

# Resilience by Design

Lessons on Inclusive  
AI Capabilities from  
the Australian Red Cross  
Community Climate  
Adaptation Pilot

November 2025



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### ADM+S

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### Acknowledgement of Country

In the spirit of reconciliation, we acknowledge the Traditional Custodians of Country throughout Australia and their connections to land, sea and community. We pay our respects to their Elders past and present and extend that respect to all Aboriginal and Torres Strait Islander peoples today.

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# Highlights

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In the small rural community of Dargo, Australia, residents, technology developers and humanitarian workers have collaborated to tackle the challenge of preparing for climate-driven emergencies.

The pilot project brought together Australian Red Cross Humanitech, technology company WEO, and local community members to co-design a new kind of preparedness platform that blends local knowledge with open data and AI-driven climate risk profiling. The platform aims to turn scattered information on climate risk into accessible insights, giving communities a stronger footing when facing floods, fires, heat and other climate risks.

This report presents an evaluation of the pilot program and the platform's key features, drawing on interviews with Dargo community members, the platform developer, and Australian Red Cross' resilience team.

Researchers from the ARC Centre of Excellence for Automated Decision Making and Society (ADM+S) evaluated the pilot against four key criteria that build on principles of responsible AI and inclusive technology design and development. These are a) safety and accountability, b) community and stakeholder participation, c) community benefit, d) sustainability and scalability.

The evaluation aimed to identify the challenges and innovations in the process of developing disaster preparedness technology through community co-design. It focused on the role of participation and provides an analysis of collective capabilities and benefit, with the ADM+S evaluation framework drawing from approaches to participatory innovation, community data capability and responsible and inclusive AI.

The pilot serves as a case study examining how data-driven and AI-supported technologies can be developed ethically, inclusively and responsibly to create benefit and real capabilities for local communities.

## Overview of findings for the pilot

Community participation was built into the pilot process with the goal of achieving technology design that is embedded in place, accessible, reliable and robust, and championed by key community stakeholders.

We found that by supporting data-informed decision-making for disaster preparedness and resilience planning, the pilot represents a significant step toward inclusive, community-centred technological solutions for humanitarian challenges. Against our four core evaluation criteria, we found that the pilot achieved important progress:

**Safety and accountability.** Safety, accountability, and ethical considerations were prioritised and central to the pilot's design and implementation. Initial errors in risk profiling were identified and effectively addressed, underscoring the value of responsive feedback loops and iterative refinement.

Barriers to explainability were mitigated through the translation of platform scope and purpose during co-design activities and through sustained engagement with community 'champions' who supported others' understanding and trust.



**Community and stakeholder participation.**

Meaningful community and stakeholder engagement was achieved in part through existing Australian Red Cross connections and the employment of a local team member as facilitator of an extensive co-design process.

Community knowledge was incorporated successfully within the limits of the project scope. The community lead played a vital role in extending outreach beyond formal workshop settings, engaging stakeholders who were unable to participate directly.

While tourists were not actively involved, their presence and needs were identified and considered by community members, recognising their needs as transient yet significant stakeholders in emergency preparedness.

**Community benefit.** While the benefit of the platform to longer-term community resilience and disaster preparedness is yet to be fully realised, the pilot showed indirect community benefits and outcomes. These were evident in the collaborative input process, where specific information and data needs were established, as well as through the establishment of feedback loops to inform platform design, and the nomination of champions to support access among the more digitally excluded and ensure ongoing use.

**Sustainability and scalability.** The question of the sustainability and scalability of the pilot platform can only be answered speculatively.

The co-design process surfaced the common tensions and trade-offs in localising capability gains while creating a template for scalable application across different towns, regions and even international settings. It showed the importance of dual embeddedness in local community and institutional or organisational context to ensure support, iterability, and longevity.

## Recommendations

The pilot surfaced several consistent challenges, including the need to manage expectations, translate between technical and community knowledge systems, and ensure inclusive access to—and meaningful explainability of—platform features.

In responding to these challenges, several key strengths emerged: the active role of community champions in supporting inclusive participation and access, the embedding of feedback loops to guide iterative design, and the active role of a local lead who can foster participation and help identify and translate localised needs.

Key recommendations emerging from the evaluation are outlined below.

### Addressing safety and accountability:

- ↳ **Ensure early communication around privacy and disclaimers:** Engage developers from the outset in discussions about privacy expectations, data sensitivity, and the role of disclaimers.
- ↳ **Leverage local data wherever possible:** Use locally sourced data where possible to enhance relevance, accuracy, and community trust. This supports contextual integrity and ensures that platform outputs reflect lived realities.

### Enabling community and stakeholder participation:

- ↳ **Communicate scope and limitations early and often:** Clearly articulate the project's scope and restraints throughout the process to support transparency and manage participant expectations.
- ↳ **Empower local leads for community outreach:** The community lead played a key role in enabling different forms of participation. It is recommended for future projects to continue to ensure community leads are supported to engage with a wide range of stakeholders, including those unable to attend workshops.
- ↳ **Consider peripheral stakeholders:** Consider ways to represent outside stakeholder interests, such as tourists or seasonal visitors in planning and design considerations, even if they are not directly involved in co-design activities.

### Creating community benefit:

- ↳ **Collective use of digital technologies:** Consider the way technology design can achieve community-wide benefits by moving beyond individualised app design to consider collective uses—for instance across households, community groups, and local organisations—rather than assuming individualised use.
- ↳ **Reduce barriers to participation:** Prioritise low-skill requirements and intuitive interfaces to ensure accessibility for users with varying levels of digital literacy. This supports broader inclusion and empowers a wider range of community members to contribute meaningfully.
- ↳ **Support offline functionality:** Consider incorporating features that allow for offline access and data collection and entry, particularly in low-connectivity or disaster-prone environments where offline modes may be more reliable during emergencies.

### Embedding sustainability and scalability:

- ↳ **Embed a local lead within the community:** Appoint a well-connected community lead who can identify local needs, facilitate adaptation, and act as a bridge between community, organisational, and developer priorities. This is critical for identifying context-specific insights and enabling inclusive participation in located settings.
- ↳ **Developers also benefit from understanding local needs and aspirations:** Ensure that community-driven ‘blue-sky’ aspirations are meaningfully considered and communicated through dialogue between technical teams and local stakeholders.
- ↳ **Plan for both community and organisational integration:** Creating sustainable and scalable technologies requires embeddedness in place and community and in an organisational and institutional ecosystem.

These findings underscore important considerations for future technology innovation through community co-design. They reveal both recurring challenges and transferable innovations that can inform the design and implementation of future projects.



# The challenge: Toward resilient communities

The challenge of building community resilience in the face of increasing climate risk has never been greater.

Post-disaster inquiries in Australia consistently highlight the need for better public access to timely information and data to inform preparedness, response and recovery.<sup>1</sup>

A common theme is that data and information are vital to disaster resilience, *and* that this is not only the domain of emergency services.<sup>2</sup> Existing systems often fail to harness the wealth of local insights and assets and fail to integrate this with accessible emergency mapping platforms or apps, resulting in fragmented data, overlooked opportunities, and inadequate support for vulnerable populations.<sup>3</sup>

Our previous research with Australian Red Cross examined the potential and limitations of existing data-driven, map-based and AI supported platforms for addressing emergency preparedness, response and recovery.<sup>4</sup>

The *Towards Resilient Communities* report identifies three core challenges for data and AI-driven disaster preparedness technologies:

**Challenge 1. Involving communities in disaster preparedness efforts by harnessing local knowledge.** Local knowledge refers to the collective understanding, awareness, and resources available within a community that play a vital role in enhancing disaster preparedness. It involves gathering local knowledge, experiences, observations, insights, and the expertise available in the community, as well as the tangible assets and resources.

**Challenge 2. Empowering through community capability development and community-led data-driven preparedness.** Community involvement promotes collaboration, enabling information flows that are tailored to diverse community needs and are trauma informed, fostering a sense of ownership and sustainable capability building.

**Challenge 3. Supporting local decision making and action while achieving scale, sustainability and adaptability.** While localisation and scalability are often in tension with technology solutions, this is a challenge that must be considered at every stage of development, deployment and testing.

These challenges were incorporated into the problem statement for the 2024 QBE AcceliCITY Resilience Challenge Humanitarian Track (Humanitarian Challenge) and guide the focus of this pilot program evaluation. The Humanitarian Challenge is a unique cross-sector collaboration between Australian Red Cross, QBE Foundation and Leading Cities, focused on creating and scaling community-led solutions for climate resilience.

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## The 2024 QBE AcceliCITY Resilience Challenge

Three primary objectives of the pilot were derived from the problem statement developed by the Australian Red Cross Humanitech team in collaboration with the ADM+S Centre for the Humanitarian Track of the Challenge:

1. Successful implementation of a Climate adaptation technology pilot in Dargo, Victoria, Australia.
2. Empowerment of the community to collect, input, and interpret their specific risks, strengths and vulnerabilities.
3. Capacity for sustainability and scalability to other communities, regions, or contexts.

This report presents an evaluation by ADM+S researchers of a pilot program coordinated by the Australian Red Cross team that supported WEO to co-develop a climate risk profile and asset mapping platform for the rural Australian community of Dargo. Dargo was selected through its existing RediCommunities partnership with Australian Red Cross. It is also one of Victoria's most remote communities, with one road in and out of its location nestled in the Alpine region north of the state. The area has faced repeated flood and fire events.

As winners of the 2024 Humanitarian Track, Brussels-based technology company WEO proposed a technology platform to harness the transformative potential of technology to bridge the gap between data, community decision making, and local action.<sup>5</sup>

WEO's platform, co-designed with local community members and Australian Red Cross, creates hyper-local risk profiles using satellite data, AI and community insights to support decision-making and disaster preparedness.<sup>6</sup>

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## The WEO Humanitech platform & Community Climate Adaptation Pilot

### Dargo, Victoria

Dargo is a rural town on Gunaikurnai country, in the Wellington Shire Council area, at the edge of the Victorian Alps. It has a permanent population of approximately 105 people. Tourism is a major element of the local economy, with intense activity centred around the Dargo Hotel, General Store and campgrounds. With proximity to historical attractions, national parks, campgrounds and popular areas for outdoor sports, the town can swell to thousands of people in peak holiday periods.

Dargo is geographically isolated, surrounded by mountains and dense bushland, and has been impacted by bushfires, floods and heat stress. The single access road from Gippsland is winding and crosses a flood-prone river. Many roads in the surrounding areas were damaged from the 2021 bushfires and floods and are subject to seasonal closures.

The town proper is small, with no resident doctor or pharmacist. The town's Bush Nurses reside on site in the town for part of the week, but live approximately an hour's drive away, and schoolchildren commute an hour by bus to the nearest school.

Residents are highly engaged in community life, but the majority are ageing. Many residents have complex needs, which are primarily served by the Bush Nursing service. The area falls 3.4 points below the national digital inclusion score (69.8 out of 100), and 5 points below the average for digital ability (59.9).<sup>7</sup>

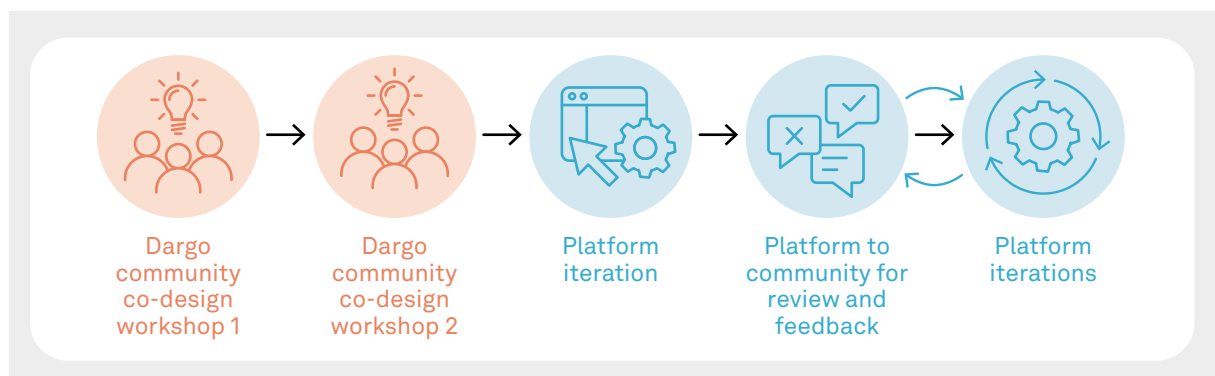
Due to Dargo's mountainous surroundings, mobile and internet service is poor. Residents report that the capacity of the local mobile tower is especially limited and overloads regularly due to the fluctuating influx of tourists throughout the year, making connectivity challenging particularly during peak summer bushfire season.

### Community co-design process

Extended engagement with the community was built into the pilot process. A local community member, employed as part of the Australian Red Cross team, coordinated and facilitated two initial co-design workshops, and served as a liaison between the community, platform developers and Australian Red Cross Humanitech resilience team (Figure 1).

The initial co-design workshop in Dargo was held with 20 residents, a notable turnout given the town's population of 105.

Participants represented a cross-section of the local community, including Country Fire Authority (CFA) volunteers, healthcare staff from the Dargo Bush Nursing Centre, leaders from the Dargo Community House, local business owners, and individuals affiliated with various community organisations and committees. Participants ranged in age and length of stay in the community, with a broad range of access, experience and skills with digital technologies.



**Figure 1.** Community co-design and platform iteration process flow.

During the first session, residents discussed the kinds of information and support they had found lacking during previous emergencies, and highlighted areas where the community faces ongoing challenges. The group also considered how technology might be applied in practical ways to improve local resilience.

A dedicated Q&A session with WEO offered participants the chance to contribute ideas for data sources and application features, explaining their relevance and potential benefits for the community.

The second workshop was held shortly after, bringing together 11 participants to further shape the project. This session focused on refining the initial list of challenges, prioritising desired platform features, and developing a shared vision for how a successful rollout could look by 2028. As a precursor to defining the scope of the Humanitech platform, the group identified six broader issues the community faces in strengthening community resilience:

- ↳ **Access to insights:** The community emphasised the need for a consolidated, trusted source of information rather than relying on multiple sources across a range of apps and websites.
- ↳ **Trustworthy disaster management protocols:** Strengthening direct engagement with emergency response agencies was seen as critical to better address local vulnerabilities and supporting long-term resilience-building efforts.
- ↳ **Infrastructure maintenance:** Managing vegetation and fuel loads, and improving critical infrastructure such as roads, utilities, and buildings, was identified as necessary to reducing risk and enhance preparedness.
- ↳ **Access to essential resources:** Improving access to water, food, reliable power, and internet connectivity during emergencies remains a key concern.
- ↳ **Clearer evacuation and safety protocols:** The community highlighted challenges in addressing diverse needs and mitigating risks associated with limited evacuation routes—especially the vulnerability posed by the town’s ‘one road in, one road out.’
- ↳ **Population insights:** Developing accurate awareness of population fluctuations and the location of residents was highlighted as a way to inform effective emergency response and targeted assistance.

Acknowledging this context the co-design process shifted to platform design to help address some of the informational needs in support of emergency preparedness. Useful features were discussed, capturing blue-sky aspirations, and working towards translating these into feasible platform features.

Attendees worked collaboratively to rank platform features based on their potential impact and alignment with community privacy concerns. Additional outcomes included the creation of a list of proposed data inputs, distinguishing between static information that remains consistent and evolving data that reflects ongoing changes.

Participants also outlined preferred update frequencies for each type. There was further discussion on how to validate data to build community trust and ensure reliability.

Recognising the diversity in digital literacy levels, the group emphasised the importance of designing an interface that is intuitive and accessible. Finally, the session concluded with a visioning exercise, imagining what successful implementation would look like in the community over the next three years.

Following the initial community workshops, platform development was guided by the insights gathered during these sessions.

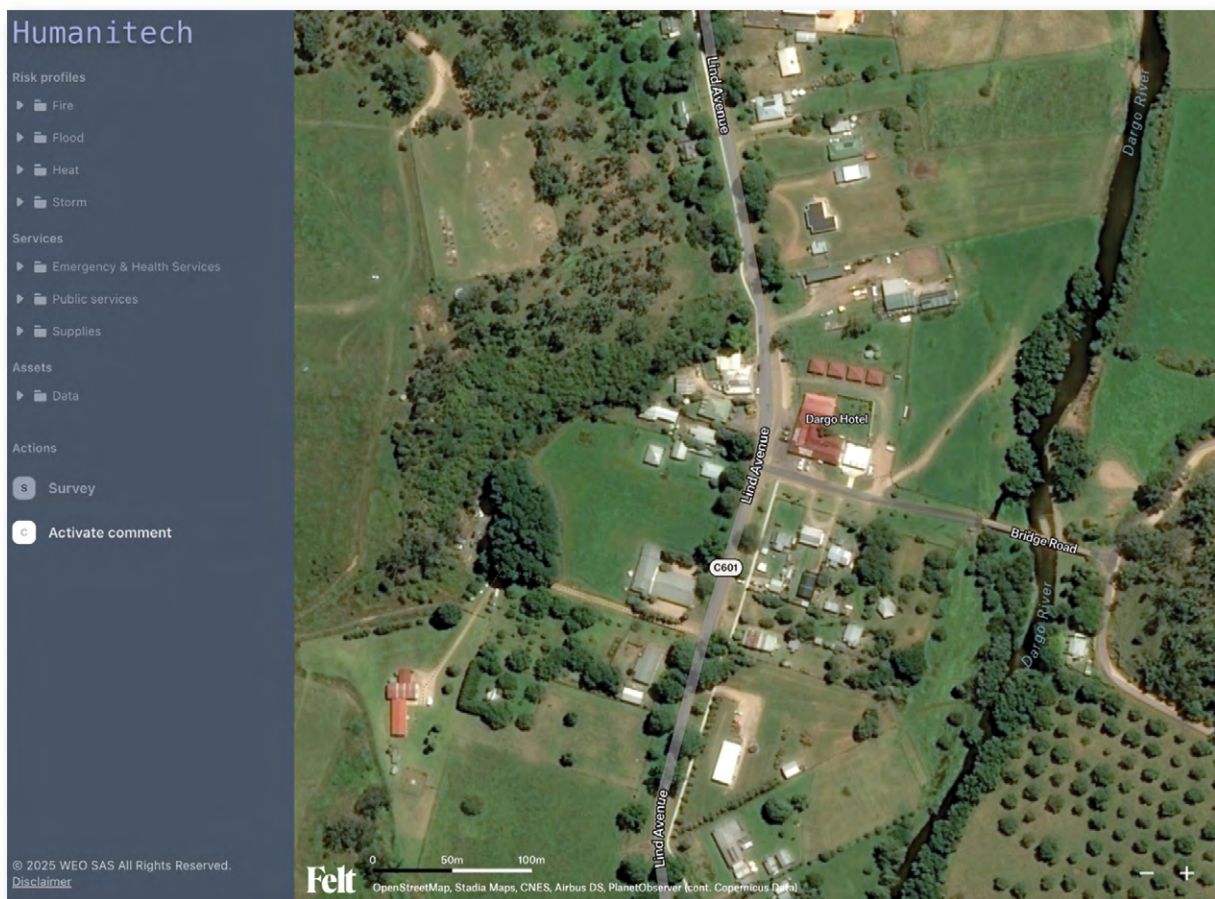
Once a minimum viable product was prepared, it was returned to the local project lead for review. Although the original plan involved a full community launch, scheduling constraints led the team to pivot toward one-on-one sessions and the training of community champions to provide targeted feedback. The community-driven development process then shifted to focused, iterative feedback and testing, ensuring the platform met local needs before wider rollout.

While early iterations were managed in an ad hoc manner, a functionality request register was soon introduced to streamline the process. The development team and local project lead met weekly to prioritise incoming requests, translating them into achievable technical tasks.

Platform updates were previewed by the local project lead (and other stakeholders when the lead deemed necessary), with feedback gathered on content, interface design, and functionality.

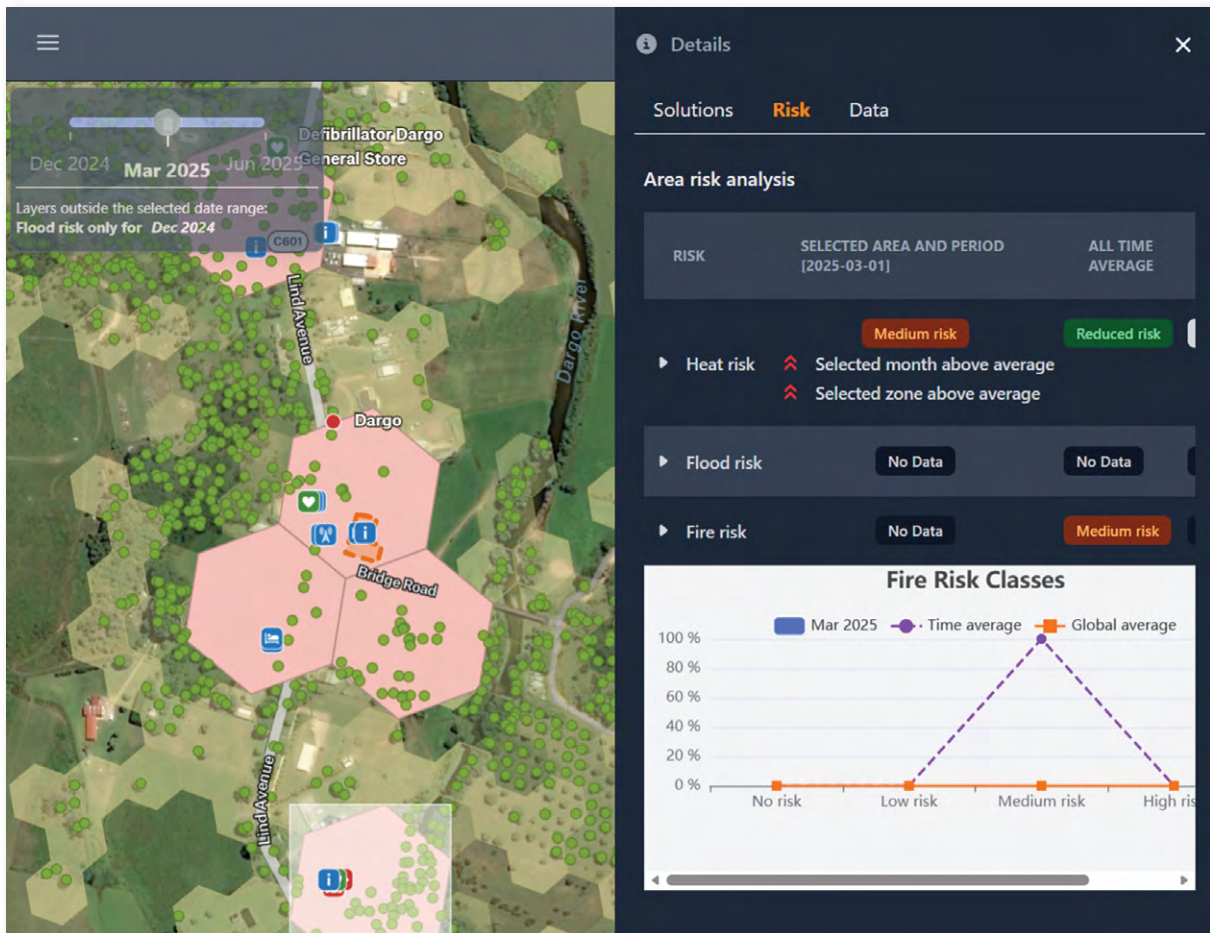
## WEO Humanitech platform overview

The platform is a community-focused, interactive risk analysis tool designed to visualise environmental and infrastructure-related risks across a geographic region. It is designed to support local decision-making by offering hyper-local insights into hazards such as heat, fire, and flood risks using open-source satellite imagery, AI image analysis and risk profiling.



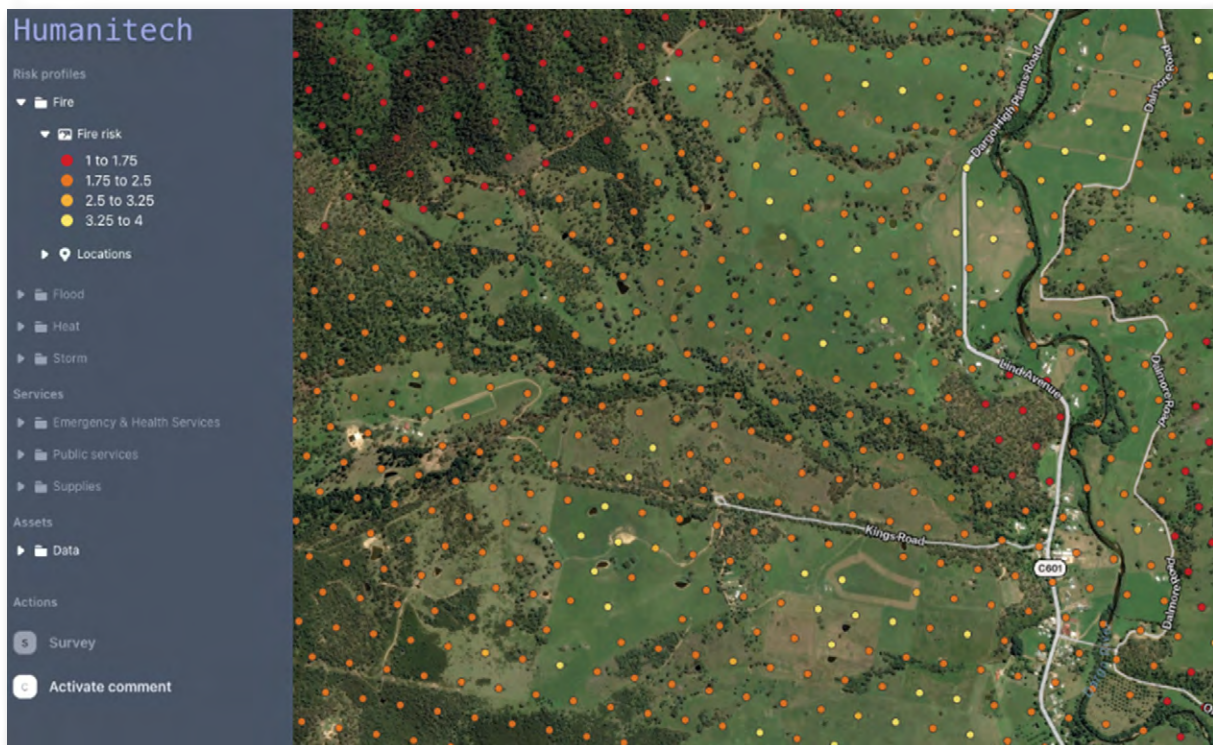
**Figure 2.** Basic map and data layers, Dargo, Victoria.

The user interface is map-based, functioning similarly to Google Maps as shown in **Figure 2**. Users can pinch and drag to navigate, zoom in and out using standard gestures, and interact with specific locations to gain detailed data insights. The left-hand sidebar provides layered filters and toggles to display various data types like community assets, services, risk profiles and social infrastructure. Users can select particular risk profile views, such as flood, fire, heat, or storm (**Figure 3** shows the flood risk profile and tree location and density).



**Figure 3.** Risk profiles, asset mapping and action plans.

Accessed via a browser, the platform is hosted on WEO's local EU servers. Upon launch, users can navigate the map interface by dragging the view to locate their area of interest—such as a specific region or local community asset—and then explore a range of environmental metrics relevant to that location. These metrics are visualised as colour-coded pixels or layers (see **Figure 4**), which users can click on to retrieve risk analyses and context-sensitive solutions (see **Figure 5**). Clicking any map point brings up detailed localised risk assessments and recommended actions on the right-hand sidebar.



**Figure 4.** Environmental metrics and layered data points for the WEO Humanitech platform.

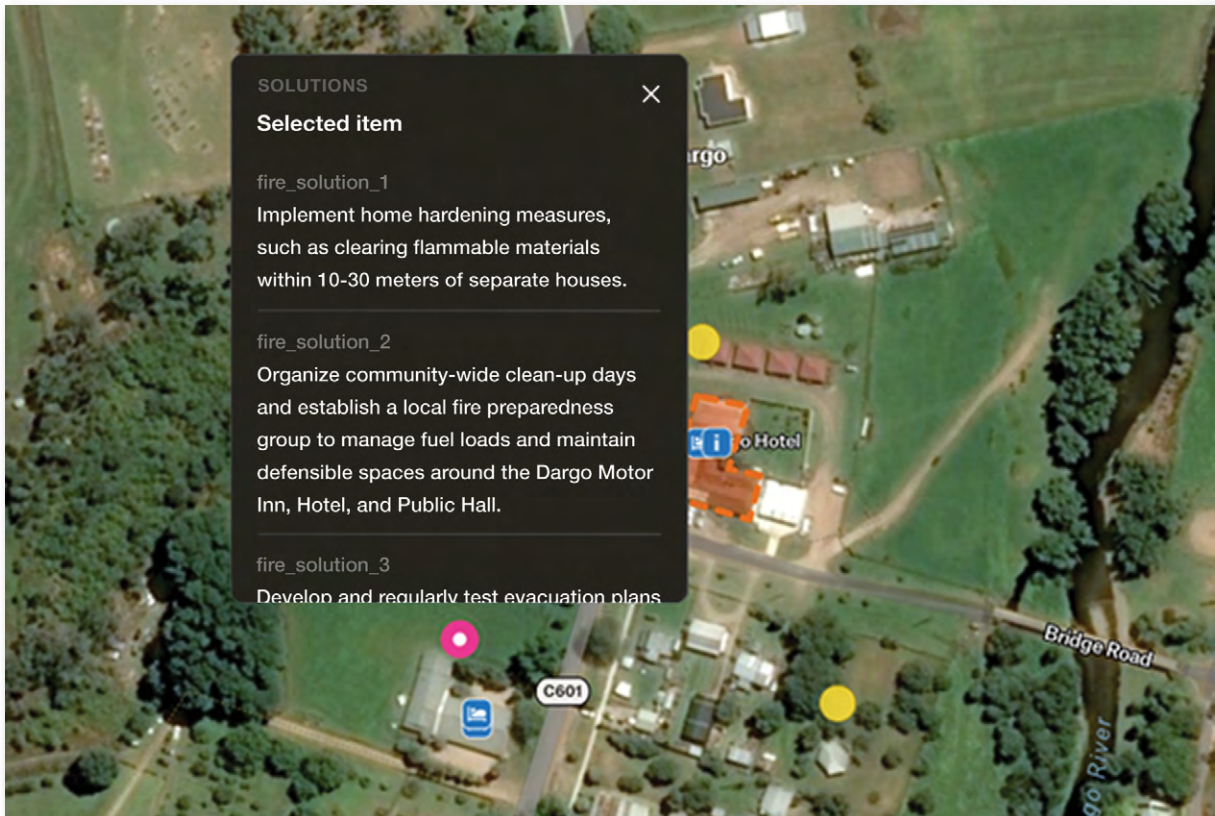


Figure 5. Area risk analysis and solutions.

The platform's core strength lies in its capacity for community engagement features, allowing users not only to explore but also to input local knowledge via map-based commenting and feedback tools and view localised risk solutions.

To incorporate local knowledge, a built-in commenting function allows community members to annotate the map with relevant observations (e.g., hazards, access routes, observations from past events). These comments are currently reviewed manually to maintain safety and reliability of input. In the development and iteration stages, the platform supported a preview feedback mechanism: rather than pushing updates directly to the live version, previews were first reviewed to ensure accuracy and safety of the input.

### Platform architecture

The platform is a geospatial risk-mapping and planning tool designed to support emergency preparedness and response in remote communities, piloted in Dargo, Victoria. It builds on Felt.com SDK (Software Developer Kit), a cloud-native GIS mapping service, selected for its open-access architecture, ease of use, and capacity to support scalable, modular design. Change sentence to: The platform was developed through a hybrid process combining third-party and custom components, using Felt's SDK to build a tailored web application that adapts its spatial rendering engine for community use.

**Initial prototype using Felt:** At the outset of the pilot, the team used the full-featured version of Felt to rapidly build and test early prototypes. Maps were built and layered directly within the Felt user interface. These prototypes were hosted on Felt, allowing quick iteration and direct sharing with end users and stakeholders. This approach leveraged Felt's strengths in intuitive design, collaborative access, and cloud-based hosting.

**Shift to custom application development:** As co-design with the Dargo community and Australian Red Cross progressed, it became clear that certain functionalities required by the pilot were not natively available within Felt's interface. In response, the development team began building a custom web application on top of the Felt SDK. This shift allowed the team to retain Felt's robust geospatial rendering capabilities while developing tailored components to support community-specific needs.

### Key features of WEO's hybrid platform

include a combination of mapped assets, satellite image analysis to embed flood, fire and heat risk profiles across the territory with location specific solutions, and community comments to add detailed and site-specific insights. These features are built on map rendering and data hosting, relying on Felt's SDK to ensure compatibility with Felt's core spatial engine. It also allowed custom frontend providing flexible control over UI and logics, hosted on WEO's own server. The SDK-based approach enables WEO to integrate features including:

- ↳ Map commenting and local knowledge annotations helping to enable community feedback.
- ↳ Layer toggling and role-based access control (under consideration).
- ↳ Custom statistics and overlays for social infrastructure and environmental conditions not available through Felt's native UI.

This architecture offers a flexible and scalable solution, combining the ease-of-use and visual accessibility of Felt with the extensibility and control of a bespoke web platform. However, Felt's tools, tailored for city engineers and other technical users, could not be seamlessly transferred to the pilot setting. As a result, features such as drag-and-drop map elements and statistical overlays were simplified, and backend services were refactored to accommodate lower bandwidth environments and varying levels of digital literacy within the community.

### Data pipeline and processing

The platform uses a multi-stage data pipeline, enabling integration of both high-resolution satellite data and community-generated content to inform risk mapping and preparedness. The platform draws on multiple sources of geospatial information:

- ↳ Satellite imagery from the European Space Agency (ESA) is accessed via open-source APIs. Level 2 imagery—already pre-processed and autocorrected—is used to ensure spatial consistency and analytical reliability.
- ↳ National geoportals and authoritative spatial data repositories are accessed where available to supplement the global datasets with localised contextual information.

**Data pipeline automation:** A Google Cloud-based architecture is used for secure data storage and access. The data is processed through a pipeline that automates the following steps:

1. Pre-processing: Spatial alignment of imagery to harmonise spatial references with other sources.
2. Machine learning (ML)-based enhancement: Noise reduction and feature sharpening.
3. Deep Learning Inference: Feature extraction for landscape features (e.g., water bodies, vegetation, temperature, built environments).
4. Post-processing: Data validation and formatting data into visualisation (map) layers.

### **Tree canopy mapping and vegetation**

**analysis:** For vegetation analysis, especially tree canopy delineation, the platform uses the High Resolution 1m Global Canopy Height Map (Meta/WRI)<sup>8</sup> as the base CHM layer for the entire area, including forests. For the villages of Crooked River, Budgee, Cobbanah, Dinner Plain, and Tabberablorra, the Meta model<sup>9</sup> was applied to orthophotos from November 2023 and August 2024, providing more current and locally precise CHM estimates for these settlements. These results were combined for a unified tree height map, and individual tree crowns were delineated using the PyCrown tool.<sup>10</sup>

**Future pipeline considerations:** Additional inputs will be considered, including community-provided information, such as details about unpassable roads and local response plans submitted through platform comments or provided by community representatives. The platform is equipped to ingest unstructured data submitted by residents, enabling more context-rich insights. In future iterations, there is possibility for these inputs to be processed using a Large Language Model (LLM) to support keyword tagging, risk classification, and the removal of personal information. This functionality, however, is not yet implemented and remains in experimental stages due to the limited volume of community input received to date.



# Evaluation aims, scope and methods

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The evaluation aimed to identify the challenges and successes of the pilot project through an analysis of platform features and the co-design process, with particular emphasis on community participation and benefit as foundational elements of responsible and inclusive data and AI technology development.

This constitutes a process evaluation, rather than an outcomes or impact evaluation. It relies on consultation and interviews with team members, field visits and interviews with local Dargo community members, along with analysis of platform features and development.

In addition to guiding the ongoing implementation and iteration of the platform in Dargo, the findings from the process evaluation can inform future technology developments aimed at building community climate and disaster resilience through co-design.

## Evaluation scope

The ADM+S team undertook a process evaluation of the WEO pilot project in Dargo, VIC from January to June 2025. The evaluation framework used for the evaluation draws on the approach to community data capabilities presented in the ADM+S and Australian Red Cross project *Towards Resilient Communities project (2021–2024)*<sup>11</sup> and international research and approaches to responsible and inclusive data and AI technology innovations.

Underpinning the framing of the pilot and the evaluation are a set of principles that the Australian Red Cross Humanitech team use to guide their work in supporting technology development and innovation. These principles are:

- ↳ **Build now for the future:** Develop products and solutions today based on sustainable business models that have a vision for the future.
- ↳ **Take time to understand the problem:** Recognise complexity and allow time to deeply understand the problem the product or technology seeks to solve.
- ↳ **Anticipate consequences:** Consider the intended and unintended consequences of technology, both in the present and in possible futures.
- ↳ **Empower people and communities:** Recognise people and communities as experts and decision-makers and be led by their lived experience.
- ↳ **Innovate openly and collaboratively:** Bring together stakeholders from different sectors, disciplines, and backgrounds in reciprocal partnerships.
- ↳ **Safeguard data and privacy:** Design technology products with respect for privacy rights and ensure the security of personal data.

Part of the ongoing challenge is embedding protections into community data practices, as articulated by the Minimum Protection Approach of the International Committee of the Red Cross (ICRC). Principles such as *do no harm and trauma-informed practice* not only shaped this framework but also directly informed the design and delivery of the pilot.<sup>12</sup>

The Australian Red Cross Community Climate Adaptation Pilot presents a useful case study of community data capability and responsible and inclusive AI design. The Pilot focused from the outset on the role of community participation and co-design, systems explainability, representative reliability, access and usability among diverse groups and benefit or capability gains.

Approaches to responsible AI are evolving and aim to improve the trustworthiness, social benefit and governance of technologies that automate decision making by analysing and learning from a range of digital data sources.<sup>13</sup>

Incorporating ethical principles formulated both nationally and internationally, responsible AI seeks to address gaps where automated systems may pose risks to individuals and population groups. These approaches arguably help ensure that innovation achieves social, individual, and environmental benefits.

*Inclusive AI* brings comprehensive attention to the processes that need to be in place to expand human and community capabilities and ensure that those systems create benefit for all.<sup>14</sup> It complements established and emerging practices and frameworks guiding responsible, accessible and fair automated digital systems, and aligns with the values that underpin the work of the Humanitech team at Australian Red Cross.

Recognising the important role that diverse citizens should play in shaping the design, development, and deployment of data and AI driven technologies, intergovernmental bodies such as the WEF, UNESCO, UNDP, and others have sought to define approaches to inclusive AI.<sup>15</sup>

Building on these reports, we extend their principles through our evaluation framework to define key questions and indicators tailored to assess the outcomes of the Community Climate Adaptation Pilot in Dargo (see **Table 1**). This approach supports a context-sensitive assessment of how co-designed technologies can advance inclusive community resilience.

## ADM+S evaluation framework

To address the evaluation aims, the ADM+S evaluation framework focuses on key dimensions of responsible and inclusive technology design through four evaluation targets:

1. **Safety and accountability:** What features are in place to ensure the platform is safe, reliable, free from bias and error and explainable for stakeholders and the community?
2. **Community and stakeholder participation:** How meaningfully have stakeholders and community members participated in the AI platform's co-design, and how well has their input shaped the integration of resilience data, risk analyses, and local knowledge?
3. **Community benefit:** How effectively has the initiative empowered the community—building local capabilities and enabling community-led, data-driven preparedness actions?
4. **Sustainability and scalability:** To what extent does the initiative support local decision-making and action while providing scalable, sustainable, and adaptable methods for wider deployment?

**Table 1.** Pilot evaluation framework: Targets, key questions, specific indicators set for the pilot evaluation and relevant data sources.

Safety and accountability		
Key question	Indicators	Data source
What features are in place to ensure the platform is safe, reliable, free from bias and error and explainable for stakeholders and the community?	<ul style="list-style-type: none"> <li>↳ The system is free from error and bias and hence trustworthy for target users.</li> <li>↳ Data and AI model management processes are in place.</li> <li>↳ Stakeholders can understand, contest and challenge or change outputs.</li> <li>↳ Ethical assurances have been incorporated into the platform design and its functionality.</li> <li>↳ Community data input is assessed for risk and balanced against privacy protection.</li> </ul>	<ul style="list-style-type: none"> <li>↳ Platform review</li> <li>↳ Resilience team workshops</li> <li>↳ Developer interviews</li> <li>↳ Community interviews</li> </ul>
Community and stakeholder participation		
Key question	Indicators	Data source
How meaningfully have stakeholders and community members participated in the AI platform's co-design, and how well has their input shaped the integration of resilience data, risk analyses, and local knowledge?	<ul style="list-style-type: none"> <li>↳ Diverse community members can co-shape, audit and help to govern the system.</li> <li>↳ Relevant stakeholders are engaged across the phases of design, development and deployment.</li> <li>↳ Local needs and wants are incorporated into the platform design and functionality.</li> </ul>	<ul style="list-style-type: none"> <li>↳ Community interviews</li> <li>↳ Resilience team workshops</li> <li>↳ Co-design workshops</li> </ul>

### Community benefit

Key question	Indicators	Data source
How effectively has the initiative empowered the community—building local capabilities and enabling community-led, data-driven preparedness actions?	<ul style="list-style-type: none"> <li>↳ The platform expands people’s real capabilities and capacity to proactively manage climate risks.</li> <li>↳ Training is in place to ensure adequate digital and AI capabilities within the community.</li> <li>↳ People with different abilities, languages and infrastructures can use the platform with equal benefit.</li> <li>↳ Adjustments have been made to cater to local conditions and varied digital access and abilities.</li> </ul>	<ul style="list-style-type: none"> <li>↳ Community Interviews</li> <li>↳ Co-design workshops</li> </ul>

### Sustainability and scalability

Key question	Indicators	Data source
To what extent does the initiative support local decision-making and action while providing scalable, sustainable, and adaptable methods for wider deployment?	<ul style="list-style-type: none"> <li>↳ Identified benefits (capability gains) are sustainable and scalable.</li> <li>↳ The system is designed for resilience in response to emergency and low connectivity situations.</li> <li>↳ The platform has affordability designed into its sustainability model, and a business model geared toward scalability.</li> </ul>	<ul style="list-style-type: none"> <li>↳ Developer interviews</li> <li>↳ Resilience team workshops</li> <li>↳ Community interviews</li> </ul>

## Pilot process, data collection and analysis

The evaluation drew on multiple sources of evidence to assess the pilot project (Figure 6), including:

1. **Appraisal of the initial project proposal:** Reviewing the original aims, scope, and framing of the pilot initiative.
2. **Review of co-design processes:** Analysing resilience team outcome reports to understand how participatory design principles were implemented.
3. **Platform review:** Via an analysis of technical documentation, platform demonstrations, and interviews with the developer team.
4. **Resilience team workshop:** Facilitating a reflective session with the implementation team to identify insights and challenges.

5. **Stakeholder interviews and fieldwork observations:** Engaging in interviews with Dargo community members and conducting onsite fieldwork observations to understand community perspectives and the local context.

Qualitative data was collected with operations and developer team members online (N=6) and with Dargo community members (N=8) on site between April and June 2025.

One research workshop was conducted with Australian Red Cross Humanitech and emergency services participants and the WEO developer (N=6) after the community co-design workshops (see Figure 6). This workshop explored the project’s core challenges and sought to clarify the evaluation measures and measures of success.



Figure 6. Evaluation and platform development processes.

A platform demonstration session occurred after the first major iteration post co-design sessions. And a follow up interview with the WEO developer and email correspondence with the WEO team helped to clarify technical features and platform design decisions.

Community members were given the opportunity to participate in a group interview or individually, and in a location of their choosing. The local project lead assisted in scheduling interviews and participants had a range of intersecting roles in the community, for example were staff of the bush nursing service, long term residents, members of the CFA, local community leaders and newer residents (see **Table 2**). Participants also had a range of access to, and skills with, digital technology. Participants were advised that they could choose which questions they wanted to answer, and that their participation (or not) would in no way impact their relationship with the Australian Red Cross or Swinburne University.

Community interviews were conducted as the primary means for gathering detailed accounts of the co-design and the inclusiveness and effectiveness of the engagement process; the needs and perceived benefits of emergency preparedness technologies in the community; the integration of the platform with local knowledge and expertise; and the usability and match with locals' digital capabilities; and the sustainability and scalability of the platform after the pilot (see **Appendix A** for the workshop and interview questions). Ethical approval was received from Swinburne University of Technology Human Research Ethics Committee (26/03/2025 – REF 20258475-21022).

Once collected, data was analysed in steps using both an exploratory or inductive approach and a deductive approach that directly considered the evaluation targets and key questions outlined in **Table 1** above.

**Table 2.** Interview participants

Participant	Role	Self-nominated digital literacy	Age
<b>Emily</b>	Healthcare management	High	25–45
<b>Sarah</b>	Healthcare professional	High	25–45
<b>Meghan</b>	Healthcare professional	Medium	25–45
<b>Tracy</b>	Community member	High	25–45
<b>Brian</b>	Community member	Low	70+
<b>Mick</b>	Community member	Medium	45–60
<b>Joan</b>	Community member	Low	60+
<b>Emile</b>	Resilience team, local project lead	Very high	25–45
<b>WEO developer</b>	WEO Founder and CEO	Very high	25–45

A trusted single source

Essential

Public

Mapping of community assets / (wifi) critical infrastructure

Highlighting telecomms black spot info

Seasonal access issues and road conditions to improve + transport infrastructure

Access to moisture levels data

Access to data re: # of people in town @ any one time

Scale: accessible not accessible 2WD, 4WD etc.

Community

Ability to access historic data feature by feature basis

River health condition

Access to river levels data

↑ needs validation

Emergency services

Ability to log on the map at-risk individuals/properties

Trust

classified

# Evaluation findings and stakeholder voices

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The analysis presented here addresses each evaluation question against key indicators as part of the ADM+S evaluation framework (**Table 1**).

It establishes broad outcomes for each evaluation target with the aim of offering key insights and recommendations for the pilot project team and Dargo community, and for future community-centred data and technologies for AI emergency preparedness. The detailed analysis foregrounds the voices of Dargo community members involved in the pilot, while considering the platform's design and iterative development, alongside the perspectives of the resilience and developer teams.

As a qualitative evaluation, the analysis draws on community interviews, developer reflections, and workshops with the Resilience Team to surface generalised challenges, innovations, and outcomes. It does not quantify platform use or assess the longer-term impact on community resilience and disaster preparedness. Insights also note the interdependencies and overlap across evaluation targets in practice—where safety, accountability, and reliability for example are reinforced through participatory processes, which in turn support community benefit and potential scalability.

The following section presents summaries of findings for each evaluation target, recommendations for future projects, and detailed analysis foregrounding the voices of participants.

## Safety and accountability

### Pilot outcomes

Safety, accountability, and ethical considerations were prioritised, and central to the pilot's design and implementation. Initial errors in risk profiling were identified and effectively addressed, underscoring the value of responsive feedback loops and iterative refinement. Barriers to explainability were mitigated through the translation of platform scope and purpose during co-design activities, and through sustained engagement with platform champions who supported community understanding and trust.

### Recommendation for future projects

- ↳ **Early communication around privacy and disclaimers:** Engage developers from the outset in discussions about privacy expectations, data sensitivity, and the role of disclaimers.
- ↳ **Leverage local data wherever possible:** Use locally sourced data where possible to enhance relevance, accuracy, and community trust. This supports contextual integrity and ensures that platform outputs reflect lived realities.
- ↳ **Explore avenues for Explainable AI (XAI) features:** Support users to understand how decisions or classifications are made through XAI features and other explanatory means. This is especially important for communities with lower digital literacy or low-trust environments and supports informed engagement with technology.

## Key question

What features are in place to ensure the platform is safe, reliable, free from bias and error, and is explainable for stakeholders and the community?

Indicators	Outcome	
↳ The system is free from error and bias and hence trustworthy for target users.	● Yes	Errors identified and addressed through feedback loops.
↳ Data and AI model management processes are in place.	○ Unclear	Ongoing data access and model management processes required.
↳ Stakeholders can understand, contest and challenge or change outputs.	● Mostly	Disclaimers about accuracy clear, and feedback processes in place but under-standing of model outputs remained untested.
↳ Ethical assurances have been incorporated into the platform design and its functionality.	● Yes	Assurances shown in the privacy preserving dimensions of the hexagonal analysis points.
↳ Community data input is assessed for risk and balanced against privacy protection.	● Yes	Manual assessment of community data in place to remove personal information, with the untested potential for automation using a large language model.

### Spatial accuracy and local insight

Trustworthiness is built on processes of ‘triangulation’ where community members, operations and developer teams test the accuracy of modelling and risk profiles and adjust in response to local knowledge.

Across interviews with community members, Australian Red Cross, and the WEO team, trustworthiness consistently surfaced as a core issue and measure of system success and usefulness. It was associated with the accuracy of the risk modelling, but also by the usefulness of the knowledge and insights generated. Importantly, community members saw their role in actively adjusting the accuracy of the modelling based on their knowledge of the terrain and historical conditions.

Community members raised specific concerns about the spatial precision of heat and flood overlay data, particularly when hazard indicators contradicted local knowledge. One community member pointed out that the platform showed flood risk in areas known to be elevated, raising issues with its credibility. These concerns centred around the platform’s use of hexagonal spatial mapping, which aggregates data over a designated area. While this design choice was confirmed by the WEO team to be a deliberate initiative to preserve privacy and reduce the risk of property-level identification, it also introduces trade-offs in accuracy and was not always reflective of local knowledge. As one community member put it:

*Obviously there are some areas where the information doesn’t seem completely accurate...I mean, where we live, we’re on a steep hill, and we’ve got straight over our house that we’re a flood risk. So whether or not that’s flood from [river level] or whether it’s flood as in erosion, that hasn’t been made clear. But we don’t see ourselves as a flood risk because of where we sit. (Emily, healthcare management)*

To address limitations in contextual accuracy, community members highlighted the importance of incorporating local knowledge to enhance data to improve reliability. As one community member explains:

*You need someone local who's been here for a long time to go through that... I think it's similar to fire. If someone's been in this area all their life, and they've seen plenty of fires come in, 90% of them will follow the same path or burn in the same area.*

*Don't get me wrong, all these models are great. They'll help, but just because the model says [flood] is not going to happen... all of a sudden the Bureau says you're going to get 30 ml of rain, yeah, you know [the flood] is coming. (Mick, community member)*

WEO recognised the critical role of community feedback loops in strengthening both the accuracy and trustworthiness of the platform. As the WEO developer reflected:

*If the model doesn't spot a tree in their backyard, then there's a level of trust that's lost. (WEO developer)*

Verification and reliability are longstanding challenges for accurate, hyperlocal emergency warning and preparedness technologies. As Emile put it:

*That's a challenge when it comes to inputting insights. How do you verify that insight? If somebody says this area floods after 17 ml, and somebody says, 'No, it'll flood after 200 ml' – which one is the correct one? (Emile, local project lead)*

Insights from locals about the accuracy of the platform influenced WEO's decision to incorporate Australia-specific data sources regarding tree and vegetation data. To improve accuracy, the risk outputs of the platform are triangulated with expert interviews, local planning documents, and manual feedback from community users. However, there is no systematic accuracy assessment method in place for fire, flood and heat predictions which limits reliability.

### Timely, relevant, and explainable risks assessment

The reliability of the platform was closely linked to the timeliness of the information, particularly in relation to its practical application during emergencies, or for guiding preparedness actions.

Local healthcare workers expressed a strong desire for real-time or near-real-time updates, especially for data categories that are highly time-sensitive. This included information about:

- ↳ Road access and conditions during fire and flood conditions
- ↳ Population presence in high-risk or remote areas during peak periods
- ↳ River health indicators, especially those linked to hygiene and recreational safety

The platform does not operate upon real-time data. While this is outside the platform's current capabilities, clearer communication to the community about data sources, analysis techniques and risk profiling would promote more informed and safer use of the platform.

Local healthcare worker Meghan suggested that the platform would benefit from a disclaimer about the application of the information. This concern was discussed early on by the Resilience Team and with the developers, with advice sought by the legal team at Australian Red Cross. It addresses the degree to which community members should rely on it for action and decision making. WEO added the following disclaimer to the platform:

*The information on this website is for general informational purposes only. The information is not guaranteed to be complete, accurate, available or up-to-date and should not be relied upon. To the maximum extent allowed by law, the organisations and individuals involved in providing the information on this website exclude all liability for loss or damage arising from the use of this website or the information it provides, whether the liability arises in negligence or otherwise.*

*The images and information provided on this website are not to be used for commercial purposes or reproduced without prior written consent. You acknowledge that any information you upload to this website may be made publicly available and may be used by Australian Red Cross at our discretion.*

*By using this website, you agree to be bound by this disclaimer.*

Disclaimers can be considered a way of mitigating risks and shifting responsibility. However, the discussion around the disclaimer was also an opportunity to clarify the scope and limitations of the platform with community members who may rely on its insights. Providing clear contextual insight and communicating the parameters of the platform's data is a critical measure for strengthening local understanding and trust—particularly in communities where confidence in traditional weather services and emergency news communication has eroded due to perceived past inaccuracies or lack of localised relevance.

The negotiation and explicit discussion of reliability in this way supports one aspect of the system's explainability. Explainable AI (XAI) is a complex field and difficult to implement technically. There is no current integration of XAI within the deployed platform as it was beyond the scope of the budget and project timeline. On the one hand, without explainability tools, the model's outputs cannot yet show how decisions or classifications are made, and this may affect user trust and the processes for contesting or adjusting outputs. On the other hand, explainability or at least trust in the scope and limits of the system can be achieved through other means, as we explore further in the 'community participation' section below where we examine the role of feedback mechanisms.

In future, WEO plans to incorporate transparency mechanisms to enable both expert and community-level scrutiny of AI-derived outputs. While WEO has taken important design steps to enhance transparency of their model—such as using only open-source datasets—further efforts are needed to communicate data provenance, provide updated information, and present system features and limitations in clear language. Doing so would improve platform literacy, support informed and safe use and reinforce the platforms trustworthiness.

## Privacy, personally identifiable information, and data stewardship

One of the challenges in developing effective disaster resilience technology lies in balancing the integration of local community insights with the imperative to protect privacy of personal information and data.

Privacy considerations were raised in the co-design phase and explored in the resilience team planning and implemented through platform design mechanisms.

From WEO's perspective, platform success depends on active community engagement, gathering as many insights, comments and inputs from the local community as possible. However, the benefits of hyperlocal information were weighed against the do no harm principle and ethical data governance practices prioritised by Australian Red Cross.

During the co-design phase, concerns were raised about the privacy and insurance implications arising from producing household level risk profiles. The community revealed a nuanced approach to privacy—balancing community safety with individual dignity, practical needs with personal comfort, and the importance of controlled, purposeful information sharing. In response, to ensure that individual dwellings were not targeted in risk assessment information, WEO made the privacy-conscious decision to aggregate data, adopting a wider unit of analysis of hexagons of 150m x 150m (originally set to 30m x 30m), so that individual dwellings were not targeted in risk assessment information. While the platform has the capability to provide more detailed data, avoiding property-level profiling information was prioritised over more precise information. This reflects a deliberate trade-off sacrificing some degree of granular accuracy in favour of privacy preservation and meeting community expectations.

A core strength identified in the WEO platform is its potential to support community-wide information sharing for resilience and emergency coordination, particularly via its comment functionality. Following consultation with Australian Red Cross, WEO made the decision not to show any personally identifiable information through community comments on the map such as names or email addresses. The commenting function—that allows users to annotate the map with local knowledge—is reviewed manually to ensure that no personally identifiable or sensitive information is disclosed through user input. WEO has explored use of a Large Language Model (LLM) to assist in reviewing and redacting sensitive content from community-contributed comments to improve privacy protection. This enables scalable moderation, however, would require further assessment to ensure personal information is managed effectively and securely.

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## Managing sensitive information

The potential to add a layer of sensitive data underscores both the practical potential and the privacy implications of the platform.

Community members consistently stressed that sensitive data must not be made publicly available on the platform, as it could expose individual vulnerabilities and pose safety risks. Local healthcare workers and emergency services volunteers in the community saw great value in using the platform to document sensitive information about individuals who have specific requirements or vulnerabilities during emergency events but understood the privacy concerns this raised. While such information is informally shared within the community, integrating it into the platform could serve as a practical way to ensure timely access by first responders during critical events. As one local healthcare worker noted:

*If you got the client's consent to upload that specific information onto the platform, it would be there then instead of just being in someone's brain... (Sarah, healthcare professional)*

In response to this potential, WEO noted that the platform does hold capacity to add layers of permission and authorisation tiers, enabling sensitive information to be viewable only by authorised personnel, such as emergency responders and bush nurses.

In the platform's operation in urban settings, it was noted that up to five distinct login permissions were seen as feasible without significant impact on the optimisation of the platform but incurs additional cost. While the platform's authorisation and permissions controls could provide an effective mechanism for managing sensitive information, successful implementation would depend on the establishment of additional governance processes—particularly around user consent for sensitive data inclusion and defined rules for authorised access.

# Community and stakeholder participation

## Pilot outcomes

Meaningful community and stakeholder engagement was achieved in part through existing Australian Red Cross connections and the employment of a local team member as facilitator of an extensive co-design process. Community knowledge was incorporated successfully within the limits of the project scope.

The community lead played a vital role in extending outreach beyond formal workshop settings, engaging stakeholders who were unable to participate directly. While tourists were not actively involved, their presence and needs were identified and considered by community members, recognising their needs as transient yet significant stakeholders in emergency preparedness.

## Recommendation for future projects

- ↳ **Communicate scope and limitations early and often:** Clearly articulate the project's scope and restraints throughout the process to support transparency and manage participant expectations.
- ↳ **Empower local leads for community outreach:** The community lead played a key role in enabling different forms of participation. It is recommended for future projects to continue to ensure community leads are supported to engage with a wide range of stakeholders, including those unable to attend workshops.
- ↳ **Consider peripheral stakeholders:** Consider ways to represent outside stakeholder interests, such as tourists or seasonal visitors in planning and design considerations, even if they are not directly involved in co-design activities.

## Key question

How meaningfully have stakeholders and community members participated in the AI platform's co-design, and how well has their input shaped the integration of resilience data, risk analyses, and local knowledge?

Indicators	Outcome	
↳ Diverse community members able to co-shape, audit and help to govern the system.	●* Yes, with some limitations	Co-design process achieved wide community input, not reaching all groups such as young people or tourists, but was inclusive of key active community leaders.
↳ Relevant stakeholders engaged across the phases of design, development and deployment.	● Yes	Local project lead key in bridging digital divides within the community to support input and use.
↳ Local needs and wants are incorporated into the platform design and functionality.	●* Yes, with some limitations	To the extent feasible with the scope and resources, co-design feature mapping helped translate to platform development.

### Having a local facilitator as part of the project team

A central element to the success of this initiative is the inclusion of a local facilitator as part of the project resilience team.

Throughout the pilot, local community member and Australian Red Cross team member Emile played a vital role by steering community engagement, running co-design processes, translating community needs and on-the-ground realities into actionable design and development priorities, and establishing effective feedback loops.

The presence of a trusted local figure was crucial for keeping the community informed, building support, and engaging diverse groups to 'get their voice heard'. With a deep understanding of community dynamics, the local facilitator connected with residents beyond formal workshops, offering flexible opportunities for participation and allowing individuals to engage at their own pace. Joan explained the benefit of having the local team member who can bring everyone together,

*...rather than them all just sort of going willy nilly...He sets out, you know, like we're going to have this meeting, and this is what we're going to talk about, where lots of times many people...need to be led. (Joan, community member)*

By identifying varied capabilities and knowledge within the community, Emile was able to capture valuable insights through a range of approaches responsive to local needs through the design and development of the platform.

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### A network of community champions

An embedded team member who is also of the community and is best placed to leverage existing networks, leaders and groups, and select champions to establish greater ownership.

This work also involves managing diversity of knowledge and skills, levels of digital access and ability and including and incorporating the wealth of local knowledge into the technical development. For instance, some community members like Brian have an enormous wealth of knowledge about local conditions but lower digital skills and may not be the primary users of the platform. Emile noted that Brian:

*...has been involved in the co-design process with respect to sharing insights and refining insights, but when it comes to talking about the tech ... the wall comes up. It's not that he's not willing. He doesn't have the level of [technical] understanding required to feed into that.* (Emile, local project lead)

Emile invited key representatives from across the town's volunteer committees to serve as bridges for information sharing, both gathering input from their members and relaying updates back. To meet people where they are both located (on properties, in or around the main town), and in terms of personal knowledge, interest and comfort with technology, Emile arranged many one-on-one chats. This approach helped to engage people with a broad range of skills and knowledge, including those less likely to participate directly in workshops, encouraging different modes of participation and engagement.

## Tech should be deployed in step with community needs and readiness

Participation challenges need to be considered to ensure diversity of input and involvement by community members.

Some stakeholders like local businesses and organisations struggled to participate due to other commitments and workloads. And younger people, a key target group, were difficult to engage:

*I don't think they get taught at school the importance of community input or community involvement. But in saying that, they will come and support other things, but they don't want to be on any committees, and that's very well, but at some stage, somebody has to take responsibility for what's going to happen in Dargo. (Joan, community member)*

There were numerous strategies for addressing this, and consideration was given to where and when different groups would be ready to engage. It was suggested that younger people could be brought into the process once the platform was active and they could gain insights from it.

*They would be [using the platform], I think, once we're at a stage where the social data has become integrated, and some insights from community have been integrated, they would be interested in seeing what the insights are, and support those. (Emile, local project lead)*

Co-design workshops helped make the technology and its uses more tangible, by exploring usability in the language and lived experiences of local communities.

From the developer's perspective, engaging directly through co-design and other feedback loops revealed valuable local insights, even though this slowed the development processes. This can aid innovation:

*We can go at the pace of the community, we can go at the pace of the city and some cities go quite quickly and some communities go a bit slower, so I think our tech at least can support that. And so, I don't know how replicable that would be to other tech projects, but I think it should because the whole point is to actually be able to support these communities.*

*We know there's a disconnect between community development approaches and innovation cycle approaches, but we're constantly trying to define the happy medium that works for how startups work and how innovation and funding cycles work and then how communities work... (WEO developer)*

Some unexpected functionality emerged through co-design processes that could not be incorporated into the platform. For example, community members sought solutions for tracking the transient tourist population that move through and contribute to risk during emergencies. Despite the inability to address these and other local needs, having the shared space to canvas and consider them was seen as itself a successful outcome.

# Community benefit

## Pilot outcomes

While the benefit of the platform to longer-term community resilience and disaster preparedness is yet to be realised, the pilot showed indirect community benefits and outcomes. These were evident in the collaborative input process, where specific information and data needs were established, as well as through the establishment of feedback loops to inform platform design, and the nomination of champions to support access among the more digitally excluded and ensure ongoing use.

## Recommendation for future projects

- ↳ **Collective use of digital technologies:** Consider the way technology design can achieve community-wide benefits by moving beyond individualised app design to consider collective uses— for instance across households, community groups, and local organisations—rather than assuming individualised use.
- ↳ **Design with lower barriers to participation:** Prioritise low-skill requirements and intuitive interfaces to ensure accessibility for users with varying levels of digital literacy. This supports broader inclusion and empowers a wider range of community members to contribute meaningfully.
- ↳ **Support offline functionality:** Consider incorporating features that allow for offline access and data entry, particularly in low-connectivity or disaster-prone environments where offline modes may be more reliable during emergencies.

## Key question

How effectively has the initiative empowered the community—building local capabilities and enabling community-led, data-driven preparedness actions?

Indicators	Outcome	
↳ The platform expands people's real capabilities and capacity to proactively manage climate risks.	●* Yes, with limitations	Short-term indirect benefits include availability of new data to support applications for council resources, planning, land management and infrastructure needs.
↳ Training is in place to ensure adequate digital and AI capabilities within the community.	● Yes	Includes council digital inclusion support. Processes identified barriers to information flow, including through different modes of communication.
↳ People with different abilities, languages and infrastructures can use the platform with equal benefit.	●* Yes, with limitations	Platform use depends on digital access and skills, but champions and co-design processes enabled collective capabilities to expand platform benefits.

## Social data, local knowledge and enhanced decision-making

The community articulated a clear need to incorporate local knowledge including insights from past emergencies, common-sense information and community experiences, to enhance decision-making for preparedness and response.

This central benefit was not, however, easy to deliver in full. As a function of core interest, the interaction between automated risk analysis and local knowledge raised the question of where the platform's capability gains might lie for community members.

Community members emphasised the need for predictive and risk models to reflect local experiences, emphasising that such integration would ensure the platform's benefit within their specific local context.

*I think they need to work together. I think you need to have their models, but you also need to have local knowledge [...] If someone's been in this area all their life, and they've seen plenty of fires come in, 90% of them will follow the same path or burn in the same area. So, there's no point having trucks here that defends this bit here when, yeah, it's never burnt, yeah, if you know what I mean? (Mick, community member)*

Long-term resident Joan talked about inaccuracies when ground-truthing the environmental data. She has served the Dargo community throughout her life in numerous capacities, both officially and voluntarily and noted:

*Local knowledge includes insights not found in official records, it's crucial during emergencies, and community members should lead efforts to document and share this information... hopefully a lot of it is based on common sense and our life experiences here... (Joan, community member)*

This stands in contrast to WEO's initial goals for the platform, which were shaped at the outset of the project, in relation to previous city-based work, and before the co-design process. WEO learned that the needs of community users differ from previous city and infrastructure clients and underestimated the changes and resource allocation needed to accommodate community needs.

*What we do see from the community is a different perspective. They're not working in this field necessarily. It's more of an inherent, knowledge from living and being there. So absolutely, we feel like [the community notes] is a really, really beneficial component of this platform, of this pilot. (WEO developer)*

Emile the project coordinator explained how the platform would have to improve existing community capabilities for trusted emergency and environmental information sharing:

*We've already got people within the community, that the community members look to for insights. They're already trusted. They've already got information to share, so it's really natural for community members to go to those people already. If we can put additional insights from other community members in the hands of those people, like your local business owners like your local CFA captain or your Bush nurses I think we'll be capturing a lot more insights but also having a lot more benefit.*  
(Emile, local project lead)

In response WEO and the Australian Red Cross resilience team have iterated the platform's 'community comments' input functionality. This feature, which is relatively novel for the developers, represents both a technical enhancement and a shift in approach, aiming to more effectively capture and integrate community knowledge with existing environmental datasets. With the community inputting their data related to risk, this could potentially generate better, more hyper-localised solutions.

## Managing diverse community expectations and anticipated benefits

The community sees the potential benefits in the platform as not just for emergency preparedness, but for a wide range of practical applications.

While capturing and preserving local knowledge and sharing critical local insights about risks and emergencies are important goals, community members highlighted additional hopes for the platform.

One unexpected benefit raised by several community members was that the platform could play a key role in property management—helping residents better understand tree density and fire risks in their vicinity. It could also provide vital data for advocacy, supporting requests to councils and service providers for funding or infrastructure improvements.

*[it would be good] for us to capture data to give to organisations for grant or increase funding for infrastructure; we haven't had that in the past. For example, if we say to [the local council], we need these information signs, or we need this area of our community to be cleared of trees but there's no evidence to back it up; we don't have data to put into a business proposal or planning proposal to say we can see that we need it. (Sarah, healthcare professional)*

Others in the community felt that the true benefits of the platform won't be tested until an emergency is experienced, perhaps signalling some disparity in expectations about whether the platform aided emergency preparedness or response. Mick noted that:

*Until we have an emergency, we don't know if it's any good, or if it's not good, or if half was good or what needs to be changed... we've got a model at the moment, see if it works. If it doesn't work, well, it has to be changed. (Mick, community member)*

In some instances, though, community expectations were beyond the scope of the current project. For instance, many hoped for more real-time information regarding people movement in the area, emergency warning and response, or access to information about vulnerable people (for the healthcare workers).

*Our biggest risk in this town is not having anything real-time. We can do as much planning as you want, and we can get as much information and data and preparedness as we can, but when a fire comes through on a Sunday, or, you know, whenever there's no one here... AI [could be used to inform] the timing of leaving, and also how to leave, what roads are open, what roads go this way? Somehow if AI can have all the information on what roads are open... I don't know if this platform can do anything like I originally was thinking. (Sarah, healthcare professional)*

Though there are opportunities to expand the platform's scope to meet community expectations for real-time information during emergency response, achieving this would require significant cost and new development work. As the WEO developer explained,

*"It needs to be like a two-year project to see how that can get integrated",*

including forming new partnerships with government agencies, securing additional funding to access relevant data, and dedicating extra time to integrate these features into the system.

### Simplicity, accessibility and usability are crucial for community

The community has a diverse range of personal digital capabilities, access and attitudes, which can have an impact on who benefits from such a platform.

Community members were quick to highlight both the main hurdles, and the personal barriers people face when it comes to using technology. Many don't have advanced digital skills, some don't have or can't afford access to digital technologies, and for some, there's a real hesitation to try new things. As Emile explained:

*“if they don't need it at a particular point in time, they won't challenge themselves to overcome challenges.”*

Sarah shared similar concerns:

*I feel like there's going to be a hurdle or a barrier in practical use for a majority of our community members using this platform, because they're not IT literate. Some of them don't even have the internet in their house, [or] that are never used to screen... Like there is going to be some barrier, and ... that's going to be in every town. (Sarah, healthcare professional)*

The community emphasised that to encourage the uptake of the platform, consideration needs to be given to making the platform as useful to the particular needs of the various community members and stakeholders, while making its interface simple and user-friendly for the community to interact with.

*If you want anybody to access it, it does have to be as simple as you can make it. Otherwise, people are just not going to. They're just going to go, now, this is too hard, forget it...and sorry, the older generation and you know, the digitally equipped or not, it's going to be hard for them, and they're the ones with the knowledge. (Tracy, healthcare management)*

Community members suggested solutions like one-on-one guidance to help people get started and to create opportunities for gradual learning and exploration so they are not overwhelmed. Brian, a long-term resident, noted that

*“if people aren't aware of what's available and they're not prepared to use it... more work on education and awareness is needed” (Brian, community member).*

Continual iterations of the platform after returning it to the local program lead for community feedback, has been another way to improve simplicity and usability, with a resilience team member emphasising that startup adaptability and organisational adaptability helps with these improvements.

# Sustainability and scalability

## Pilot outcomes

The question of the sustainability and scalability of the pilot platform can only be answered speculatively. The co-design process surfaced the common tensions and trade-offs in localising capability gains while creating a template for scalable application across different towns, regions and even international settings. It showed the importance of dual embeddedness in local and institutional or organisational context to ensure support, iterability, and longevity.

## Recommendations for future projects

- ↳ **Embed a local lead:** Appointing a well-connected community lead who can identify local needs, facilitate adaptation, and act as a bridge between community, organisational, and developer priorities is critical for identifying context-specific insights, and enabling inclusive participation in located settings.
- ↳ **Developers also benefit from understanding local needs and aspirations:** Ensure that community-driven ‘blue-sky’ aspirations are meaningfully considered and communicated through dialogue between technical teams and local stakeholders.
- ↳ **Plan for both community and organisational integration:** Creating sustainable and scalable technologies requires embeddedness in place and community and in an organisational and institutional ecosystem.

## Key question

To what extent does the initiative support local decision-making and action while providing scalable, sustainable, and adaptable methods for wider deployment?

Indicators	Outcome	
↳ Identified benefits (capabilities gains) are sustainable and scalable.	○ Unclear	Sustainability of engagement related to the ability of champions to support community use. Sustainability of community comment feature and updated risk profiles yet to be established.
↳ The system is designed for resilience in response to emergency and low connectivity situations.	● No	At this point the browser-based system relies on adequate laptop or desktop and internet access, with uncertainty about plans to print maps and information for offline local access.
↳ The platform has affordability designed into its sustainability model, and a business model geared toward scalability.	●* Yes, with limitations	The innovations are usable and adaptable, with low input costs offering affordable scalability. Scalability yet to be determined, but key features are adaptable for other settings.

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## The role of local project champions in sustaining engagement

Champions within the community and within Australian Red Cross offer an avenue for iterating platform design, sustaining engagement and establishing institutional support.

Trusted champions in the Dargo community were identified early on to help iterate and build engagement across different parts of the community. They were already involved in community-building activities and initiatives and were often go-to people for supporting others in the community.

Having a group of local champions means that sharing information and local insights with the developer team could be more comprehensive and inclusive. They also play a key role in training others, socialising the technology and ensuring that others can benefit from the platform outputs.

This was a key part of the sustainability and scalability puzzle that the operations and developer teams worked through early on:

*So, we need to figure out a way for engagement on the platform. I think that's going to be key as well for scaling... From the tech perspective, what we would like obviously is as much engagement and as much comments as possible, because if we don't get enough [engagement] then it is going to be difficult to actually get to the process where we can transfer from manual filtering to AI filtering.*  
(WEO developer)

Australian Red Cross organisational champions were also enlisted throughout the co-design process to explore ways of incorporating the platform or its processes and insights into existing programs. These translational avenues are essential for creating continuity and answering the question of 'what happens next?'

### Sustained impact relies on technical, institutional and community factors

Technology systems operate in social and institutional or organisational contexts. Therefore, consideration needs to be given to technical, institutional and community factors in relation to one another so that impact can be sustained and enable maintenance and adaptation, stewardship and engagement.

For instance, although map generation and satellite data analysis using AI is scalable, organisational policy and interest drive potential and create important limitations or frictions. The Australian Red Cross application of the humanitarian principle of do no harm means that considerations of privacy and transparency are critical and this can limit the scope of data collection and AI analysis, even if there seems to be broad benefit. Understanding how the community contextualises the idea of do no harm throughout the technical development of the platform, can help to ensure clarity of use and enhance trust, which can sustain the impact both in the community and within the organisation.

*I think you do need that disclaimer that says, 'Please note, this is information drawn from what is available, and this is the best scenario that we can give you this point.' So, some kind of disclaimer that says this information is accurate as good, positive...like a really good way of explaining to people how it can pull that information together that you know it's going to give you a higher degree of [confidence to] leave and evacuate and making you feel comfortable. (Meghan, healthcare professional)*

The platform also operates in the contexts of a range of existing apps and emergency systems and must make sense against the information and warnings they provide. Community members judged and made sense of platform features against what they knew:

*Like the Vic Emergency [app] can be a bit over cautious, saying, you know, evacuate now, fire's going to be near, and that's where the locals are, like, don't be silly, you don't need to. (Meghan, healthcare professional)*

*I turn it off because annoys me. Doesn't stop beeping all the time. Yeah, right. Even if you sort of move just to your area. (Mick, community member)*

An ideal situation for some was that the platform could be integrated with these existing apps:

*"you need to connect them all together" (Mick, community member).*

## Community members place emphasis on access and resilience

Communication technology resilience and offline access to critical information are priorities for community members.

In a location that has limited local technical support and infrastructure capacity, community members highlighted the diverse digital capabilities of residents and precarious connectivity through mobile towers or satellite access.

*“If this is down as well, then [the platform] is down” (Mick, community member).*

The community canvassed several options including printed hardcopies of maps available in a central location:

*If it doesn't help the locals, it'll help any tourists, but then it's got to be accessible, and we've got to know where to get it... another information board somewhere that can be put up with signs that can be put up saying, in case of emergency, have a look at these boards. Because if the power is out and the phones are off. Well, fair chance the pub won't be open. (Mick, community member)*

This and an earlier proposal for a central 'kiosk' respond to concerns about the vulnerability of communication systems, and the need to have central visibility and engagement in the platform. However, there are ongoing challenges in implementing these solutions. These include the financial costs and responsibility for local businesses to maintain a public kiosk, as well as the practical difficulties of supplying printed maps that may quickly become outdated and do not easily convey the layered data displays.

Limiting the costs and barriers to increase use so that it becomes integrated into community life, by building community capabilities and demonstrating a value proposition, not just for community, but for the other stakeholders, can ensure community ownership of the platform.

*I ideally want to see a tool that's left with the community or a tool in the hands of the community that allows them to make decisions to build or support the building of their own resilience. (Emile, local project lead)*

To achieve this goal, community capacity has to be accounted for. One insight from this process as suggested by the tech team was to identify and set usability goals from the outset, to ensure that all community needs are understood and the platform is built to incorporate that from its first iteration.

### The trade-off between hyper-local information and generalisability

Making something scalable often requires sacrificing the depth and specificity that comes from working closely with local communities and using rich, triangulated social data.

For instance, community members emphasised the unique characteristics of their community, and the need for tailored technology to suit local needs. General things like real-time information, multi-language support and restricted user access levels were proposed. Responding to local conditions, community members also nominated location specific information like tourist numbers and location monitoring, the ability to upload details of at-risk individuals and integrating river height sensors. For Dargo community members, keeping tourists informed was a priority as they were seen as at heightened risk.

*Unless you're living in the community and aware of your community, the geography and infrastructure and the barriers, then you won't know, and no one would expect you to know.*  
(Meghan, healthcare professional)

However, for the hyperlocal functionality to be scalable and sustainable, engagement with the platform from the community would be key.

*Let's just say we have a population of 100 in Dargo, but we have another community where we've got a population of 1000, but we only get fifty data points from each. It's skewed in a way because the area will be bigger, and you know we might want a few more local insights from a community that is larger. So we need to figure out a way for engagement on the on the platform. I think that's going to be key as well for scaling.*  
(WEO developer)

From this the development team saw lessons and technical capabilities developed through the pilot that could be transported to other city and rural contexts. However, the WEO developer thought the process still needed work. The challenge of incorporating or responding to community members' ideas and requests led the WEO developer to talk about approaching the process differently in future. She thought that a better approach might be to have and demonstrate

*"a set of functionality that can be added on or not".*

Functionality add-ons could then be explored and chosen or adapted further. This, she thought, might improve the scalability and speed in working in a co-design format.

## Can community participation be sustained with scale?

Embedding community participation and feedback loops in ongoing platform iteration and development ensures sustainability and the potential to scale.

Iteration feedback loops throughout the process and before deployment helps the community accept and feel safe with the technology. It remains an open question as to whether this can be sustained as a platform scales. This was not a major part of the original project design for the developer team.

*So going to that really community level as really helped us understand, well, actually there's another level of information that's reasonably easy to automate and generate that sort of smaller community might be able to use, such as taking it to the maybe the regional or larger authorities to either get funding or whatever it might be their needs, so that's been really, really interesting from our perspective and that's helped us actually to develop and enhance our tech to be able to include that type of functionality. (WEO developer)*

A crucial project management tool associated with the co-design process was the development of a 'functionality register', along with a preview function to facilitate iteration and testing. These allow the team to iterate with the community and assess priorities while enabling transparency about what is and is not achievable.

The challenge will be replicating these processes across diverse urban and rural contexts.

*How are we going to get engagement from the community without [the project lead] having to go and speak to every single person to please use this platform. I think that's probably a discussion about scale ... but it's not just for scale I think it's just necessary in general. Are we going to gamify something where communities can have some fun with it before they access it? (WEO developer)*

These concerns and questions remained unanswered through the pilot but are crucial for resolving challenges of sustainability and scale.



# Insights, opportunities and recommendations

A disaster resilient community is defined in the *Community Engagement for Disaster Resilience Handbook* as one that ‘works together to understand and manage the risks that it confronts’.<sup>16</sup>

In the *Road Map to Community Resilience*, the International Federation of Red Cross and Red Crescent Societies (IFRC) emphasises that resilience requires an understanding of the threats that communities face as well as their underlying contexts and causes.<sup>17</sup> This is particularly important when disasters are increasingly intense, frequent, and compounding, meaning that communities may be ‘engaged in simultaneous actions for disaster prevention, preparedness, response and recovery as cascading and concurrent events occur’.<sup>18</sup> However, this requires accurate localised data, shared knowledge and trusted analysis in an accessible form, and this remains an ongoing challenge.

Initiatives like the WEO Humanitech platform can contribute to these efforts but face many challenges. As the evaluation shows, AI and automated data analysis in combination with crowdsourced or open data made accessible through an interactive mapping platform has great potential and can attract community interest.<sup>19</sup> However, there is an inherent tension in the goal of providing accessible data and information and generating capability gains for community members with diverse digital skills and access, and balancing accuracy in data analysis against privacy and accountability. These challenges have introduced substantial friction into humanitarian technologies. As a result, it is important to ensure that data-driven processes are reliable, privacy preserving, representative and secure. In other words, they should do no harm.

As a target for how to innovate while protecting and including public interests, the goals of inclusive AI begin with safety, reliability and accountability. These goals are evidenced in the WEO platform through efforts to establish reliability, ensure safety, involve community members and stakeholders through participatory processes and co-design and design for diversity and usability. A central concern for community members was in realising the precise capability gains they sought to improve their emergency preparedness. This played out differently for different members of the community. Inclusive AI also requires benefit—real capability gains—in applied contexts, along with usability, accessibility and sustainable cost.

Our overall assessment of the success of the platform pilot process considered these elements of Inclusive AI and focused on the extent to which the pilot expanded the capabilities of the community of Dargo in its effort to build climate emergency resilience. The technology and platform review and analysis of community and operations and developer team voices makes clear headway in addressing these challenges.

The pilot process and the platform break new ground in Australia's AI innovation front, showing the importance of deep community embeddedness and organisational tolerance for participatory processes. Where community members are closely involved in technology development, AI and automated decision-making systems can be designed to avoid harm and expand the capabilities communities need to address climate risks in ways that work best for them. Sidestepping community participation can risk wasting resources and result in unexpected harms.

The WEO Humanitech hybrid platform, combining automated data processing, machine learning, and participatory design, offers a promising model for community-led resilience planning. However, its limitations around explainability, accuracy validation, and sustained community engagement beyond the pilot phase, underscore the need for further investment in user-centred design, transparency tools, and long-term governance models.

The pilot successfully aligns with the UN Sendai Framework, particularly guiding principle (d), which advocates an all-of-society approach. It requires:

*empowerment and inclusive, accessible and non-discriminatory participation, paying special attention to people disproportionately affected by disasters, especially the poorest. A gender, age, disability, and cultural perspective should be integrated in all policies and practices, and women and youth leadership should be promoted.*<sup>20</sup>

In addition, the co-design process adhered to measures of best practice in increasing community participation and disaster capability as outlined in the *Community Engagement for Disaster Resilience Handbook* prepared by the Australian Institute for Disaster Resilience:

- ↳ Recognising the community as the central reference point for planning, implementing, and measuring success.
- ↳ Develop a strong understanding of the unique history, values, diversity, strengths, priorities and needs of each community, while also understanding the environmental, political, and historical context of any hazard or emergency event.
- ↳ Recognise the complex and dynamic nature of both the community and the risks they face, and that building disaster resilience requires ongoing investment and engagement.
- ↳ Working in partnership, mindful of potential issues arising from an imbalance of power between communities and partnership organisations.
- ↳ Respectful and inclusive communication between communities and partners, recognising the strengths and values of both.
- ↳ Recognising, supporting, and building existing capability to reduce disaster risk and increase resilience in communities and organisations.<sup>21</sup>

## Key insights and stakeholder recommendations

Drawing on insights across community members, the Australian Red Cross Humanitech resilience team and WEO developer team, and review of the platform itself and its co-design and use within Dargo, we offer the following key insights and recommendations for different stakeholders.

### Humanitech program (and future Resilience and Humanitarian Challenge pilots)

Strong participation is resource intensive but creates innovations that are invaluable for creating real new opportunities for communities and can inform innovative technical capabilities.

Be ready to leverage indirect or secondary benefits for community members and stakeholders. For example, residents in Dargo saw the value of new information that can help with environmental management, road access, grant writing for government funding or other such benefits. Foregrounding indirect benefits can help community members see the value of the process of participating in technology design and implementation.

Position humanitarian technology driven by data and AI as a collective capability-building opportunity. AI-driven resilience tools should not only be understood as technical solutions but as enablers of community agency, preparedness literacy, and equitable participation in disaster planning.

Communicate a framework for inclusive AI with developers and community members alongside Humanitech values regarding privacy by design and do no harm. Centre the reality that harms are not always predictable and should be addressed as part of the co-design or discovery process.

Scale through dual embedding in community and institutions such as Australian Red Cross requires longer-term planning with clearly defined outcomes and impact that aligns both with community needs and benefit and organisational mission.

### Developers of community platforms

Consider designing layered access and privacy controls to manage the flow of information to the right people while protecting vulnerable community members. This is vital for establishing and maintaining trust and targeted benefit.

Access and usability are crucial considerations that can help to establish an inclusive trajectory. This should not only come from product testing at the end of the development pipeline, but from considering inclusion factors from the beginning.

Explainability and transparency can mean different things to community members than AI developers. For some can mean translating how data and information is transformed into outputs that may guide decision making, or the degree of reliability of those outputs. This can involve practical explanations of the meaning of overlays, features and calculations or advice and solutions.

Focus on establishing strong feedback loops with trusted community members or end users. Feedback loops require mechanisms for challenging and altering AI systems outputs.

Strong participation (co-design and participation throughout the whole development pipeline) can foster transparency and support trustworthiness, even when the explainability of AI models and outputs remains technically challenging.

Scalability should not be traded off against local benefit gains. While technology development is resource intensive and often relies on funding models that demand generalisable and scalable systems, demonstrating direct and indirect local benefit and capability gains establishes the foundations for scalability.

### Community members and stakeholders

Understand from the outset the need for sustained community engagement to achieve sustainable outcomes but recognise that these outcomes can be about individual and community capabilities that go beyond the technology itself.

Informed use of community-oriented weather, risk analysis, forecasting and emergency warning systems will help boost communities' ability to respond to emergency events when they happen.

Identify the diversity of needs, wants, requirements and abilities within a community when working to develop technology solutions to emergency management. Identifying that diversity is a first step toward raising capabilities as a whole and hence building community resilience.

Having a local community lead as a connector and source of local knowledge can help to drive direct and indirect benefit in emergency management partnerships.

Encourage involvement of young people and other marginalised members of the community who are less likely to participate in co-design processes. Establish what's in it for them, and what forms of engagement will work best – don't assume they are not interested.

Establish alternative means for enabling the participation of community members who are otherwise unable to attend meetings (whether for their marginalisation or unavailability due to other commitments and time constraints). For example, meeting people where they are, including in their workplace or home visits where appropriate to ensure inclusive engagement.

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### Emergency management stakeholders

Support and provide resources to enable trusted local information sources, empowering intermediaries between local communities and state-based emergency management information systems.

Overcoming barriers in gathering and making available local knowledge should be a key goal for emergency management stakeholders. Systems that enable local area input and feedback will strengthen existing apps and warning systems. Accuracy and trust for rural and remote areas can be low for existing emergency management apps and platforms or information systems.

Streamline processes that combine open data sources such as satellite data with local knowledge and community specific information.

Feedback loops work to establish important modes of 'triangulation' and can build depth of understanding and drive use of emergency management and information systems.

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# Appendix A

## Australian Red Cross resilience team interview questions

One of the big challenges in developing effective disaster resilience technology is accessing and incorporating useful data while protecting data privacy.

- a) What has the approach to this been, and how has it played out so far?
- b) What does success look like for this challenge?

Another key challenge, we know, is about how to create technology that can improve localised decision making in a way that is also sustainable for the community AND scalable and adaptable for other communities.

- a) How are all these elements coming together in the platform so far, and
- b) What does success look like for this challenge?

We know that social and digital inclusion is uneven in all communities and this poses another challenge.

- a) What has been the approach to addressing this unevenness in the technology design and co-design processes?
- b) What does success look like for this challenge?

## Community interviews

### A. Introduction

1. Can you tell me a bit about yourself and your involvement in the pilot project?
2. What motivated you to get involved?

### B. Community involvement & co-design

3. How well do you think the project reflects the needs and priorities of the community?
4. Have there been opportunities for meaningful input and feedback during the design or implementation of the platform?
5. Did the process feel inclusive of people with different levels of digital skills or access?

### C. Perceived effectiveness & usefulness

7. Have you had a chance to play around with the platform? How useful have you found it in helping you or others understand or prepare for disaster risks?
8. Are there particular features or tools that stood out as especially helpful or confusing?
9. In your view, was the platform accessible to people who are not very tech-savvy? Why or why not?

### D. Local knowledge, insights & decision-making

11. Do you feel the platform helps surface or organise local knowledge that might otherwise be overlooked?
12. Can you give an example of how this platform has changed the way people think about disaster preparedness locally?
13. Has it influenced any decisions at a community or household level – or do you think it is likely to if it's properly in use?

**E. Capabilities and skill-building**

14. Has being part of the project helped you develop any new skills or confidence around technology, data, AI or emergency preparedness?
  1. Do you understand how the platform works technically? And the AI component?
15. What about others you know who participated—do you think the project built local capabilities more broadly?

**F. Scaling potential & broader use**

16. Do you think this kind of platform could work in other communities?
17. What would need to change to make it more useful or sustainable elsewhere?
  1. Does it have a life beyond the pilot – Kiosk?

**G. Governance, data & trust**

18. Were there any concerns raised in the community about how data would be collected, used, or stored?
  1. Any concerns about personal data collection? E.g., will it raise issues about identifying vulnerable people in the community?
  2. Does it raise insurance or liability issues?
19. How well do you think the project team handled issues like privacy, consent, or ownership of community data?
20. What would make you (or others) feel more confident in using this kind of AI or data platform in the future?

**H. Wrap-up**

21. Is there anything else you'd like to share about your experience with the platform or the project overall?
22. If you were giving advice to another community starting a similar project, what would it be?

**WEO interview****(a) Digital platform:**

- a. What was the original primary goal and focus of the platform, and in what ways have these changed through the co-design process?
- b. Can you tell us about the technical architecture for the mapping platform (built on Felt as third-party platform provider)?
  - i. Does it build on previous designs and projects or products?

**(b) Data pipeline:**

- a. Can you detail the processes involved in data access, collection, processing, analysis and integration into the platform? (What are the open-source data sets used, how are they accessed and updated – API etc?)
  - i. (What work is involved in data processing, linking, and preparation for use? – if not answered)
- b. What are the processes or techniques for assessing data quality and accuracy?
- c. Is this work sustainable for community members, or needs to be done within your team?
- d. What about real time data and changes going forward...?

**(c) Data analysis or AI model use:**

- a. What methods of analysis or AI model types are used (e.g., descriptive, geospatial, inferential, predictive or generative model types, e.g., for risk assessment and overlay; there is something labelled 'LST', and generation of solutions or 'LIMP plan'?)
- b. What forms of accuracy assessment are used to check the fire and flood risk profiles presented against local conditions?
  - i. Is there a way for community members to adjust this if inaccurate?
- c. How are you establishing transparency and explainability for these processes – especially for the community members

**(d) Data and AI governance:**

- a. How is personal data collected and handled, and how will it be secured, anonymised, used as part of outputs?
- b. Are any consent processes built into the system to provide oversight of any personal or community data collected and used?
- c. Is there capacity for allowing different levels of access to sensitive data – e.g., locating vulnerable people for the bush nurses and emergency services...?

**(e) Usability and co-design:**

- a. Could you highlight how you make decisions about the tool and its design?
  - i. How has the co-design process and stakeholder engagement impacted this process (if this hasn't been adequately answered yet)
  - ii. What evidence is used to make decisions about the tool? Could you share a few examples?
- b. Were there specific design and usability goals for the platform and what have been the challenges and innovations there?

**(f) Community collaboration and capabilities:**

- a. What are the major challenges and innovations that have happened by working collaboratively with the Dargo community and Aus Red Cross team?
- b. How have you dealt with accessibility or capability issues that have been identified through the co-design process (like mobile only access, low digital skills among community members)?

**(g) Scaling and relocating the platform:**

- a. What is the trade-off between designing and developing a system that is adapted to local conditions and incorporates local knowledge, and the goal of scaling and replicating across a wide range of community contexts?

# References and notes

- 1 New South Wales Government (2022). 2022 Flood Report: Full Report. <https://www.nsw.gov.au/nsw-government/projects-and-initiatives/floodinginquiry>.
- 2 Department of Prime Minister and Cabinet (2021) *Australian Data Strategy Action Plan*, available at: <https://ausdatastrategy.pmc.gov.au/>.
- 3 Commonwealth of Australia (2018) National Disaster Risk Reduction Framework. Available at: <https://www.nema.gov.au/about-us/governance-and-reporting/strategies-and-frameworks>.
- 4 McCosker, A., Shaw, F., Calyx, C., Kang, Y.B., Albury, K. (2022). *Mapping Community Resources for Disaster Preparedness: Humanitarian Data Capability and Automated Futures*. ARC Centre of Excellence for Automated Decision-Making and Society. <https://doi.org/10.25916/DPB7-5118>.
- 5 McCosker, A., Kang, Y.B., Shaw, F. (2023) *Towards Resilient Communities: Data Capability and Resource Mapping for Disaster Preparedness*. ARC Centre of Excellence for Automated Decision-Making and Society, Melbourne. <https://doi.org/10.26185/hgz2-h212>.
- 6 Australian Red Cross (2024) <https://www.redcross.org.au/media/releases/2024/a-new-climate-resilience-partnership-invites-global-tech-entrepreneurs-to-pilot-their-solutions-for-humanity/>
- 7 <https://leadingcities.org/humanitarian-challenge>
- 8 Thomas, J., McCosker, A., Parkinson, S., Hegarty, K., Featherstone, D., Kennedy, J., Ormond-Parker, L., & Ganley, L. (2023). *Measuring Australia's Digital Divide: The Australian Digital Inclusion Index 2023*. ARC Centre of Excellence for Automated Decision-Making and Society, RMIT University, Swinburne University of Technology, and Telstra. <https://doi.org/10.25916/528s-ny91>.
- 9 Meta & World Resources Institute. (2023). *High Resolution 1m Global Canopy Height Maps*. Retrieved from [https://gee-community-catalog.org/projects/meta\\_trees/](https://gee-community-catalog.org/projects/meta_trees/).
- 10 Meta. (2024, April 22). Using Artificial Intelligence to Map the Earth's Forests. Retrieved from: <https://sustainability.atmeta.com/blog/2024/04/22/using-artificial-intelligence-to-map-the-earths-forests/>.
- 11 Tolan, J., Yang, H. I., Nosarzewski, B., Couairon, G., Vo, H. V., Brandt, J., Spore, J., Majumdar, S., Haziza, D., Vamaraju, J., & Moutakanni, T. (2024). Very High-Resolution Canopy Height Maps from RGB Imagery Using Self-Supervised Vision Transformer and Convolutional Decoder Trained on Aerial Lidar. *Remote Sensing of Environment*, 300, 113888. <https://doi.org/10.1016/j.rse.2023.113888>
- 12 Meta AI Research. (2024). HighResCanopyHeight (GitHub repository). <https://github.com/facebookresearch/HighResCanopyHeight>
- 13 Manaaki Whenua – Landcare Research. (2023). PyCrown: Fast Raster-Based Individual Tree Segmentation for LiDAR Data (GitHub repository). <https://github.com/manaakiwhenua/pycrown>
- 14 McCosker, A., Kang, Y.B., Shaw, F. (2023) *Towards Resilient Communities: Data Capability and Resource Mapping for Disaster Preparedness*. ARC Centre of Excellence for Automated Decision-Making and Society, Melbourne.
- 15 ICRC (2022). *Protection in the Movement*. <https://www.icrc.org/en/document/protection-movement>
- 16 Ibitoye, A. O., Nkwo, M. S., & Orji, R. (2025). Rethinking Responsible AI from Ethical Pillars to Sociotechnical Practice. *AI and Ethics*, 1–17.
- 17 Shams, R. A., Zowghi, D., & Bano, M. (2025). AI for All: Identifying AI Incidents Related to Diversity and Inclusion. *Journal of Artificial Intelligence Research*, 83.
- 18 Bano, M., Zowghi, D., & Gervasi, V. (2024, April). A Vision for Operationalising Diversity and Inclusion in AI. In *Proceedings of the 2nd International Workshop on Responsible AI Engineering* (pp. 36–45).
- 19 Shams, R. A., Zowghi, D., & Bano, M. (2025). AI and the Quest for Diversity and Inclusion: A Systematic Literature Review. *AI and Ethics*, 5(1), 411–438.
- 20 World Economic Forum (WEF), (2022). *A Blueprint for Equity and Inclusion in Artificial Intelligence*. <https://www.weforum.org/publications/a-blueprint-for-equity-and-inclusion-in-artificial-intelligence/>.
- 21 UNESCO, (2025) *The Ethics of Artificial Intelligence*. <https://www.unesco.org/en/artificial-intelligence/recommendation-ethics>.
- 22 UNDP (2025). *Human Development Report 2025: A Matter of Choice: People and Possibilities in the Age of AI*. <https://hdr.undp.org/content/human-development-report-2025>.
- 23 <https://www.homeaffairs.gov.au/emergency/files/national-strategy-disaster-resilience.pdf>
- 24 <https://www.ifrc.org/document/road-map-community-resilience>
- 25 <https://knowledge.aidr.org.au/resources/handbook-community-engagement/>
- 26 Herfort, B., Lautenbach, S., Porto de Albuquerque, J., Anderson, J., & Zipf, A. (2021). The Evolution of Humanitarian Mapping Within the OpenStreetMap Community. *Scientific Reports*, 11(1), 1–15.
- 27 United Nations (2015) *Sendai Framework for Disaster Risk Reduction 2015 – 2030*. <https://www.preventionweb.net/publication/sendai-framework-disaster-risk-reduction-2015-2030>.
- 28 These steps are paraphrased from *The Handbook for Community Engagement for Disaster Resilience*, available at <https://knowledge.aidr.org.au/resources/handbook-community-engagement/>



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