Climate Resilience Alliance

Jordan

Heat early warning system: Current status and recommendations

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Practical ACTION

MERCY CORPS

IFRC

Introduction and objectives

This case study examines the current state of the heat early warning system (HEWS) in Jordan including how heat risk is understood and monitored, and how warnings are issued, communicated, and acted upon across institutions. It forms part of a series of case studies conducted across eight countries of the Zurich Climate Resilience Alliance (the Alliance), which applies a common analytical framework to assess HEWSs across key pillars and identify good practices, gaps, and enabling conditions for people-centred, impact-based early warning for extreme heat.

Key messages

- **Heat risk in Jordan is rising fast, with limited impact evidence but strong hazard knowledge.** Heatwaves are getting longer and more intense in Jordan, and projections show continued warming and more very hot days. Trend and hazard evidence is strong, but epidemiological and cross-sector impact studies are still limited and uneven, particularly in their understanding of vulnerability, exposure, and risk across different groups, places, and sectors.
- **Jordan has a solid technical and institutional foundation for monitoring and forecasting heat, but translating forecasts into action remains a key challenge.** The Jordan Meteorological Department (JMD) maintains extensive climate records and introduced a formal national heatwave definition and classification system in 2024, based on maximum temperature relative to local climate norms. However, interviewees highlighted that the main challenge is not forecast availability, but the interpretation, localization, and use of this information by decision-makers and local actors.
- **Warnings travel through many channels, but messages are often too generic and don't reach everyone.** Government, media, and digital platforms are central to dissemination. However, heat warnings are often perceived as generic and private not sufficiently linked to clear practical guidance, and reach is uneven for remote communities and marginalized groups, for example in desert areas, among refugee populations, or for those with limited access to information.
- **Preparedness and response are increasing, but largely driven by general disaster risk management rather than dedicated heat action planning.** Institutions activate sectoral protocols during heatwaves, and humanitarian and community-based approaches are expanding. However, heat-specific preparedness measures and coordinated national and local heat action plans remain limited. Community-centred and anticipatory approaches are emerging but not yet systematically integrated, for example in addressing constraints related to housing conditions, access to resources, and social norms.
- **Governance structures are evolving, but coordination, data sharing, and financing are bottlenecks.** Jordan has strong national climate and disaster risk frameworks and heat is increasingly recognized as a policy priority. However, implementation at the local level, coordination across institutions, data sharing, and sustained funding remain major barriers.

Methodology

This case-study is based on a combination of semi-structured interviews and a targeted review of peer-reviewed literature and grey documentation related to extreme heat and the HEWS in Jordan. Four interviews were conducted between October and November 2025 with stakeholders across meteorology and humanitarian and development organizations (see list of organizations below). Evidence was synthesized using the four pillars of early warning systems (1) disaster risk knowledge; 2) observations, monitoring, analysis, and forecasting; 3) warning dissemination and communication; and 4) preparedness and response capabilities) alongside enabling components for effective systems.

Interviews were conducted with:

- Mercy Corps Jordan
- Jordan Meteorological Department (JMD)
- The International Federation of Red Cross and Red Crescent Societies (IFRC)
- International Water Management Institute (IWMI)

List of acronyms used

CBHFA - Community Based Health and First Aid

CRMC - Climate Resilience Measurement for Communities

FCDO - Foreign, Commonwealth and Development Office

GAM - Greater Amman Municipality

GESI - Gender Equality and Social Inclusion

HEWS - Heat Early Warning System

IFRC - The International Federation of Red Cross and Red Crescent Societies

IWMI - International Water Management Institute

JMD - Jordan Meteorological Department

JRC - Jordan Red Crescent

PIK - Potsdam Institute for Climate Impact Research

MENA - Middle East and North Africa

NAP - National Climate Change Adaptation Plan

NCSCM - National Center for Security and Crises Management

NEPCO - National Electric Power Company

UNFCCC - United Nations Framework Convention on Climate Change

UNDP - United Nations Development Programme

UNHCR - Office of the United Nations High Commissioner for Refugees

UNURP - United Nations Urban Resilience Programme

WISER - Weather and Climate Information Services

Early warning systems

Early warning systems (EWS) are one of the best-proven and effective measures for saving lives and minimizing losses and harm caused by disasters. They help those at risk of floods, heatwaves, wildfires and other climate hazards to take risk-informed, timely, meaningful, and impactful early action to keep themselves and their assets safe. The Alliance works across all eight components of EWS so that they deliver essential services for the most vulnerable women, men, and children, supporting communities to be resilient to climate hazards, enabling them to thrive.

Disaster risk knowledge

Hazard knowledge, trends, and climate projections

Jordan has experienced increasingly intense and frequent hot days and nights in recent years (Alwadi and Abdulla, 2022). The wider Middle East and North Africa (MENA) region is warming nearly twice as fast as the global average (WMO, 2024). The rising frequency of extreme heat is a clear indication of shifting climate patterns affecting the country and the wider region. In 2025, Jordan experienced one of its most extreme heatwaves on record, marked by unprecedented daytime and nighttime temperatures. During this heatwave, nighttime temperatures did not fall below 35°C in some parts of the country and remained above 31.8°C in Amman, the capital city, which hosts around 4-4.5 million people, equivalent to approximately 40-45 per cent of Jordan's population (Niranjan, 2025).

There is a growing and increasingly robust body of scientific evidence on temperature and heatwave trends across Jordan and the wider region. Multiple studies confirm clear and accelerating warming trends across the country (Zeitoun, 2024; Bashabsheh et al., 2025; Alwadi and Abdulla, 2022). Key temperature indicators, including the frequency of warm days and warm nights, as well as heatwave duration, have increased significantly, while cold extremes have declined. Between 1982 and 2024, heat-related events, particularly in desert and semi-arid zones, have intensified markedly (Bashabsheh et al., 2025). The inclusion of heatwaves that occurred across Jordan over the past 10 years in the National Disaster Risk Reduction Strategy (2023–2030) highlights their growing relevance and recognition as a priority hazard (The Hashemite Kingdom of Jordan, 2025).

Jordan's capital Amman has experienced the largest increase in heatwave characteristics in the country, with approximately a sevenfold rise in annual heatwave days (Alwadi and Abdulla, 2022). Projections indicate that the city could experience around 41 heatwave days per year by 2050 (Alwadi and Abdulla, 2022).

Climate projections show that temperatures will continue to rise for all climate scenarios across Jordan (Binder et al., 2022). Average temperatures are projected to increase by approximately 1.7–2.5°C by mid-century and up to 3–4.5°C by the end of the century, depending on emissions pathways (Binder et al., 2022). The number of very hot days above 35°C is expected to increase substantially, with projections suggesting 15–26 additional hot days per year by 2030 and up to 70 more by 2080, particularly in densely populated western regions (Binder et al., 2022). Similar studies have also been carried out for the wider MENA region, describing similar trends (Varela et al., 2020; Wedler et al., 2023).

Mortality and epidemiological evidence

Heat-related health research in Jordan is still emerging, with only a few epidemiological studies published since 2024. A national analysis using daily mortality and meteorological data across 42 districts between 2000 and 2020 found a clear association between high temperatures and increased mortality risk, with stronger effects in highly urbanized areas and locations with low greenness (Luque-garcía et al., 2024). These findings highlight the role of environmental and urban factors in shaping heat risk.

Evidence from Amman further demonstrates the health burden of extreme heat. Between 2000 and 2016, the city experienced more than 500 attributable heat-related deaths over 77 hot days at temperatures above 30.7°C (Alwadi and Alahmad, 2024). However, mortality data were available only in aggregated form, limiting the ability to assess how vulnerability varies by age, gender, or socio-economic status groups, or adjust for other exposures such as humidity and air pollution.

There is some research to indicate that women in Amman were more vulnerable to heat compared to men (Alwadi et al., 2024). As highlighted in a recent study in Amman, susceptibility to heat exposure is shaped by contextual and gendered inequalities such as limited mobility or limited access to resources (Alwadi et al., 2024). The authors also note that demographic factors, including higher female life expectancy and an older age structure among women, may increase vulnerability.

Furthermore, Jordan's National Climate Change Health Adaptation Strategy (2024–2033) states that although historic data on heat strokes and their geographic distribution was very limited, '*the number of heat strokes recorded in Jordan during the period from 2020 to 2023 are increasing at a rate of 60 cases per year. About 84% of these heat strokes occurred in Ghor Elsafi in the Governorate of Karak*' (Ministry of Health Jordan, 2025)

Current estimates suggest that annual heat-related mortality in Jordan could nearly double by 2030 compared to historical levels (Binder et al., 2022). Also in the wider MENA region, projections suggest that heat-related mortality rates could increase by eight to twenty times by the end of the century compared to the historical period (1951–2005) (Alwadi and Alahmad, 2024).

Heat and thermal comfort in refugee shelters

Jordan hosts a large refugee population, and there is a growing body of evidence highlighting the need to address heat exposure, thermal comfort risks, and low-cost adaptation strategies in refugee shelters in Jordan (Moran et al., 2021; Sato, 2022; Albadra et al., 2017). Jordan hosts the second-highest share of refugees per capita in the world (ACAPS, n.d.). Jordan's population of around 11 million included more than 1.3 million refugees as of 2024, the majority of whom are Syrian nationals. Most refugees live in urban areas, while others reside in camps such as Azraq and Zaatari; close to half of the refugee population are children, and many live below the poverty line (ACAPS, n.d.). This demographic context makes understanding heat risks in displacement settings particularly important.

Figure 1 Daily life in Zaatari refugee camp in Jordan, 2014. Photo by Dominic Chavez/World Bank from https://www.flickr.com/photos/10816734@N03/14344707682. Licensed under Creative Commons CC BY-NC-ND 2.0

More recently, field studies in the two largest refugee camps, Zaatari and Azraq, located in northern Jordan and hosting tens of thousands of displaced Syrians, provide important evidence on heat exposure (Albadra et al., 2017). Surveys and physical measurements conducted in both camps found that the majority of households reported their shelters to be unbearably hot during peak summer months. Around 85 per cent of surveyed households were dissatisfied or very dissatisfied with indoor thermal conditions in summer, compared to 33 per cent in winter (Albadra et al., 2017). The research identified key structural and social drivers of heat exposure, including poor insulation, limited ventilation, and the need to balance cooling with privacy, security, and protection from sand and dust.

When asked about key design priorities, residents emphasized security and safety as the most important considerations, followed by thermal comfort, and then privacy (Albadra et al., 2017). Detailed coping strategies and gendered constraints identified in these studies are discussed in more detail in the sections on “Preparedness and response capabilities” and “Gender and social inequalities addressed inclusively”.

Further experimental research in Azraq camp demonstrated that simple and low-cost measures, such as improved insulation (e.g. sealing gaps and avoiding heat leaks), adding a second shaded roof to block direct sun, improving airflow through extra vents and windows, using sand or other materials to absorb heat in walls and buildings, and employing small evaporative coolers using water and a fan, can reduce indoor temperatures by up to 6°C (Moran et al., 2021). Importantly, these solutions can be implemented using locally available materials and skills. These interventions were implemented by refugees themselves under an existing 'cash-for-work' scheme with assistance from the Office of the United Nations High Commissioner for Refugees (UNHCR) Jordan and the Norwegian Refugee Council to ensure they were practicable and achievable.

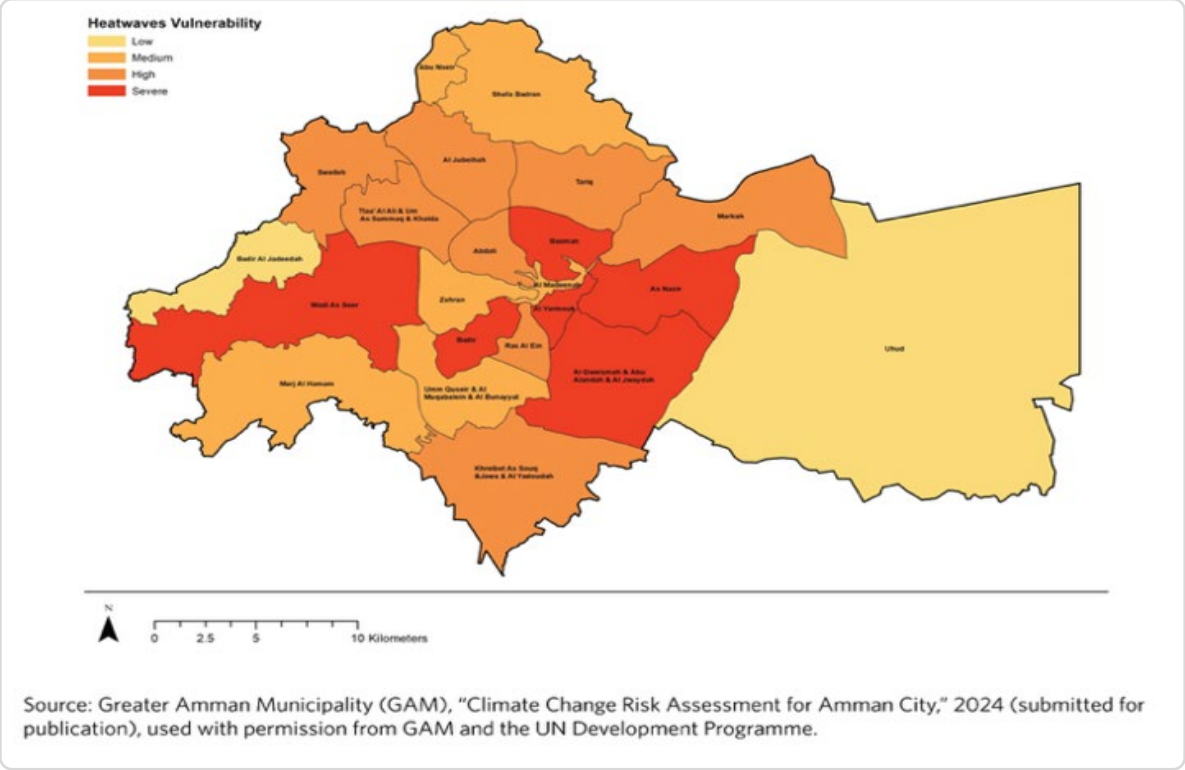
Early studies and humanitarian reports already flagged the need to consider and study thermal comfort of shelters in Jordan two decades ago (Moran et al., 2021). However, despite long-standing recognition, thermal comfort has not consistently been prioritized in humanitarian shelter design, and evidence-based solutions remain insufficiently scaled. Shelter design must however address multiple hazards (e.g. floods, dust storms, cold), often requiring trade-offs.

Urbanization, land use, and the urban heat island

Jordan has a highly urbanized population, and with over 90 per cent of the population living in cities and continued urban growth projected, inefficient urbanization is increasing pressure on infrastructure and services while intensifying urban heat risks (World Bank Group, 2022). There is a growing body of evidence linking rapid urbanization and land use change to increasing heat exposure in Jordan, particularly in Amman. Studies show that urban expansion in Amman has been substantial over recent decades, accompanied by reductions in vegetation and natural land cover (Alkaraki et al., 2024; Shatnawi et al., 2025). For example, deep learning–based modelling of land use and land cover change in the Greater Amman Municipality (GAM) (1980–2030) found that urban areas expanded from 6.6 per cent of total land area in 1980 to over 45 per cent by 2023 (Alkaraki et al., 2024). This transformation has been associated with significant increases in land surface temperatures across the city, particularly in Eastern and Central Amman (Shatnawi et al., 2025). A continued rise in maximum land surface temperatures is projected, with increases of more than 14°C in 2030 compared to historical conditions (Alkaraki et al., 2024).

The GAM published its first Climate Risk Assessment and its second Climate Action Plan in 2024 (Halaseh, 2024). As part of this process, a heatwave vulnerability map was developed to identify spatial patterns of heat exposure and vulnerability across the city (Figure 3). The assessment highlights central and western districts as among the most vulnerable to extreme heat. Similarly,

the Municipality of Sahab, in their Urban Resilience Action Plan, has undertaken a Multi-layered Vulnerability Assessment that identifies climate and urban risks, including heat and the urban heat island effect, and co-develops locally relevant actions with communities and stakeholders (Hammad and Nimri, 2025).



Source: Greater Amman Municipality (GAM), "Climate Change Risk Assessment for Amman City," 2024 (submitted for publication), used with permission from GAM and the UN Development Programme.

Figure 2 District vulnerability to heatwaves in Greater Amman Municipality (GAM). Source: https://carnegieendowment.org/research/2024/05/amman-jordan-climate-vulnerability-adaptation

Energy, critical infrastructure, and other sectors

Heat poses increasing risks to critical infrastructure and essential services in Jordan, particularly in the energy and water sectors. Jordan's climate risk profile emphasize that rising temperatures are expected to affect multiple sectors beyond health, including labour productivity, infrastructure resilience, agriculture, and water availability (Group, 2022; Binder et al., 2022).

During the severe heatwave in August 2025, when temperatures exceeded 44°C in some areas, the National Electric Power Company (NEPCO) reported record electricity demand, reaching the maximum system capacity and placing significant strain on the national power grid (Jaber and Qasim, 2025). The Electricity Distribution Company, responsible for electricity distribution in Jordan's Southern Regions, announced that there would be no power outages due to unpaid bills during the heatwave. Still, NEPCO reached out through social media to request reducing electricity use, including limiting air conditioning and non-essential consumption to prevent blackouts. A recent case-study on sustainable energy use in Jordan calls for improved coordinated communication strategies during heatwaves, such as more explicit guidance on temperature settings, time-of-day guidance, and feedback mechanisms, to support households in managing consumption without compromising health (Jaber and Qasim, 2025).

These pressures are expected to intensify in the future. Studies indicate that rising temperatures and climate change will significantly increase cooling demand across Jordan, with projections showing a substantial rise in residential energy consumption and cooling loads by the end of the century (Albatayneh et al., 2024). The residential sector already accounts for a large share of electricity use, and energy poverty affects a significant proportion of households, particularly in

low-income and peripheral areas, limiting access to cooling and increasing vulnerability during extreme heat (Jaber and Qasim, 2025). Low-income households are especially exposed due to inefficient housing, high energy costs, and limited access to adaptive technologies. Recent research further highlights the importance of energy-efficient and climate-adaptive housing in reducing heat risks. A study on low-income housing in Jordan shows that inefficient building envelopes, poor ventilation, and rising energy costs increase vulnerability to extreme heat, while low-cost passive cooling strategies can significantly improve thermal comfort and reduce electricity demand (Albadaineh et al., 2026).

Heat risks are also closely interconnected with water scarcity. Jordan is among the most water-stressed countries globally, and rising temperatures and more frequent heatwaves are expected to further increase water demand while reducing availability (Bashabsheh et al., 2025; World Bank Group, 2022). These interdependencies highlight the potential for cascading impacts across infrastructure systems and the need for integrated, cross-sectoral approaches to heat risk management.

Traditional and indigenous knowledge

Alongside scientific and technical research, heat risk knowledge in Jordan is strongly shaped by community experience and traditional practices. One interviewee highlighted that *'there's a lot of traditional and indigenous knowledge, especially the Bedouin as people living in the deserts, who probably have a lot of experience in managing heat waves'*. They explained that Bedouin groups have long adapted to extreme heat through their shelters and clothing: *'They have their own ways of building the tents… even their clothing is in a fabric that reflects heat rather than absorb[s] it'*. These practices also extend to agriculture, with communities using heat tolerant crops, particularly in the Jordan Valley, where another interviewee highlighted that *'there are crops that need the high temperature, we are known for this'*. Community ideas for heat adaptation continue to emerge, including proposals for shade structures built from materials already in the community, like clay or hay.

Interviewees also report increasing awareness of climate change and changing weather patterns. A national survey conducted by Mercy Corps Jordan of over 1,000 community members and leaders found that more than 70 per cent of respondents considered heatwaves to be severe or very severe, with highest risk perception among young adults (aged 21-30) and among women. This perception was even higher than that reported for flash floods (50 per cent), a hazard recognized as a major climate risk in Jordan, suggesting that public concern about heat may already be high (Murad et al. 2025). However, interviewees also recognized that extreme heat is often normalized and perceived as *'just hot weather'*.

Knowledge gaps

Despite the growing evidence base on heat risks in Jordan, important knowledge gaps remain. While hazard and climate information is relatively strong, epidemiological and health research have only started to emerge and are not always able to research vulnerabilities across groups due to data limitations. Interviewees confirmed that although public awareness messaging on heatstroke and dehydration is issued during heatwaves, detailed data or even research on vulnerable and marginalized populations, particularly in remote and desert areas, remains limited. As a result, the distribution of vulnerability across different social and occupational groups is still not well understood.

Data availability further constrains risk knowledge. An interviewee stressed that in remote and marginalized areas there is *'a lack of information, an absence of data'*, and *'no research that tells us that these areas may be exposed'*. Further, access to vulnerable groups may be limited by

location and access information. Even where temperature trends are known *'there's not that much reporting in terms of connecting the cases to weather temperature'* making heat-related impacts difficult to quantify.

Engagement with heat also varies across sectors. While some institutions, such as those working in agriculture and water management in the Jordan Valley, have developed responses to extreme heat events, existing mechanisms often remain focused on hazards such as frost rather than extreme heat. This reflects broader institutional and governance gaps in integrating heat into risk management frameworks across sectors.

Across interviews, a recurring theme was the limited localization and translation of national climate and heat knowledge into actionable information. Respondents noted that although Jordan has a wide range of policies and strategies, implementation at municipal and community levels remains uneven. Risk information is not always tailored to local contexts and risk perception may be low in some cases. Analysis and decision-support tools at subnational levels remain underdeveloped, limiting targeted early action.

Observations, monitoring, analysis, and forecasting

Jordan Meteorological Department (JMD) is the technical backbone of heat monitoring and warning, drawing on observations and multiple weather models. Forecasting has shifted from manual interpretation to model-based workflows. As one interviewee noted, *'Before, we used to analyse the readings manually, now we have numerical models that we work with'* alongside institutional system upgrades, including a system connected to Civil Defence, currently active since 2021. JMD emphasized the use of multiple forecasting models and international guidance as part of standard operational practice. Meteorologists routinely compare outputs from global and regional models, including those from leading forecasting centres, to ensure robustness and confidence in heatwave forecasts.

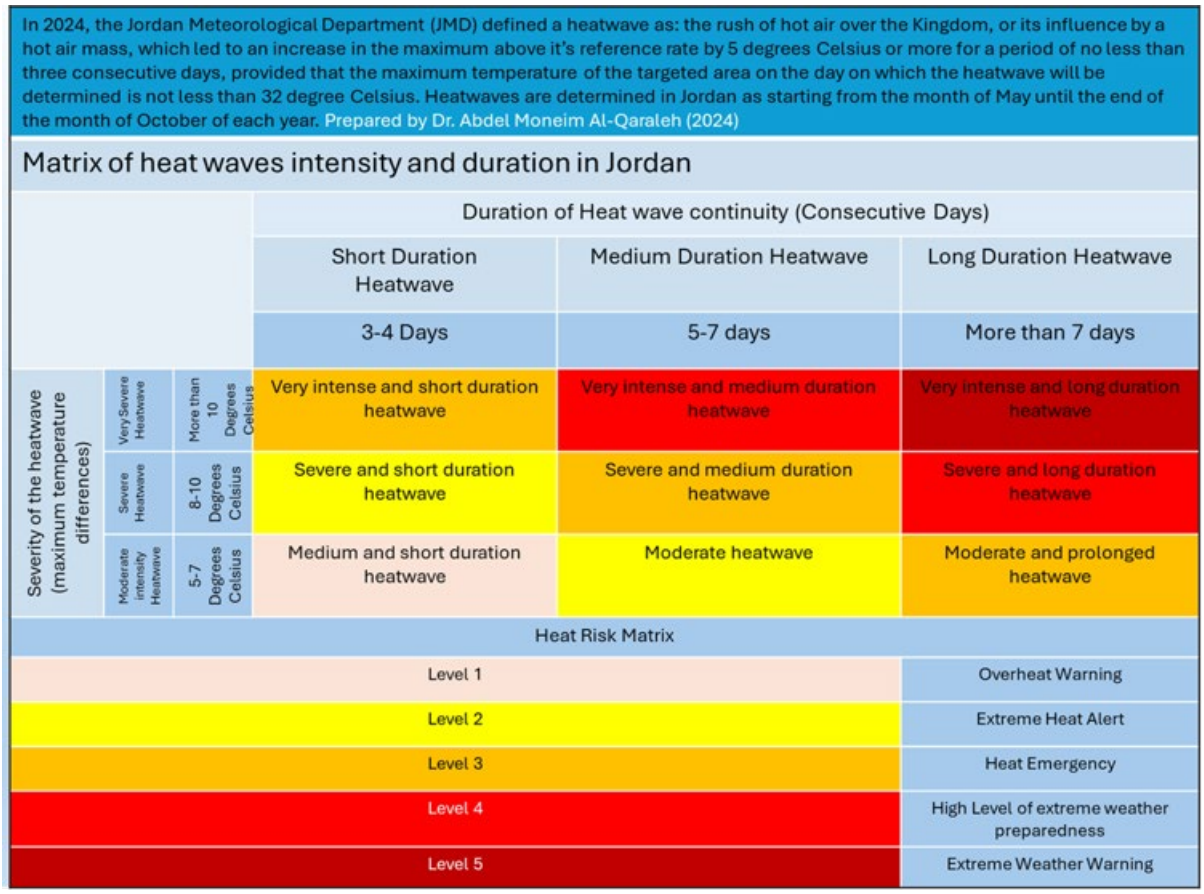
Interviewees indicate that Jordan has a strong institutional foundation for hazard monitoring. JMD maintains extensive historical climate records, reportedly spanning more than 100 years, which are used to analyse temperature trends and classify extreme events. Heatwaves are monitored within a defined seasonal window from May to October and are assessed in relation to historical climatology to contextualize severity and rarity. Recent events have been characterized as among the longest and most intense in the historical record. JMD affirmed that it is putting effort into building a system for warning about heatwaves that reaches citizens at the right time, using advanced modelling. Across interviews, the technical forecasting chain during recent heat events was described as functional, with warnings issued, actions taken, *'with meteorological colleagues even producing a dedicated case study afterwards'*.

Through the Weather and Climate Information Services (WISER) program, European Centre for Medium-Range Weather Forecasts ensemble forecasts will be available to JMD, as well as communication materials for reporting forecasts and warnings.

Heatwaves definitions

A key recent development is the formalization of a national heatwave definition and classification matrix developed in 2024 by JMD, based on synoptic conditions and temperature departures.

JMD defines a heatwave as the intrusion of a hot air mass causing maximum temperatures to rise roughly ≥5°C above local reference averages for at least three consecutive days, with an additional condition that maximum temperature in the targeted region is not less than 32°C, within the heat season from May to October. The matrix further classifies events by three durations: short (3-4 days), medium (5-7 days), and long (> 7 days). Warnings are updated dynamically as conditions evolve. Heatwave intensity is measured through degree exceedance from local reference averages and categorized as medium (5–7°C above average), severe (8–10°C above average), and extremely severe (>10°C above average) (Figure 4). Thresholds are geographically differentiated, recognizing that not all areas are affected by the same intensity, depending on the direction of the air mass, with the east often more affected than the west.



In 2024, the Jordan Meteorological Department (JMD) defined a heatwave as: the rush of hot air over the Kingdom, or its influence by a hot air mass, which led to an increase in the maximum above it's reference rate by 5 degrees Celsius or more for a period of no less than three consecutive days, provided that the maximum temperature of the targeted area on the day on which the heatwave will be determined is not less than 32 degree Celsius. Heatwaves are determined in Jordan as starting from the month of May until the end of the month of October of each year. Prepared by Dr. Abdel Moneim Al-Qaraleh (2024)

Matrix of heat waves intensity and duration in Jordan

			Duration of Heat wave continuity (Consecutive Days)		
			Short Duration Heatwave	Medium Duration Heatwave	Long Duration Heatwave
			3-4 Days	5-7 days	More than 7 days
Severity of the heatwave (maximum temperature differences)	Very Severe Heatwave	More than 10 Degrees Celsius	Very intense and short duration heatwave	Very intense and medium duration heatwave	Very intense and long duration heatwave
	Severe Heatwave	8-10 Degrees Celsius	Severe and short duration heatwave	Severe and medium duration heatwave	Severe and long duration heatwave
	Moderate intensity Heatwave	5-7 Degrees Celsius	Medium and short duration heatwave	Moderate heatwave	Moderate and prolonged heatwave

Heat Risk Matrix	
Level 1	Overheat Warning
Level 2	Extreme Heat Alert
Level 3	Heat Emergency
Level 4	High Level of extreme weather preparedness
Level 5	Extreme Weather Warning

Figure 3 JMD heat warning matrix (translated by UK Met Office) 2024. Source: https://tinyurl.com/27pyf8ax

JMD described a five-level warning scale for heat linked to specific procedures, triggering actions by the Civil Defence as well as other actors, which begin preparedness actions for example based on the severity level and which sensitive points may be affected. Bulletins and warnings are updated twice daily, and categories are revised dynamically as events evolve. Lead times typically range from early signals to some institutions one to two weeks in advance to more detailed and confident forecasts 48-72 hours before onset.

Gaps and challenges

Despite relatively strong forecasting capacity, interviewees highlighted that the main challenge in Jordan is less the availability of forecasts and more their translation into actionable information. One respondent described the baseline as *'good enough to be used'*, but *'not being used efficiently and effectively yet'*, emphasizing the need for stronger coordination and interpretation to support early action.

Heat warning thresholds as well as messages remain general rather than location specific and may not be sufficiently tailored to municipalities or specific geographic contexts. This does not only mean a localized threshold and forecast, but also supporting pre-defined actions and responses once forecasts are received.

Next, respondents highlighted challenges related to data access and sharing across agencies, noting that meteorological station data can be costly and not always easily accessible. While such arrangements may be necessary for meteorological services, to maintain financial sustainability and deliver operational services, they can also limit the wider use of data for developing tailored, impact-based risk information. Impact-based forecasting relies on a two-way exchange of data and

knowledge. In practice, gaps in data sharing across both sides of this interface can constrain the development of integrated and impact-based warnings.

Spatial coverage gaps in meteorological observations were also noted by JMD, particularly in remote areas, which affects forecasting quality and warning confidence. Resource limitations remain a key barrier, including insufficient funding for automated and integrated early warning systems across agencies. Interviewees described reliance on externally funded projects for system upgrades, despite strong human capacity and technical expertise within the national EWS. JMD however also highlighted ongoing efforts to strengthen the technical backbone of the HEWS, including the development of a digital platform for heat monitoring and warning dissemination, as well as upgrades to observation and forecasting infrastructure.

Warning dissemination and communication

Dissemination channels and institutional mechanisms

Interviewees described a multi-channel dissemination system with central institutions being the JMD and the National Center for Security and Crises Management (NCSCM). All early warnings are issued through the department's website or through the social media pages of JMD and distributed via around 300 liaison officers from various and diverse institutions. Warnings are also shared directly with the NCSCM after which alerts move through institutional channels to the Ministry of Health, Civil Defence Directorate, and other agencies. Municipalities formally receive warnings through the Ministry of Local Administration.

Alongside government channels, media and private platforms play an important role. Formal warnings go out across the media. Messages appear through visual or audio media, or some online messages and sources including national television and radio. Interviewees highlighted the influence of private forecasting services, which benefit from large outreach. The platform's mobile applications and accessible formats were highlighted as reasons why communities frequently use it to access weather information.

Recent developments in warning dissemination include the testing of a national cell broadcast system by the Telecommunications Regulatory Commission in 2025, intended to enable fast population-wide alerts during severe weather and emergencies (The Jordan Times, 2025).

Humanitarian actors also use their own communication infrastructures for last-mile dissemination, including channels such as Instagram, Twitter, Facebook, and household/refugee field visits.

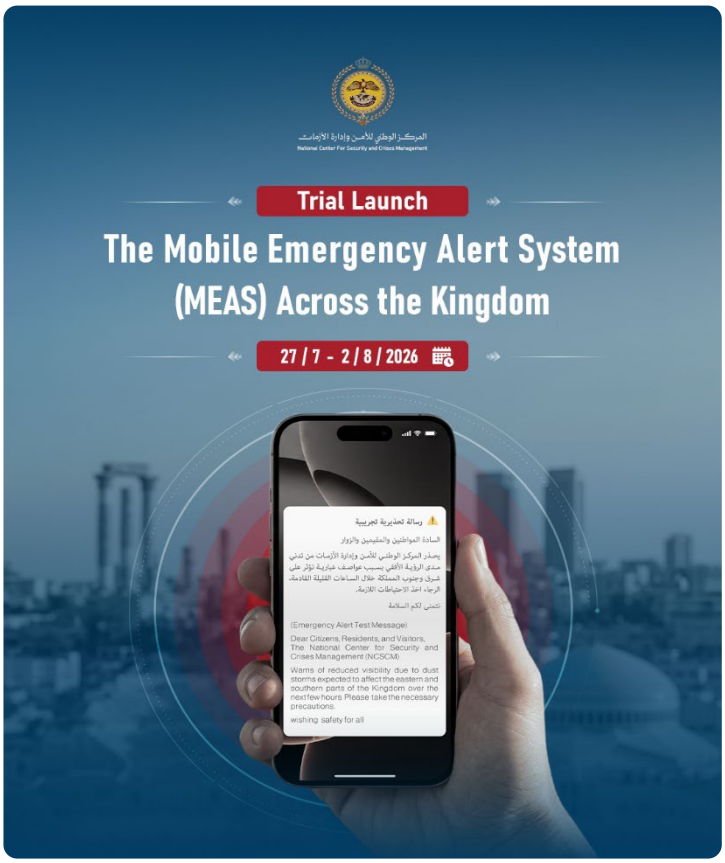


Figure 4. Launch of a series of trials for the national mobile emergency alert system between July/August 2026. Source: NCSCM, 2026

Audience targeting and accessibility

Several interviewees highlighted accessibility gaps, particularly for remote or mobile populations, refugees, and low-income urban communities. In refugee camps, most organized communication is led by UNHCR and partners (including Jordan Red Crescent and other non-governmental organizations), using a combination of clinic visits, community-based and volunteer networks, information desks, camp community centres, SMS, social media, and noticeboards to share advice on heat, health, and coping measures. Refugees who have their own smartphones and internet access also receive the general national warnings issued by JMD, government media, and private apps.

Interviewees mentioned that in areas like Azraq, information does not easily reach herders and people living in semi-permanent communities outside of the towns. As one interviewee noted, this requires liaison officers to *'physically go and drive to multiple different communities to pass on hazard information'*. Uneven access to media and internet connectivity limits the reach of warnings in some areas.

Equity concerns remain central. Vulnerable groups, including older adults, persons with disabilities, women, children, and populations in desert areas, may not consistently receive or be able to act on warnings. Interviewees emphasized the need for more inclusive and targeted communication approaches tailored to different needs and contexts. Some actors have begun to address these gaps through more targeted and user-centred communication approaches (e.g. Mercy Corps' campaign in the next section).

Localization and community feedback mechanisms are limited yet emerging. While there is increasing recognition of the importance of co-designed EWSs, risk information and guidance are not yet systematically adapted to local vulnerabilities or linked to context-specific actions.

Awareness initiatives

In response to these challenges, awareness initiatives have emerged to improve accessibility and user-centred communication. For example, a national campaign launched in 2024 by JMD called 'Protect Yourself from the Heat' which used visuals and simple messages was reported to have a positive impact. Another example of effective and targeted communication is the national-level Harrek Wa'yak campaign, implemented by Mercy Corps (Box 1).

Gaps and challenges

Despite the presence of multiple dissemination channels, interviewees consistently highlighted the gap between the information and enabling action, both individual and institutional. Warnings are often perceived as generic and not sufficiently linked to clear behavioural guidance. As one respondent noted, warnings may state that temperatures will be above normal, without a lot of guidance on what that actually means in practice.

Also institutionally, while national actors disseminate warnings through an established network of liaison officers across institutions, municipalities and local actors have pointed to challenges in interpreting and operationalizing this information. These perspectives highlight a disconnect between information provision at the national level and its practical use for decision-making at the local level.

Furthermore, consistency and reliability across communication channels can be a challenge particularly when official and unofficial sources circulate in parallel on social media. However,

interviewees stressed that, in the case of extreme heat in Jordan, official warnings are generally timely, clear, and widely trusted. Some did however suggest that repeated or frequent warnings may reduce public responsiveness over time.

The *Harrek Wa'yak* awareness campaign

The *Harrek Wa'yak* campaign (حرّك وعيك, 'Raise your awareness'), implemented in 2025 by Mercy Corps under its climate resilience program Tabeaa (Partnerships for public health: Turning guidance into action), translated community-level evidence into actionable heat-health messaging.

The campaign targeted populations most exposed to heat risks, including children walking long distances to school, pregnant women exposed to midday heat, and older adults living in poorly ventilated homes. Combining digital outreach and in-person events (including interactive sessions in three vulnerable locations), the campaign reached 700,000 people online and 535 in person. The initiative was further strengthened through a partnership with MedLabs, a leading private laboratory in Jordan, which provided on-site health screenings.

Ahead of peak summer temperatures, awareness content was co-developed with the Ministry of Health Directorate of Health Awareness and Media. Content was disseminated through official Ministry of Health, Mercy Corps, municipal, and health centre social media platforms, as well as national media.

The use of simple language, clear awareness visuals, and targeted messaging for specific vulnerable groups (e.g. pregnant women, older adults, and parents of young children) helped improve comprehension and engagement. Monitoring and evaluation data indicated that messages were well received across target communities.

Implemented under the leadership of the Ministry of Health, the campaign was closely aligned with national systems, ensuring that messages were scientifically grounded, nationally consistent, and delivered through trusted public channels. This positioned the initiative as a public health intervention embedded within existing institutional frameworks, rather than a standalone awareness effort.

Preparedness and response capabilities

Link to action and operational response

Anticipatory action and response to heat warnings currently occur primarily through general disaster/emergency management procedures, rather than dedicated national or local heat action plans. Once a heatwave alert is issued, relevant agencies activate internal emergency protocols. As one interviewee explained, *'Based on the forecasts and the warnings we issue, every institution concerned activates its own emergency plan'*.

The Ministry of Health prepares emergency services and hospital readiness for heat-related cases, while Civil Defence monitors hotspots and high-risk areas. Municipalities may suspend outdoor work during peak heat periods. The Jordan Red Crescent (JRC) also has its own readiness protocols, including preparing logistical teams and ambulance units on standby. JRC's actions follow the roles assigned by the NCSCM, which mobilizes agencies if conditions escalate. JRC maintains direct links with governmental departments, but funding constrains their ability to build clear plans to anticipate or respond to an early warning.

Other sectoral responses have been triggered during the past events, such as the Jordan Valley Authority issuing emergency irrigation plans, universities shifting to virtual learning, and a lot of organizations reverting to work from home. Farmers' unions publicly warned about risks to crops and water availability. These examples indicate that heatwaves already trigger a range of sectoral actions, even if not yet guided through a dedicated national heat action plan.

Interagency coordination

Coordination was identified as both a strength and an ongoing challenge. Collaborative initiatives have been developed across institutions to strengthen early warning systems and interagency coordination. A key example is the Jahez project, funded by the Foreign, Commonwealth and Development Office (FCDO) and implemented by the IWMI and the UK Met Office, in collaboration with national stakeholders. The project focuses on improving how climate and risk information is generated, translated, and disseminated across agencies, thereby enhancing its usability at the local level. Within this collaboration, the UK Met Office is working closely with the JMD and the NCSCM to strengthen the production and communication of risk information across institutional levels.

Despite progress, interviewees stressed that responsibilities are not fully clear across institutions: *'There's some overlap and lack of clarity in the roles and responsibilities… who is the lead responsible agency for planning, for response, for recovery'* and that actions often remain siloed with strong departments operating independently. Despite these challenges, respondents observed an increasing openness to collaborate.

Community engagement, awareness and translation of warnings into action

Across interviews, actors mentioned that social awareness remains a major barrier. In the words of one interviewee: *'Sometimes there is weak social awareness… people think heat is something normal although it has deadly impacts'*. This highlights the challenge of translating heat warnings into meaningful behavioural change.

Local engagement and awareness activities on heat in Jordan are expanding to address this. For example, JMD's 'Protect Yourself from the Heat' campaign in 2025, described in Box 1, provides clear and practical advice for households, workers, and caregivers.

Another example is the Mercy Corps' climate resilience program Tabeaa (Partnerships for public health: Turning guidance into action). The project aims to strengthen community resilience to climate-related hazards, including extreme heat, through evidence-based and locally grounded approaches at both community and national level.

Within this framework, a resilience assessment was conducted using the Climate Resilience Measurement for Communities (CRMC) framework, alongside a Gender Equality and Social Inclusion (GESI) analysis. This process identified key resilience gaps and highlighted the need for practical, trusted heat-health guidance tailored to vulnerable groups.

The CRMC tool in the project was used to understand community needs, and prioritize interventions, and co-design solutions with communities (Mercy Corps, 2024). An assessment of climate change adaptation and disaster risk reduction policies was also conducted under the project. Plans for the coming years include implementing interventions on increasing green spaces and raising awareness on reducing energy consumption in households during heatwaves in targeted communities, among other interventions that aim to increase community resilience. Building on these findings, Mercy Corps implemented a national-level awareness campaign (Box 1).

Humanitarian organizations play an important role in raising awareness. Actors such as the JRC use multiple channels to reach communities, including volunteer teams, field visits, and awareness leaflets, as well as Community Based Health and First Aid (CBHFA) teams who provide household level education. The JRC also maintain clinics in places like Zaatari camp, where awareness is raised through their visits to the clinics, especially with warnings about the heat and how to deal with it.

Evidence from refugee settings further illustrates how communities cope with heat under constrained conditions. Common coping mechanisms included water use, such as pouring water on the body or clothing throughout the day, using wet towels around the head, neck, or shoulder, removing carpets and spraying screed floors with water, or sitting in covered courtyards (Albadra et al., 2017). Most households kept windows open to improve ventilation, although often constrained by dust, sandstorms, insects, and privacy and safety concerns. Coping strategies are shaped and limited by structural and social factors, including shelter conditions, resource availability, and cultural norms. In particular, around half of families in Azraq camp reported limited ability to adapt clothing, especially among women, highlighting gendered constraints on behavioural adaptation. These findings show that while awareness and behavioural responses exist, the capacity to act on heat risk information remains uneven and context-dependent.

At the municipal level, climate plans focus on long-term measures to reduce heat-related exposure. The GAM published its first Climate Risk Assessment and its second Climate Action Plan in 2024, both including heat. The plan outlines vulnerable groups and sectors affected by heat, with actions listed around reducing and maintaining the urban heat island effect and carbon emissions in Amman through blue and green infrastructure (UN Habitat and UNDP, 2024). The City of Sahab's Urban Resilience Action Plan (URAP), published in 2025, also includes heat. The City also undertook a vulnerability assessment, and co-developed locally-led actions with communities and stakeholders, and shortlisted actions for the city such as expanding green spaces and nature-based solutions (Hammad and Nimri, 2025).

Multi-hazard approach

Multi-hazard integration appears mainly through parallel hazard initiatives rather than an integrated system. Interviewees pointed to separate hazard programmes. They also described broader fragmentation where different ministries, relevant government entities, and local authorities host different systems, linked to siloed development investments and projects. The Government of Jordan is making efforts to align different systems and investments for risk and information, including early warning systems.

Interviewees also recognized that some communities are exposed to *'flash flooding and heatwave at the same time'*, and highlighted compound pressures, including that Jordan is *'the most water scarce country in the world'*, requiring water to be considered *'at everything we do'*. Heat is also linked to compound drought and water crisis dynamics, with an interviewee noting the water crisis *'gets worse with heatwaves'*. Overall, while awareness of compound and cascading heat risks is growing, operational integration across hazards remains limited, with opportunities to strengthen coordination, joint planning, and early warning across sectors such as water, urban planning, and disaster risk management.

Gender and social inequalities addressed inclusively

Emerging evidence highlights important GESI dimensions of heat vulnerability in Jordan. For example, a study found that heat- and cold-related mortality risks were higher among women compared to men in Amman (Alwadi et al., 2024). The study attributes these differences to contextual and structural factors, including gendered social norms, housing conditions, and unequal access to resources, which can limit women's abilities to adapt to extreme temperatures. At the same time, there exist limited epidemiological studies to understand health risks across groups due to limited data availability.

Gendered and social vulnerabilities are also evident in humanitarian settings. Studies in refugee camps show that shelter design and living conditions can constrain adaptive behaviours. For example, in the Zaatari camp, the shelter design did not consider physical and social preferences (Albadra et al., 2017). Low-level windows allowed outside visibility into private spaces, leading female households to close or block windows, reducing ventilation and increasing indoor heat exposure. Women in particular also reported more limited options to adapt clothing.

GESI was found to be focussed especially on humanitarian and community-level interventions, but less consistently embedded in national warning system and plans. For example, Mercy Corps described conducting GESI analyses to identify vulnerable groups and tailor communication, including targeted messaging for pregnant women, parents of young children, and elderly populations. Accessibility of warnings was highlighted as a major priority, with efforts to simplify language and use visuals in recognition that *'awareness is the biggest issue with regards to heat in Jordan'*, as noted by an interviewee.

Despite these efforts, significant gaps remain in inclusive dissemination and last-mile reach. In addition, inclusive first-mile approaches to designing warnings and institutionalizing feedback mechanisms remain limited. While some community-based initiatives collect input through local engagement activities, there are no systematic, GESI-sensitive mechanisms to capture feedback from vulnerable groups on warning accessibility, understanding, or usability. Strengthening such feedback loops would be important to ensure that warning systems are responsive to the needs and constraints of different population groups. Interviewees noted that people with disabilities, older adults, and socially isolated individuals may not receive warnings due to limited device access,

mobility, or social networks. Similarly, populations in remote desert areas, including pastoral and semi-nomadic groups, are often difficult to reach through standard communication channels, highlighting the need to use what one interviewee described as *'every method, all methods'* to ensure coverage. Overall, interviews suggest that the systematic integration of GESI into national warning, preparedness, and response systems remains limited. This includes, for example, the limited use of warnings that explicitly identify vulnerable groups and communicate the specific risks and impacts they face.

Local community involvement

Local community involvement in heat risk management in Jordan is present through outreach, awareness, and consultation activities, but the existence of fully co-designed, heat-specific early warning systems is described as still limited. Several humanitarian actors emphasized that their work is grounded in community engagement. For example, an IFRC interviewee highlighted that they *'work with the community and through the community,'* using their own communication platforms alongside volunteer networks and community structures. CBHFA teams play a key role in last-mile outreach, delivering heat awareness messages during field visits and household engagement.

National partnerships are also combined with local-level engagement and first-mile approaches. Mercy Corps described working closely with municipalities and local actors to better understand community needs and perceptions, with key informants noting that they conducted a lot of interviews to get the community's perspective. These consultations are used to inform targeted awareness campaigns and locally relevant interventions. The FCDO's Jahez project also co-designs community resilience action plans with communities, supported by municipal focal points, to reflect both institutional and community perspectives and priorities for strengthening resilience to multiple hazards, including heat.

However, interviewees consistently emphasized that community-centred approaches to heat early warning are still emerging. Current priorities include moving towards community co-designed early warning, contextualized for the specific users. Respondents highlighted that while national systems and information flows exist, the first mile is where a lot of the emphasis needs to go. Ensuring that community engagement is inclusive of diverse groups (e.g. women, older adults, persons with disabilities, and marginalized populations) is critical to ensure that early warning systems reflect different needs and capacities.

Effective governance and institutions

Jordan has made good progress in developing national climate change frameworks and commitments. National policy frameworks, including the National Climate Change Adaptation Plan (NAP) and the Climate Change Health Adaptation Strategy, as well as Jordan's Biennial Transparency Report to the United Nations Framework Convention on Climate Change (UNFCCC) (Ministry of Environment, 2025), recognize heat as a growing risk and highlight the need to strengthen climate services, early warning systems, and cross-sector adaptation planning.

At the same time, heat is not yet systematically integrated into these national adaptation and disaster risk frameworks. References to heatwaves in the NAP remain limited, largely confined to the health sector and selected measures such as climate-responsive building design (Murad et al. 2025; Ministry of Environment, 2022). Policy attention remains largely focused on the health sector, but even there, dedicated programmes for heatwave management are still limited. In 2012, the

Ministry of Health noted the absence of specific heatwave management interventions, and recent assessments indicate that progress has remained limited, partly due to other priorities such as the Syrian refugee crisis and the COVID-19 pandemic (Ministry of Health Jordan, 2025). While heat is therefore still an emerging issue, the latest Climate Change Health Adaptation Strategy (2024–2033) identifies two key priorities: 1) the development of a heat-health warning system and 2) the strengthening of healthcare preparedness during heatwaves (Ministry of Health Jordan, 2025).

Governance responsibilities for heat are distributed across multiple institutions. JMD generates forecasts and warnings, which are disseminated through the NCSCM and sectoral ministries, including the Ministry of Local Administration, which relays information to municipalities. Civil Defence, the Ministry of Health, municipalities, and other agencies then activate their own sectoral response protocols. Humanitarian organizations play a supportive role within this structure.

At the same time, implementation challenges remain. Jordan has relatively strong national frameworks but weaker localization and limited municipal engagement, as well as limited focus on heatwaves (Murad et al. 2025). This gap between national policy ambition and local implementation was also mentioned by interviewees. Another challenge mentioned was coordination and clarity of roles. While leadership roles are defined at national level, the challenges persist mainly in coordination, resources, and localized actions. More broadly, respondents highlighted the absence of ‘a harmonized and streamlined risk management system’, resulting in multiple parallel or isolated initiatives that are not always aligned across mandated institutions or ministries. Resource limitations further constrain governance effectiveness, with funding shortages and limited dedicated budgets for heat preparedness and response noted by interviewees as persistent barriers.

Overall, governance structures for managing heat risk in Jordan are evolving and increasingly recognized within national adaptation and disaster risk frameworks. However, strengthening institutional coordination, improving localization and data availability, and ensuring sustained financing remain key priorities for developing a more integrated and people-centred heat early warning system.

Key recommendations

- **Improve vulnerability profiling, impact monitoring, and data integration**: Systematic data on heat impacts remain limited in Jordan. Strengthening analyses that combine epidemiological, occupational, and spatial vulnerability data can support more targeted warnings and anticipatory actions. However, there is limited availability of disaggregated data (e.g. by gender, age, disability, and socio-economic status), which constrains a more inclusive understanding of vulnerability. It is therefore crucial to improve the generation and use of such data, complemented by community knowledge and lived experience to identify vulnerability pathways, exposure patterns, and coping constraints. Participatory approaches and engagement with frontline actors, such as health workers and local authorities, can inform locally relevant impact thresholds and communication strategies. In parallel, improving access to meteorological data is essential. More open and timely data-sharing practices, including observational data from the JMD, would enable researchers and operational partners to better analyse heat risk and support anticipatory action.
- **Strengthen the impact-orientation and contextualization of warnings**: Although JMD operates heatwave thresholds and issues forecasts, warnings are still often perceived as generic and are primarily hazard-based. Further contextualization of warnings, reflecting local conditions, vulnerabilities, and exposure, as well as tailoring messages for different population groups and regions (such as refugees, women, outdoor workers, and remote populations), could significantly improve their usability and relevance. Warnings should also be accompanied by clear recommendations on what actions should be taken.
- **Improving preparatory plans and anticipatory actions**: There is a need to strengthen preparedness and anticipatory action planning. This includes developing scenario-based approaches that link different warning levels and impact information to predefined actions, decision thresholds, and response mechanisms. These should be formalized through joint standard operating procedures across responsible agencies and community actors. To ensure coherence and effectiveness, roles and responsibilities should be clearly defined, with specific triggers and corresponding actions identified for each actor. These systems should be regularly tested and refined through simulations and exercises to ensure that warnings translate into timely and coordinated action.
- **Enhance first-mile engagement, last-mile communication, feedback mechanisms, and trust**: Warnings may not always reach or resonate with all population groups. Engaging diverse communities in the design of HEWS is essential. Strengthening communication channels, including user-friendly formats, local languages, and GESI-friendly feedback mechanisms, can improve usability, trust, and continuous system improvement. Two-way communication and engagement with vulnerable groups, including through humanitarian and community networks, should be prioritized to ensure warnings are accessible, actionable, and trusted.
- **Strengthen local response capacity and sustainable financing**: While Jordan has relatively strong national disaster risk and institutional frameworks, heatwaves are still insufficiently addressed and implementation and response capacity at local and municipal levels remain uneven. Strengthening local preparedness, clarifying roles and responsibilities, and ensuring sustainable financing for preparedness and anticipatory action for heatwaves would improve the effectiveness of HEWSs. This includes integrating heat into existing disaster risk management and social protection mechanisms, as well as supporting local authorities and partners to operationalize early action.

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This case study complements our global report: Understanding the Global Landscape of Heat Early Warning Systems. You can view the full report here.

About the Zurich Climate Resilience Alliance

The Zurich Climate Resilience Alliance is a collaboration between humanitarian, NGO, research and private sector partners, working to build resilience to climate hazards in rural and urban contexts.

Formerly the Zurich Flood Resilience Alliance, we have over a decade of experience in generating evidence of communities' current levels of climate resilience and identifying appropriate solutions.

Through long-term community programmes, new research and stakeholder influencing, we strive to deliver systemic change at scale and realize our vision of a world in which communities are more resilient to climate hazards, and able to thrive.

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