response in a protracted conflict setting. The tendency to use AI as large language models rather than information models is particularly problematic in Syria, where the humanitarian situation requires not just processing of existing knowledge but generation of new insights about rapidly evolving conditions, local dynamics, and emerging needs that may not be captured in historical datasets (Sandvik 08/07/2025). Syria's context amplifies the concern that AI systems dissolve existing frameworks for knowledge production, as traditional humanitarian knowledge-making processes in the country have evolved to incorporate local expertise, community feedback mechanisms, and contextual understanding that AI systems may disrupt or override. The centralization and flattening tendencies of AI systems directly conflict with humanitarian localization efforts that are particularly important in Syria, where international access is often limited and local organizations possess irreplaceable knowledge about community needs, cultural sensitivities, and effective intervention strategies (ALNAP 19/05/2025).

The requirement for continuous verification of AI-generated information becomes especially critical in Syria's information-contested environment, where misinformation, propaganda, and competing narratives about the conflict create additional layers of complexity that AI systems may not adequately account for or may inadvertently perpetuate (Comes, Van de Walle, & Van Wassenhove 01/11/2020). The limitations of AI in capturing tacit knowledge, institutional understanding, and relationship awareness are magnified in Syria's context, where successful humanitarian intervention often depends on nuanced understanding of tribal relationships, local power dynamics, historical grievances, and informal social networks that cannot be easily quantified or modeled. Additionally, concerns about data privacy, consent, misinformation risks, politicization, and mistranslation take on heightened significance in Syria, where information can become weaponized, where different communities speak multiple languages and dialects, and where data sharing across territorial and political boundaries raises serious security and ethical concerns for both humanitarian actors and the populations they serve (Haykal D, Goldust M, Cartier H and Treacy 02/07/2025).

CONCLUSION

Artificial intelligence within Syria's humanitarian response has moved from conceptual exploration to operational deployment across protection, displacement forecasting, climate monitoring, health, legal assistance, coordination, and infrastructure recovery.

Tools such as Sentry Syria demonstrated that AI-enabled early warning systems can directly reduce civilian harm while strengthening accountability through verified, sensor-based documentation. Predictive models for IDP movements and platforms like MEACAM signal a gradual shift toward anticipatory action, integrating market, conflict, and satellite data to forecast displacement, drought, and flooding risks. AI-driven service tools, including CIMA for immunisation adherence, trauma-detection models for refugee children, and information chatbots such as SignpostChat and Adala-Bot, illustrate how machine learning and generative AI can address access gaps in overstretched systems. Meanwhile, crisis analytics platforms like UNDP's RAPIDA, earthquake damage mapping tools, and water optimisation models demonstrate AI's growing role in rapid damage assessment, reconstruction planning, and public health risk reduction. Collectively, these initiatives show that AI in Syria is not theoretical: it has already delivered measurable operational value across multiple sectors.

However, the ecosystem remains fragmented and constrained by structural realities. Infrastructure deficits, limited connectivity, fragmented governance, data silos, and funding volatility undermine scalability and sustainability. Predictive systems struggle with non-stationary shocks such as sudden ceasefires, escalations, or economic collapse, while digital divides risk excluding the most vulnerable populations. Ethical concerns around data privacy, surveillance, algorithmic bias, hallucinations in generative AI, and the erosion of local knowledge systems are particularly acute in Syria's politicised and information-contested environment. As such, AI in Syria's humanitarian response should be understood as transitional: promising but not yet institutionalised. Moving forward will require embedding AI tools within established coordination structures, investing in shared data infrastructure and local technical capacity, prioritising human oversight and localisation, and linking predictive analytics to anticipatory financing and operational decision-making frameworks. Only through this shift from isolated innovation to system-level integration can AI meaningfully strengthen resilience and protection outcomes in Syria's protracted crisis.