MONSOON 2024 PILOT — LESSONS LEARNED

Implementing Digital and Spatial Technologies for Anticipatory Action in the Mahakali Basin of Nepal

GSMA · UKaid from the British people · adpc · naxa · DCA actalliance · Institute of Himalayan Risk Reduction · viamo · NNSWA Nepal National Social Welfare Association

Acknowledgment

We gratefully acknowledge the funding support from GSMA UKAID and the Asian Disaster Preparedness Center (ADPC) for the successful implementation of the DASTAA and ACT FIRST projects. We extend our sincere appreciation to our implementing partners DCA Nepal, Institute of Himalayan Risk Reduction (IHRR), NAXA, Nepal National Social Welfare Association (NNSWA), Viamo Nepal, and Nepal Flying Labs(NFL), for their technical expertise and invaluable collaboration. We also thank the Dodhara Chandani Municipality, Bheemdatt Municipality, and Parshuram Municipality for their active support, along with the dedication of local communities, field teams, and youth volunteers, whose collective efforts have been instrumental in strengthening anticipatory action and building resilience in the Mahakali Basin.

Project Consortium

naxa

Institute of Himalayan Risk Reduction

DCA actalliance

viamo

NNSWA Nepal National Social Welfare Association

Nepal FlyingLabs

SUMMARY

This document is based on the lessons learned from implementing Anticipatory Action through Digital and Spatial Technologies for Anticipatory Action (DASTAA) & Adopting cutting-edge and Frontier Technologies for Building Resilience through Anticipatory Action (ACT FIRST) projects in Nepal. Our approach to anticipatory action was data and technology-driven, focusing on household-level risk assessments and tailored, multichannel risk communication. To achieve accurate household-level risk computation, the project team used DASTAA, an integrated platform for risk assessment and early action planning. The activities, challenges, and lessons learned from each project are systematically reviewed using the Early Warning for All Framework[1], which divides disaster risk reduction's core principles into four critical evaluation pillars. The DASTAA & ACT First projects[2] are carried out in 3 municipalities located within the Makahali river basin in Far-West Nepal. This document aims to communicate and provide a structured analysis of the implementation process and highlight challenges and lessons learned to guide and enhance future anticipatory action initiatives in Nepal and beyond.

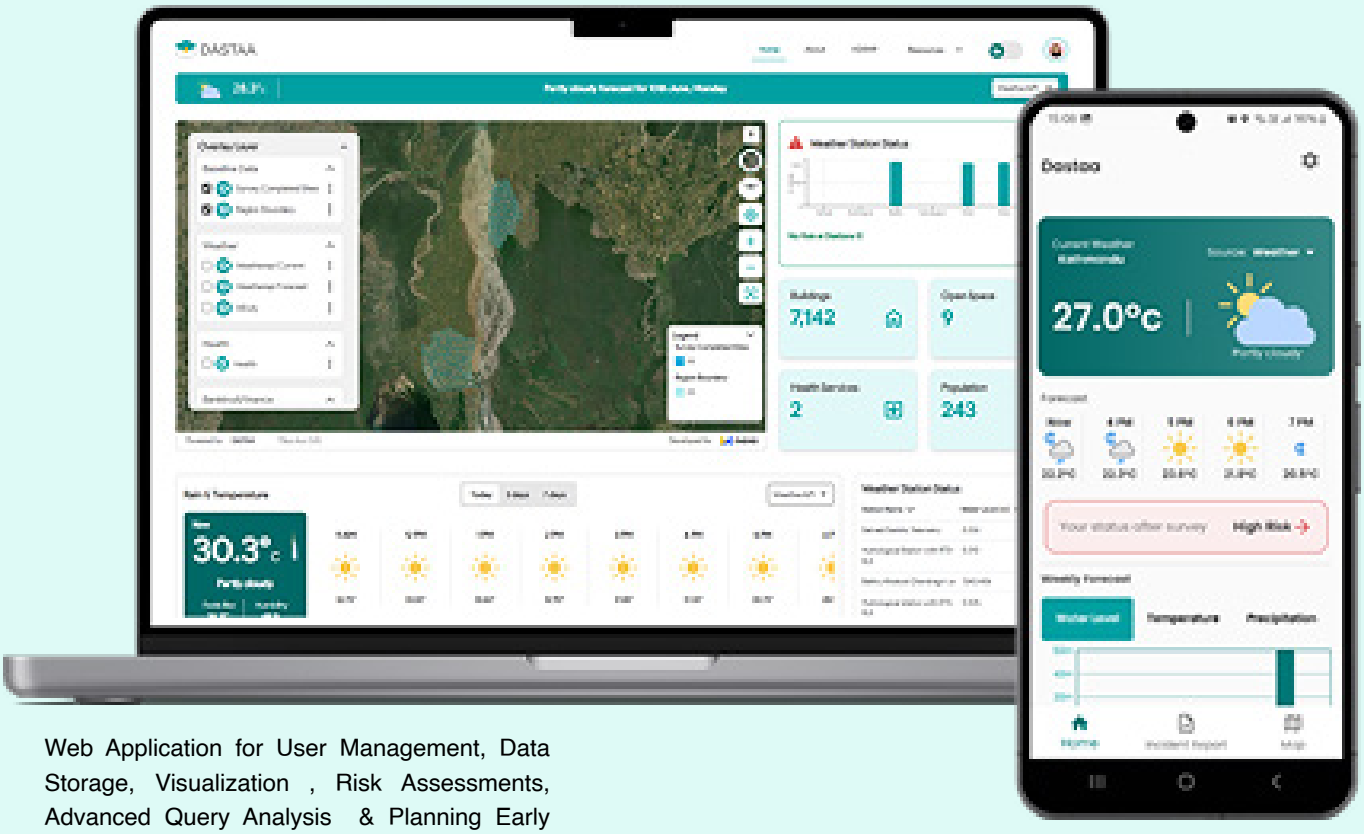
1 Early Warning For All framework
2 DASTAA project & Act First Project

DIGITAL AND SPATIAL TECHNOLOGIES FOR ANTICIPATORY ACTION

An Integrated Modular, Data-Driven Platform for Enhanced Anticipatory Action

DASTAA is an integrated and modular digital platform for disaster preparedness, enabling household and community-level risk assessments and early action planning, including risk communication, relief distribution, and humanitarian cash transfers. DASTAA aims to shift the disaster management paradigm from a response-based approach to a data-driven preparedness-based approach. DASTAA enhances decision-making across all phases of the disaster management cycle by bringing data, people, and technology together. The platform comprises both mobile and web applications.

COMPONENTS OF DASTAA



Web Application for User Management, Data Storage, Visualization , Risk Assessments, Advanced Query Analysis & Planning Early Action Interventions for Anticipatory Action decision making.

Mobile Application to facilitate field based surveys , push notifications for early warning messaging, visualizing important information and updating household profiles.

Modular Features of DASTAA

DASTAA offers a diverse array of modules, allowing users to select options tailored to their specific needs and the various stages of their projects.

1

User & Organization Management Module

Manage user accounts, permissions, and organizational structures.

2

Data Inventory Module

Maintain an organized repository of diverse kinds of datasets.

3

Data Collection Survey Module

Plan, execute and monitor household and community surveys.

4

Project Management Module

Create, Plan, organize, and track projects effectively, from initiation through completion.

5

Hazard Assessment Module

AI assisted hazard mapping for multiple hazards (flood, landslide, heat wave, etc.)

6

Vulnerability Assessment Module

Set parameters and Indicators to compute vulnerability at community level or individual geographical objects such as households, educational institutions, health facilities, and other geographic units.

7

Know Your Risk Module

Compute risk score considering multi hazard for any location globally.

8

Risk Visualization Module

Visualize datasets(risk and hazard) in the form of interactive maps, dashboards, and infographics.

9

Damage Assessment Module

Design & conduct damage assessment surveys and generate assessment reports.

10

Cash Transfer Module

Plan and manage humanitarian cash distribution.

11

Relief Distribution Module

Conduct data driven targeted relief distribution management.

12

Risk Communication Module

Manage multi channel risk communication (SMS, IVR, sirens, social media, and mobile push notifications.)

13

Beneficiary Tracking Module

Identify beneficiaries, monitor their activities, and track progress to ensure effective support.

14

Integration with National DIMS *(Disaster Information Management System)*

Automated data linkage with national DIMS platforms.

15

Knowledge Management Module

Repository of knowledge documents.

CHAPTER 1:
ACT FIRST AND DASTAA PROJECT

The DASTAA tool has been implemented in three municipalities in Nepal with the support of two projects: ACT FIRST and DASTAA.

ACT FIRST:
Adopting Cutting Edge and Frontier Technologies for Building Resilience through Anticipatory Action

Implementation Locations: Bheemdatt Municipality Wards 9, 10, 11 and Dodhara Chandani Municipality Wards 6, 7, 8, 9, 10

Timeline: October 2023 - March 2025

Implementation Partners:

- Local Implementation Partner/Community Organization: Nepal National Social Welfare Association (NNSWA)
- Research Partner: Institute of Himalayan Risk Reduction (IHRR)
- Telecommunication Partner: Viamo Nepal
- International Humanitarian Organization: DanChurchAid (DCA) Nepal

Funding Program:
The GSMA Innovation Fund for Anticipatory Humanitarian Action 2022

DASTAA:
Digital and Spatial Technologies for Anticipatory Action

Implementation Locations:
Dodhara Chandani Municipality Wards 1, 3, and Parshuram Municipality in Nepal

Timeline:
December 2023 - January 2025

Implementation Partners:
NGOs: Nepal National Social Welfare Association (NNSWA), Nepal Flying Labs (Nepal), International Humanitarian Organizations: DanChurchAid (DCA) Nepal

Funding Program:
Asian Disaster Preparedness Center (ADPC) iCARE Innovation Fund 2023

Besides the project locations mentioned above, the respective municipalities independently funded the implementation of DASTAA in Wards 2, 4, and 5 of the Dodhara Chandani Municipality and Wards 2, 8, 9, 10, and 11 of the Parshuram Municipality. As a result, we were able to implement project activities across the entire Dodhara Chandani Municipality and Parshuram Municipality.

CHAPTER 2: PROJECT AREAS

The Mahakali River basin is situated near the westernmost border of Nepal. The Mahakali River originates in the Api Himal range of the Himalayas and has an average discharge of approximately 658 m^3/s at the Sharada Barrage. It flows about 250 km from its source before crossing into India, passing through Nepal's Darchula, Baitadi, Dadeldhura, and Kanchanpur districts.

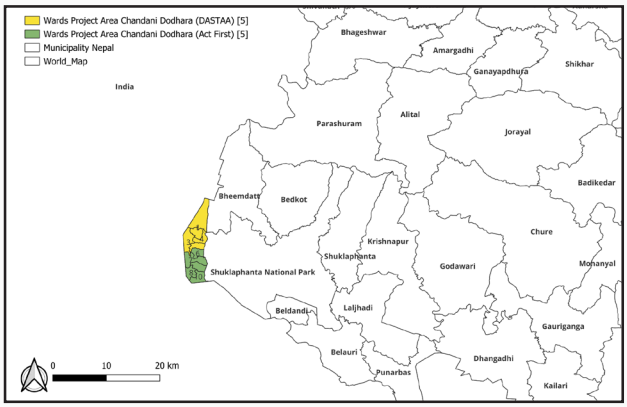
During the monsoon season, intense and unpredictable rainstorms cause water levels in the Mahakali River to rise sharply, posing severe flood risks to nearby settlements. Historically, river overflows within the basin have led to infrastructure damage, community displacement, and loss of livelihoods. In 2014, severe flooding submerged more than 500 houses and claimed at least eight lives[3] . On October 2021, over 200 houses near the flooded Mahakali and Jogbudha rivers were inundated in floodwater in the Kanchanpur district displacing more than 2600 people, loss of infrastructures[4]. More recently, a record-breaking cloudburst in 2024 triggered extreme rainfall (624 mm), displacing 300 families and evacuating approximately 891 households to safer locations[5]. These events underscore the persistent and severe flood risks communities face surrounding the Mahakali River basin and the possible impact DASTAA could have within this area.

Both the Projects ACT FIRST and DASTAA were implemented in three municipalities: Dodhara Chandani Municipality (1), Bheemdatt Municipality (2), and Parshuram Municipality (3), all located in the Mahakali river basin in the Far Western region of Nepal. These areas have historically been highly vulnerable to flooding due to their proximity to the Mahakali River and its tributaries. Monsoon-induced floods frequently displace communities, devastate agricultural land, and damage critical infrastructure. The lack of adequate flood protection measures in many settlements further exposes homes, roads, and schools to seasonal floodwaters.

3 Mahakali flood in Nepal kills 8, submerges over 500 homes
4 Nepal - Floods and landslides Oct 2021
5 Floods displace 900 families in Kanchanpur

KEY IN KEY INFORMATION OF THE PROJECT AREA

DODHARA CHANDANI MUNICIPALITY



Project Locations: All 10 Wards (Ward 2, Ward 4, and Ward 5 co-financing from the Municipality)

Number of Households: **9,140**

Total Area: **56.608 sq.km**

Total No of Wards: **10**

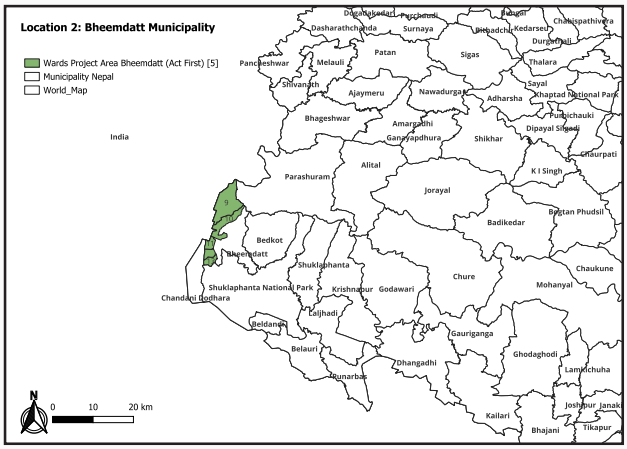
Population: **48,515**

- Male: **24,456**
- Female: **24,059**

Major Hazards:
Earthquake, Flood, Human-Wildlife Conflict, Fire, Pandemic, Windstorm

Source: Household Survey 2024 (Act First & DASTAA project)

BHEEMDATT MUNICIPALITY



Project Locations:
Ward-9,10,11,12, &13

Number of Households: **6,906**

Total Area: **85.89 sq.km**

Total No of Wards: **19**

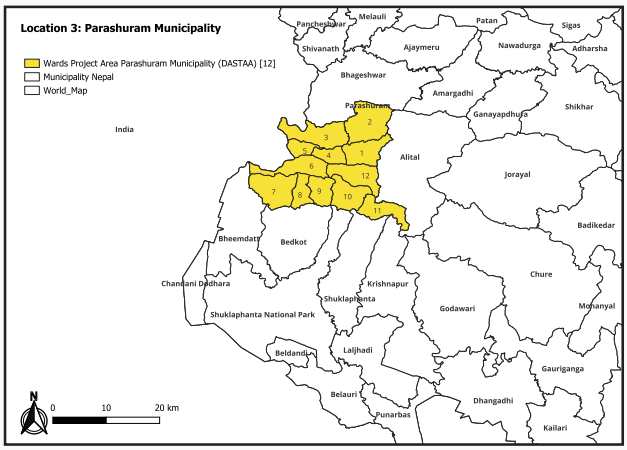
Population: **35,555**

- Male: **17,460**
- Female: **18,095**

Major Hazards:
Earthquake, Flood and Inundation, Drought, Windstorm, Coldwave, Fire

Source: Household Survey 2024 (project Act First)

PARSHURAM MUNICIPALITY



Project Locations: All 12 wards (Ward 2, Ward 8, Ward 9, Ward 10, and Ward 11 co-financing from the Municipality)

Number of Households: **6757**

Total Area: **414.07 sq.km**

Total No of Wards: **12**

Population: **39,565**

- Male: **20340**
- Female: **19225**

Major Hazards:
Earthquake, Landslide, Flood, Epidemic, Fire, coldwave

Source: Household Survey -2024 (DASTAA project)

Background of the EW4All Framework

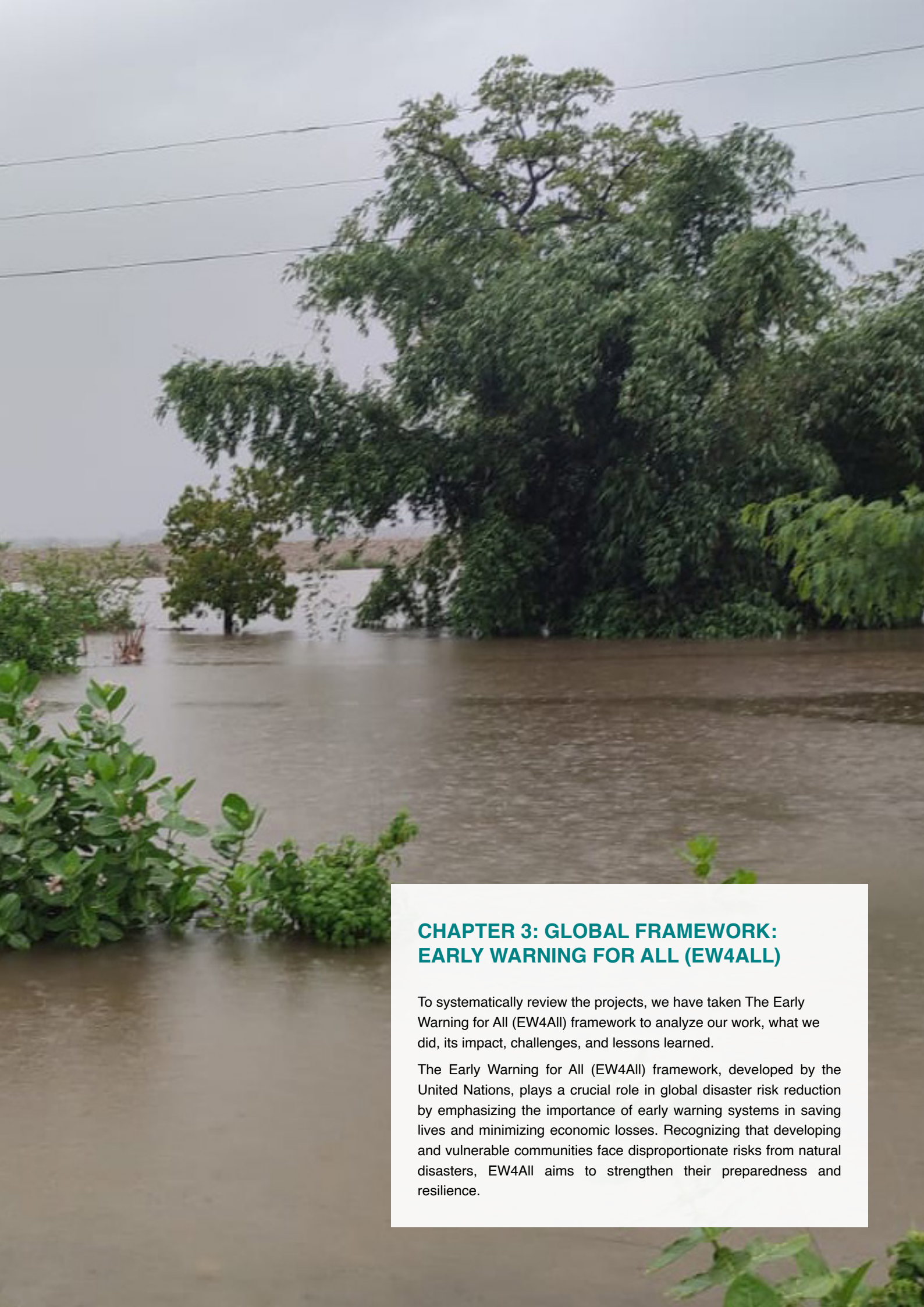
The EW4All initiative was launched by the United Nations in 2022 to ensure that every person on Earth is protected by early warning systems by 2027. This initiative stems from recognizing that while early warning systems have effectively reduced disaster-related fatalities and damages, nearly half of the world's population still lacks access to them. The United Nations Secretary-General called for global action to bridge this gap, leading to the development of the EW4All framework.

The framework builds on existing global and regional efforts to enhance disaster preparedness, aligning with the Sendai Framework for Disaster Risk Reduction (2015-2030), the Paris Agreement on climate action, and the Sustainable Development Goals (SDGs). It promotes a multi-hazard approach to early warnings, ensuring that different types of disasters, such as floods, storms, heat waves, and earthquakes are addressed comprehensively.

The EW4All framework is built on four key pillars, each led by global organizations such as the United Nations Office for Disaster Risk Reduction (UNDRR), the World Meteorological Organization (WMO), the International Telecommunication Union (ITU), and the International Federation of Red Cross and Red Crescent Societies (IFRC), ensuring an integrated and coordinated approach to early warning. The four key pillars focus on:

- Disaster Risk Knowledge: Understanding and assessing risks through hazard mapping, vulnerability analysis, and historical disaster data to inform effective early warning systems.
- Monitoring and Forecasting: Strengthening meteorological, hydrological, and geological monitoring networks to predict and detect hazardous events in real-time.
- Communication and Dissemination: Ensuring that warnings reach all stakeholders using reliable communication technologies, including governments, emergency responders, and at-risk communities.
- Preparedness and Response: Enhancing community preparedness, disaster response planning, and capacity-building to ensure timely and effective action when warnings are issued.

We aim to assess our projects' effectiveness, identify improvement areas, and contribute to the global effort of making early warning systems accessible to all by adopting the EW4All framework.



CHAPTER 3: GLOBAL FRAMEWORK: EARLY WARNING FOR ALL (EW4ALL)

To systematically review the projects, we have taken The Early Warning for All (EW4All) framework to analyze our work, what we did, its impact, challenges, and lessons learned.

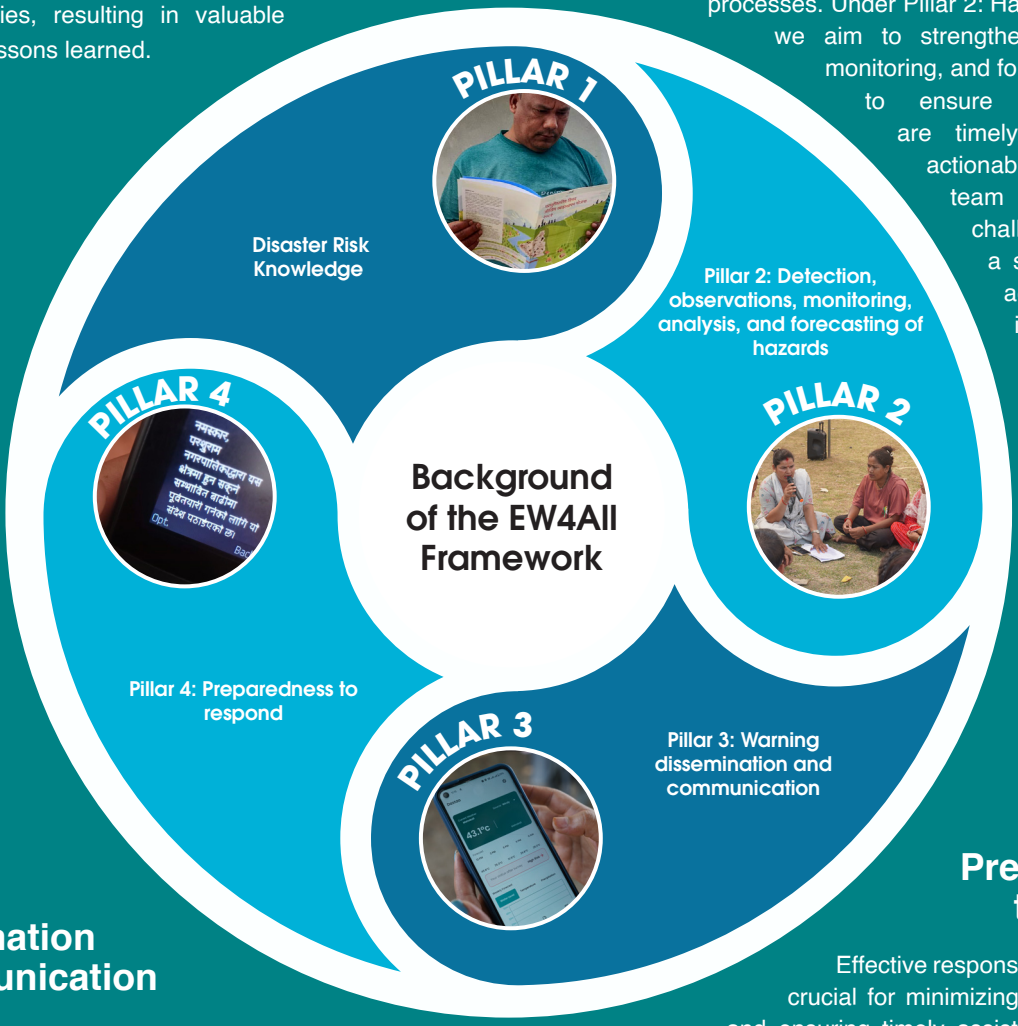
The Early Warning for All (EW4All) framework, developed by the United Nations, plays a crucial role in global disaster risk reduction by emphasizing the importance of early warning systems in saving lives and minimizing economic losses. Recognizing that developing and vulnerable communities face disproportionate risks from natural disasters, EW4All aims to strengthen their preparedness and resilience.

Pillar 1: Disaster Risk Knowledge

Risk Knowledge is the cornerstone of effective early warning systems. However, a significant gap exists in the availability, accessibility, and integration of risk information and assessments globally, especially in developing countries such as Nepal. Pillar 1: Disaster Risk Knowledge aims to enhance global risk understanding and integrate risk information into inclusive, accessible, and effective early warning systems. Under this pillar, our work directly strengthened disaster risk knowledge through various activities, resulting in valuable outputs and lessons learned.

Pillar 2: Detection, observations, monitoring, analysis, and forecasting of hazards

Accurate hazard detection and forecasting are essential for effective early warning and disaster preparedness. Anticipatory action can be optimized to reduce disaster risks by integrating hydro-meteorological data with real-time monitoring and impact-based forecasts. However, challenges such as forecasting uncertainties and limited monitoring infrastructure highlight the need for continuous improvements in data accuracy and decision-making processes. Under Pillar 2: Hazard assessment, we aim to strengthen the detection, monitoring, and forecasting systems to ensure early warnings are timely, accurate, and actionable. The project team addressed these challenges through a series of targeted activities, resulting in key outputs and lessons learned.



Pillar 3: Warning dissemination & communication

Early warning dissemination and communication are essential to at-risk communities, enabling timely and informed decisions. Under Pillar 3: Warning dissemination and communication, the project team implemented a series of activities focused on delivering early warnings and early actions through multiple channels in a clear, understandable, and actionable manner. These efforts resulted in key outputs and lessons learned that contribute to improved communication strategies.

Pillar 4: Preparedness to respond

Effective response preparedness is crucial for minimizing disaster impacts and ensuring timely assistance for affected communities. Implementing proactive evacuation measures and financial support mechanisms enhanced local resilience and emergency response capabilities. However, challenges such as inadequate infrastructure and limited resources highlight areas for improvement in future preparedness efforts. Under Pillar 4: Preparedness to respond, we have implemented different activities to increase the preparedness to respond, resulting in different outputs contributing to key lessons.

PILLAR 1

DISASTER RISK KNOWLEDGE

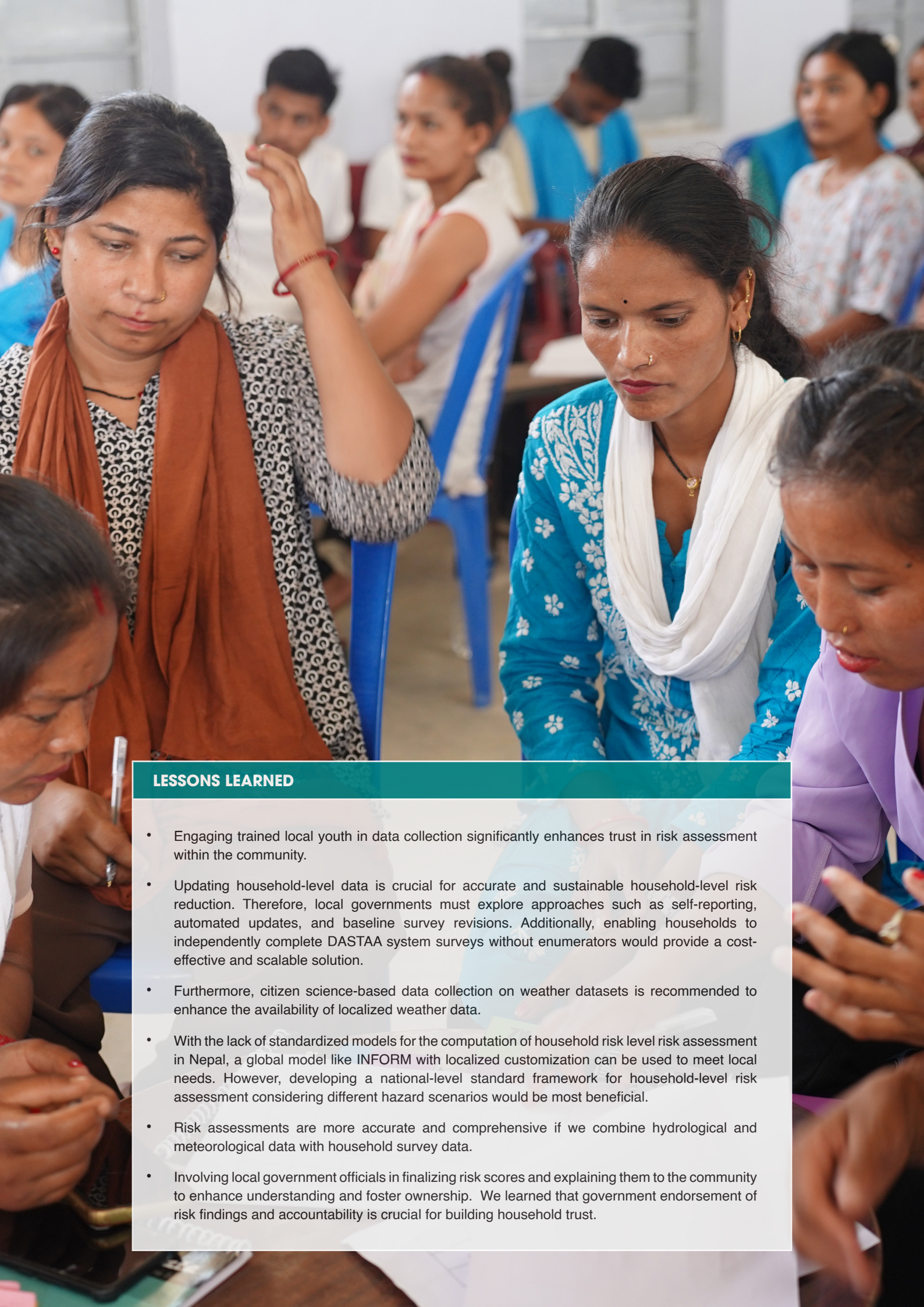
Risk Knowledge is the cornerstone of effective early warning systems. However, a significant gap exists in the availability, accessibility, and integration of risk information and assessments globally, especially in developing countries such as Nepal. Pillar 1: Disaster Risk Knowledge aims to enhance global risk understanding and integrate risk information into inclusive, accessible, and effective early warning systems. Under this pillar, our work directly strengthened disaster risk knowledge through various activities, resulting in valuable outputs and lessons learned.

ACTIVITIES AND OUTPUTS

- A comprehensive household-level survey questionnaire was developed, incorporating 456 questions and 51 indicators to assess physical, socio-economic, environmental, and institutional vulnerabilities within households.
- A total of 117 local youths were trained and mobilized for mobile-based digital data collection using NAXA assessment, ensuring every household coverage within the municipalities.
- Flood hazard maps were developed using the HEC-RAS hydrological model to enhance flood risk assessment.
- HH survey data were integrated with flood models localizing the INFORM Risk Model to generate risk profiles for 22,803 households, categorizing them into high, medium, and low-risk groups.
- Household Level Disaster Risk Management Plans (HDRMPs) were made accessible to respective households through the DASTAA app and printed copies, improving awareness of vulnerabilities.
- Community simulations and drills were conducted, incorporating IVR with gamification strategies to enhance understanding of risks, early warning systems, and anticipatory actions.
- Local government officials were sensitized and trained on effectively using the DASTAA system to visualize color-coded household risk profiles, disseminate early warning messages and allocate resources efficiently.
- A total of 414 government officials received training on anticipatory action for data-driven disaster preparedness, strengthening local government disaster management capabilities.
- Community map boards were designed, printed, and installed to highlight risk areas, community resources, and infrastructure, aiding local communities and authorities in addressing existing risks.

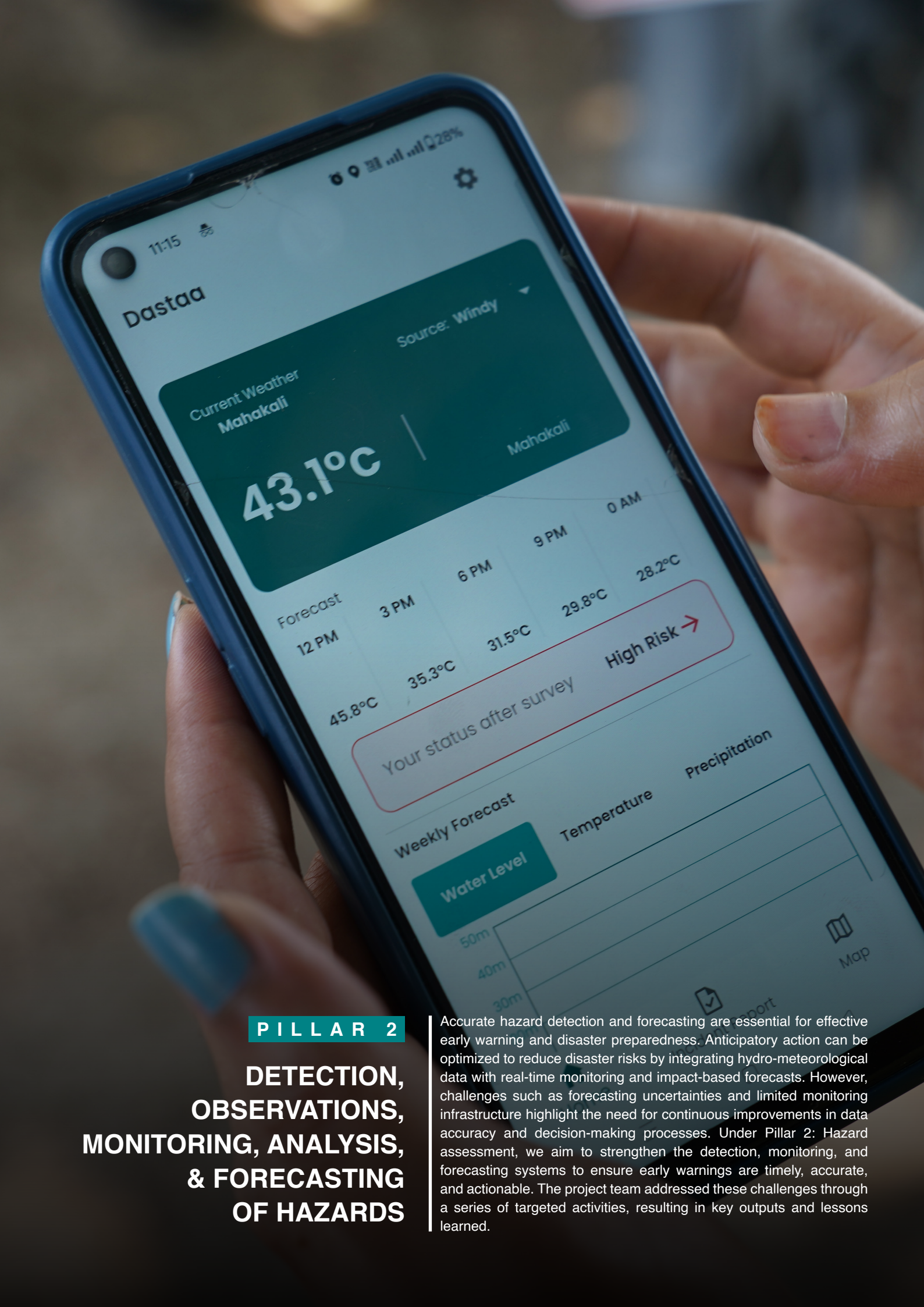
CHALLENGES

- The development of a standardized household survey questionnaire was challenging due to the diversity in socio-economic conditions across regions, necessitating frequent adaptations for different communities.
- The process of household-level data collection was time-consuming due to challenging terrain and limited transportation infrastructure in remote areas.
- The accuracy of the derived flood model was reduced by the limited availability of hydrological and meteorological data, the absence of historical flood events, and the lack of high-resolution terrain data.
- Building community trust in the risk assessment findings was difficult, as households showed skepticism toward scientific methods that affected household engagement.
- Some households expressed skepticism about their assigned risk score and reported a higher perceived risk to increase their chances of receiving government funding.
- The limited availability of internet access and mobile devices necessitated the printing and distribution of risk profiles to each household, leading to increased resource and time consumption.



LESSONS LEARNED

- Engaging trained local youth in data collection significantly enhances trust in risk assessment within the community.
- Updating household-level data is crucial for accurate and sustainable household-level risk reduction. Therefore, local governments must explore approaches such as self-reporting, automated updates, and baseline survey revisions. Additionally, enabling households to independently complete DASTAA system surveys without enumerators would provide a cost-effective and scalable solution.
- Furthermore, citizen science-based data collection on weather datasets is recommended to enhance the availability of localized weather data.
- With the lack of standardized models for the computation of household risk level risk assessment in Nepal, a global model like INFORM with localized customization can be used to meet local needs. However, developing a national-level standard framework for household-level risk assessment considering different hazard scenarios would be most beneficial.
- Risk assessments are more accurate and comprehensive if we combine hydrological and meteorological data with household survey data.
- Involving local government officials in finalizing risk scores and explaining them to the community to enhance understanding and foster ownership. We learned that government endorsement of risk findings and accountability is crucial for building household trust.



PILLAR 2

DETECTION, OBSERVATIONS, MONITORING, ANALYSIS, & FORECASTING OF HAZARDS

Accurate hazard detection and forecasting are essential for effective early warning and disaster preparedness. Anticipatory action can be optimized to reduce disaster risks by integrating hydro-meteorological data with real-time monitoring and impact-based forecasts. However, challenges such as forecasting uncertainties and limited monitoring infrastructure highlight the need for continuous improvements in data accuracy and decision-making processes. Under Pillar 2: Hazard assessment, we aim to strengthen the detection, monitoring, and forecasting systems to ensure early warnings are timely, accurate, and actionable. The project team addressed these challenges through a series of targeted activities, resulting in key outputs and lessons learned.

ACTIVITIES AND OUTPUTS

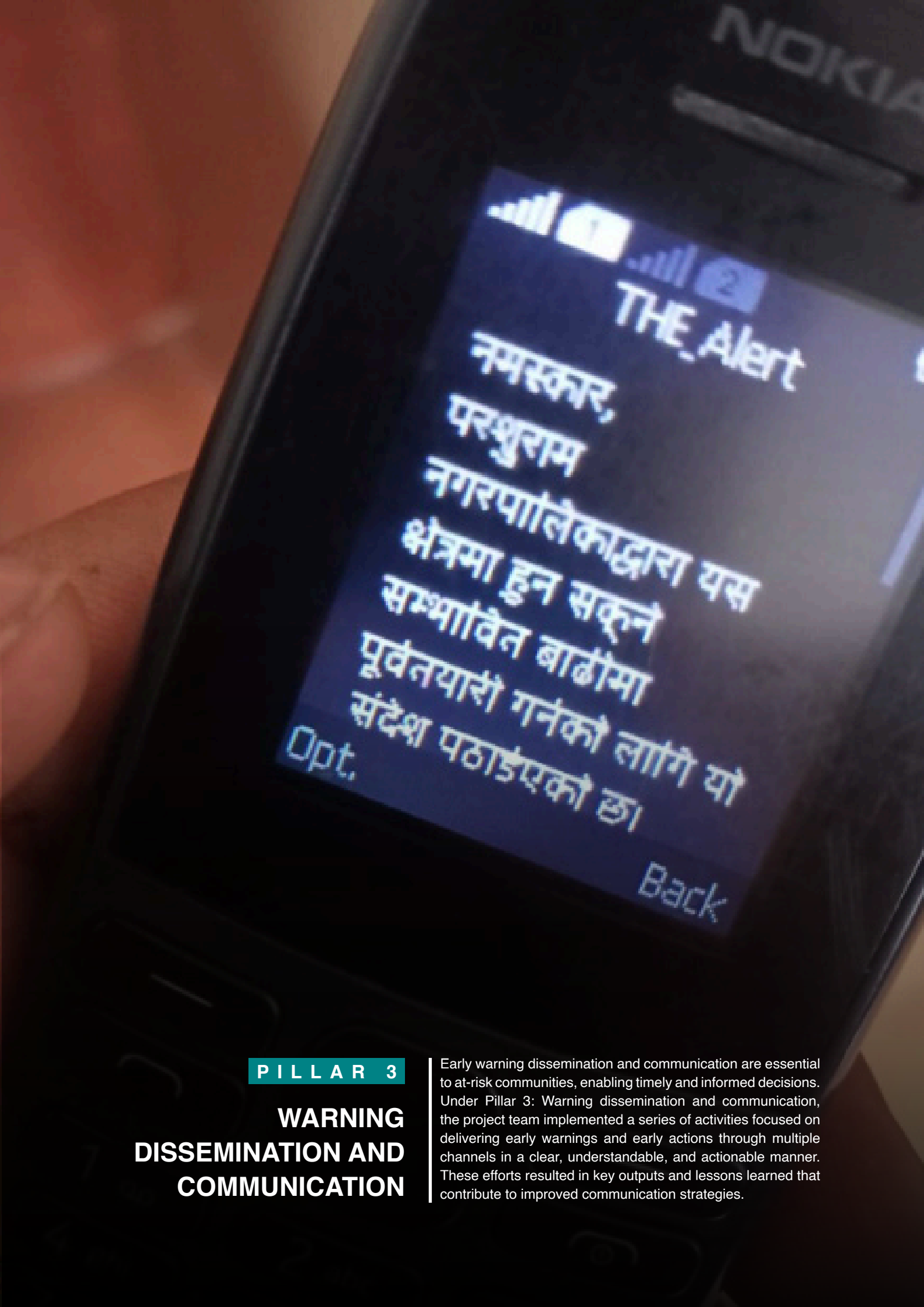
- A dedicated monitoring team was established to monitor water levels at three critical stations along the Mahakali River (Mahakalit at Dattu, Mahakali at Parigaon, and Mahakali at Dodhara Chandani - 4 Lane Bridge) under the leadership of municipalities and collaboration with the Mahakali Basin Field Office, Department of Hydrology and Meteorology (DHM), Nepal.
- With the coordination from DHM Mahakali Basin Field Office and Dodhara Chandani Municipality, a Radar Level Sensor (RLS) was installed in the Four Lane Bridge of Mahakali River, i.e. downstream of Sarada Barrage to receive real-time updates on the water level of Mahakali river which is very crucial for the downstream communities like Kutiyakabhar.
- Besides, the real-time hydro-meteorological data, including weather, river monitoring, and forecast, was integrated into the DASTAA system, allowing easy access to near real-time data and enhancing situational awareness for households and local government to support timely hazard detection.
- Under the technical support of DHM, coordination by Dodhara Chandani Municipality, and facilitation by IHRR, the Impact Based Weather Forecast (IBF) program was launched in three Palikas (Dodhara Chandani, Bheemdatta, and Parshuram)
- Impact-Based Forecasting Workshops were organized to train local government and community members on the significance of IBFs, combined with knowledge on monitoring and interpreting risk matrices in DASTAA to support informed decision-making.
- A total of 18 Impact-Based Forecasts (IBF) bulletins were issued to support anticipatory actions across three municipalities, aimed to provide actionable forecasts based on predicted impacts by collaborating with DHM.
- The proactive leadership at these municipalities was able to receive the hydro-meteorological information on time. The developed Early Action Protocol, Task Force, and institutional structure supported the municipality in accessing this information timely.
- The project team supported Dodhara Chandani Municipality for the development of the Disaster Preparedness and Response Plan (DPRP).

CHALLENGES

- The accurate forecasting of localized weather information was challenging due to the complex topography, limited infrastructure, and the lack of ground station data in the Mahakali Basin.
- The development of a precise flood forecasting model was challenging due to a lack of detailed historical data on past impacts, and regional vulnerabilities further complicated the process.
- The effective monitoring, analysis, and informed decision-making were hindered by limited human resources at the local government level.
- The 3-day forecast from DHM provides only a limited window for taking early action, leaving minimum time to be ready for possible disaster events.
- The dominance of traditional post-event response practices hindered the adoption of proactive approaches.

LESSONS LEARNED

- Expanding the hydro-meteorological monitoring network by adding local stations and integrating global datasets is essential for improving forecasting accuracy and extending lead time.
- Organizing awareness training for local government officials will ensure accurate interpretation and timely decision-making using the forecast and monitoring tools provided.
- Through developing robust forecast verification mechanisms, we should reduce false warnings and increase model credibility.
- We need to customize impact-based forecasting models to align with the specific hydrological context of the project area.
- Impact-Based Forecasting (IBF) taught us that it is much more effective than traditional forecasting. Unlike regular forecasts that only describe the weather, IBF provides insights into potential impacts, allowing for targeted early action.



PILLAR 3

WARNING DISSEMINATION AND COMMUNICATION

Early warning dissemination and communication are essential to at-risk communities, enabling timely and informed decisions. Under Pillar 3: Warning dissemination and communication, the project team implemented a series of activities focused on delivering early warnings and early actions through multiple channels in a clear, understandable, and actionable manner. These efforts resulted in key outputs and lessons learned that contribute to improved communication strategies.

ACTIVITIES AND OUTPUTS

- We collaborated with local government stakeholders to draft and review 41 types of early warning message templates before the monsoon season to ensure the timely activation of risk communication in case of a forecasted hazard.
- The published Impact-Based Forecasts (IBFs) and special bulletins were simplified into local languages, incorporated with actionable insights, and shared with households via SMS, IVR, and social media platforms like WhatsApp, Viber, and Facebook.
- Tailored early warning messages were sent to households with vulnerable groups, providing clear response instructions based on forecasted risks.
- Interactive Voice Response (IVR) technology was used for the wider dissemination of the severe weather forecast and Impact Based Weather Forecast Bulletin. The team carried out multichannel risk communication using mobile-based SMS, IVR, Social Media community, and community sirens.
- Issued a total of 127,667 IVR messages and 41,500 SMS alerts to at-risk households during the monsoon season in response to forecasted hazards.
- Continuously shared hydrological and meteorological updates through social media platforms, including Facebook and LinkedIn, to keep local communities informed.
- Developed a push notification system within the DASTAA mobile app that notified designated early warning personnel (e.g., DRR focal persons, Mayors, CDMCs) when water levels reached critical thresholds.
- The project team evaluated and ensured the proper functioning of physical sirens, activating them when evacuation triggers were met.

CHALLENGES

- The target of reaching all vulnerable households with risk communication via SMS/IVR was hindered by the lack of phone access for approximately 1/7th of the households in the project area.
- The warning messages were disseminated on time; however, poor network connectivity in remote areas delayed their delivery, meaning not every household received the message on time, and some did not receive it at all.
- Sending early warning messages to every household member was expensive, so alerts were mainly sent to household heads, usually men, who were often away for work. As a result, women, children, and the elderly at home lacked direct access to warnings, making them more vulnerable during emergencies.
- Building and maintaining public trust in risk messages was challenging because discrepancies between forecasts and actual conditions led to household skepticism. This loss of trust caused people to ignore future warnings, making effective risk communication and dissemination more difficult.
- The physical sirens had limited coverage in geographically dispersed areas, limiting their effectiveness in reaching wider communities.
- Local language differences i.e. language barriers made it difficult to share important information with communities.

LESSONS LEARNED

- Utilizing a combination of communication methods, including DASTAA push notifications, IVR, SMS, social media, and physical sirens, is an effective approach to ensure widespread coverage and accessibility to risk communication.
- Regardless of multiple modes of digital communications including SMS, IVR, and Social Media; the conventional way of communicating through physical sirens, local committees need to be blended in the entire process.
- Using clear, simple language and avoiding technical jargon is crucial to ensure households understand the early warning message.
- Incorporating feedback loops into communication strategies strengthens community engagement and allows ongoing improvements.
- The poor access to mobile phones and the internet in remote areas has restricted DASTAA's outreach, while IVR has partially addressed access issues. More solutions are needed to reach remote areas and it could be in-person advisories or community sirens in case the area is very remote.
- Sending SMS and IVR messages to many people is expensive, and some family members still don't receive important warnings.
- Women should be prioritized as direct recipients of risk messages, and community networks should be used to share information with all household members to ensure equitable access to early warnings and an inclusive approach.
- Reliance on digital tools excluded some vulnerable populations. Language and literacy barriers hindered the complete comprehension of messages. Hence multi-language risk communication should be prioritized.
- Tools like DASTAA are invaluable for the timely dissemination of critical information. Pre-prepared message templates in DASTAA enable one-click mass communication, ensuring rapid and efficient alert distribution during emergencies.

PILLAR 4

PREPAREDNESS TO RESPOND

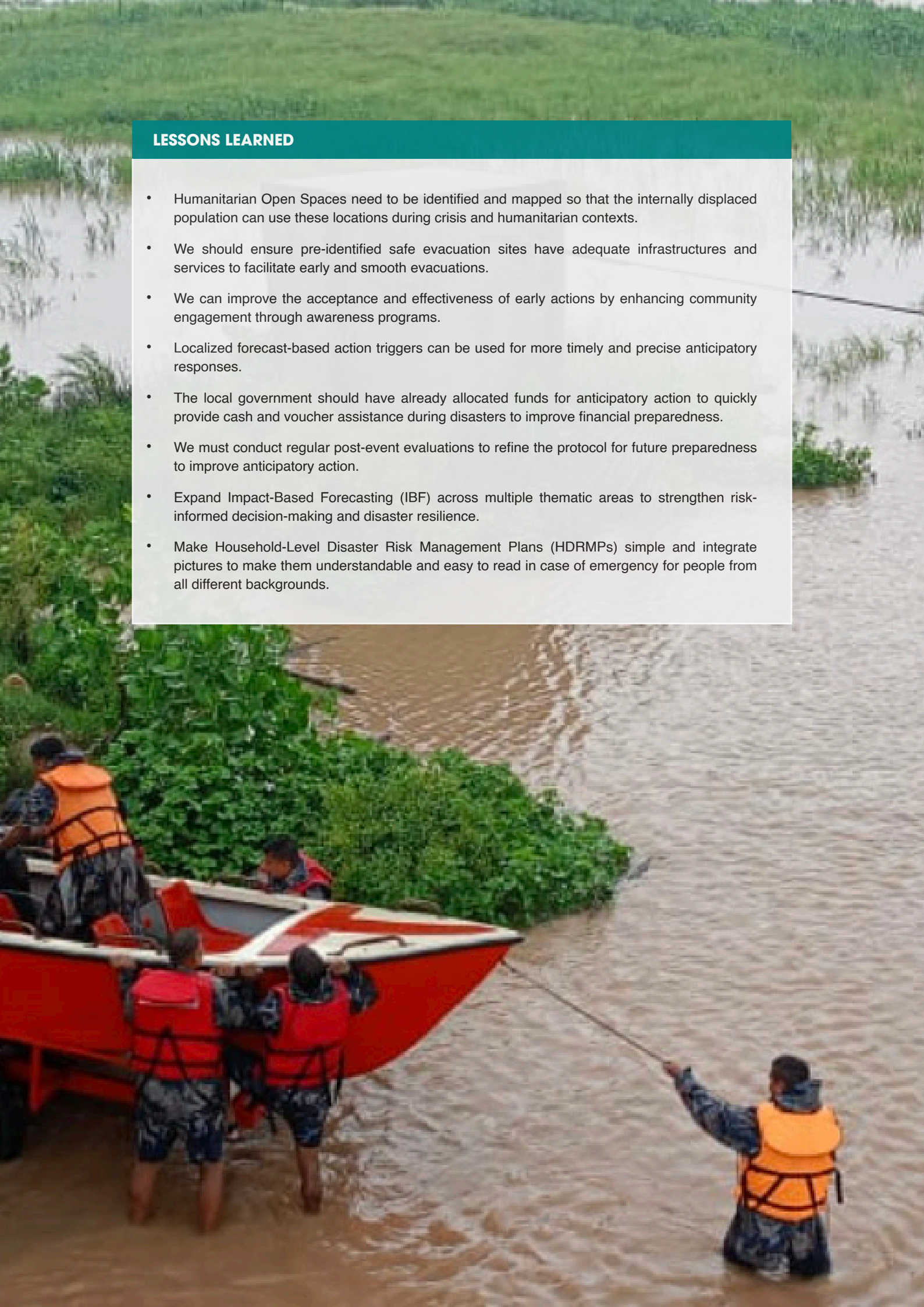
Effective response preparedness is crucial for minimizing disaster impacts and ensuring timely assistance for affected communities. Implementing proactive evacuation measures and financial support mechanisms enhanced local resilience and emergency response capabilities. However, challenges such as inadequate infrastructure and limited resources highlight areas for improvement in future preparedness efforts. Under Pillar 4: Preparedness to respond, we have implemented different activities to increase the preparedness to respond, resulting in different outputs contributing to key lessons.

ACTIVITIES AND OUTPUTS

- The project team had a pre-agreement with local Community Disaster Management Committees (CDMCs). Hence, multipurpose Group Cash Transfers (GCTs) became easier while it was needed to increase accountability on the use of cash as well as to strengthen local resilience.
- 620 individuals evacuated to designated safe shelters before the flood, including 124 households in Bheemdatt Municipality and 271 households in Dodhara Chandani Municipality.
- Post-disaster financial assistance reached 884 households, including:
- 555 in Dodhara Chandani Municipality
- 14 in Parshuram Municipality
- 315 in Bheemdatt Municipality
- Disaster risk finance was distributed to support short-term recovery and strengthen community resilience.
- Household Level Disaster Management Plans (HDRMPs) for 22,803 households were generated and distributed.

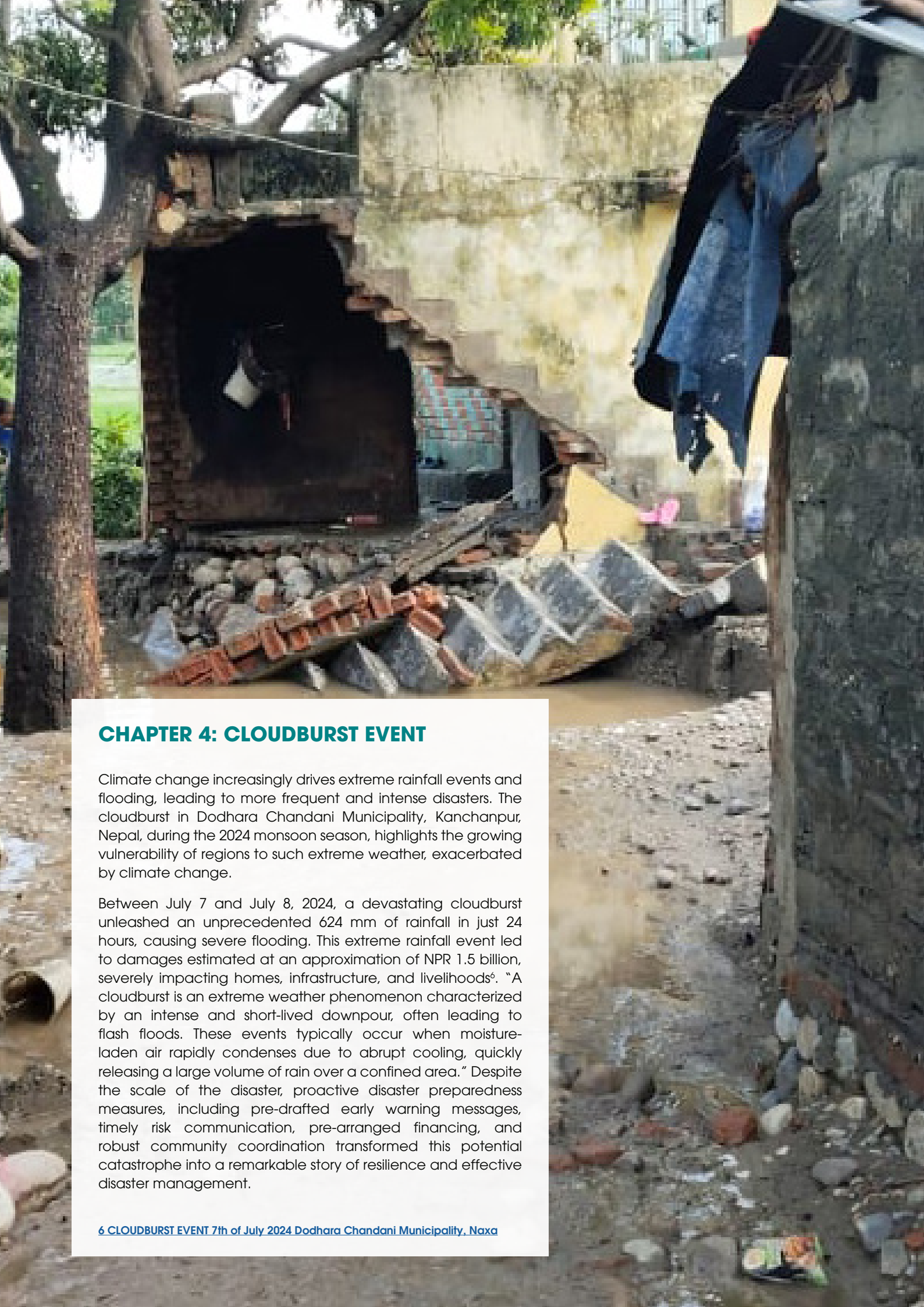
CHALLENGES

- Accommodating displaced individuals was challenging due to the limited availability of evacuation centers and safe spaces, which were often lacking essential facilities.
- Community reluctance and lack of awareness made it difficult to evacuate people to safe shelters on time during emergencies.
- The shortage of critical equipment, such as boats, sirens, and life jackets, constrained evacuation efforts.
- The absence of clear Standard Operating Procedures (SOPs) regarding disaster response led to inconsistencies in response coordination.
- Financial constraints restricted the scale and reach of anticipatory assistance.
- During the disaster, it was hard for people to follow and read the whole evacuation document.



LESSONS LEARNED

- Humanitarian Open Spaces need to be identified and mapped so that the internally displaced population can use these locations during crisis and humanitarian contexts.
- We should ensure pre-identified safe evacuation sites have adequate infrastructures and services to facilitate early and smooth evacuations.
- We can improve the acceptance and effectiveness of early actions by enhancing community engagement through awareness programs.
- Localized forecast-based action triggers can be used for more timely and precise anticipatory responses.
- The local government should have already allocated funds for anticipatory action to quickly provide cash and voucher assistance during disasters to improve financial preparedness.
- We must conduct regular post-event evaluations to refine the protocol for future preparedness to improve anticipatory action.
- Expand Impact-Based Forecasting (IBF) across multiple thematic areas to strengthen risk-informed decision-making and disaster resilience.
- Make Household-Level Disaster Risk Management Plans (HDRMPs) simple and integrate pictures to make them understandable and easy to read in case of emergency for people from all different backgrounds.



CHAPTER 4: CLOUDBURST EVENT

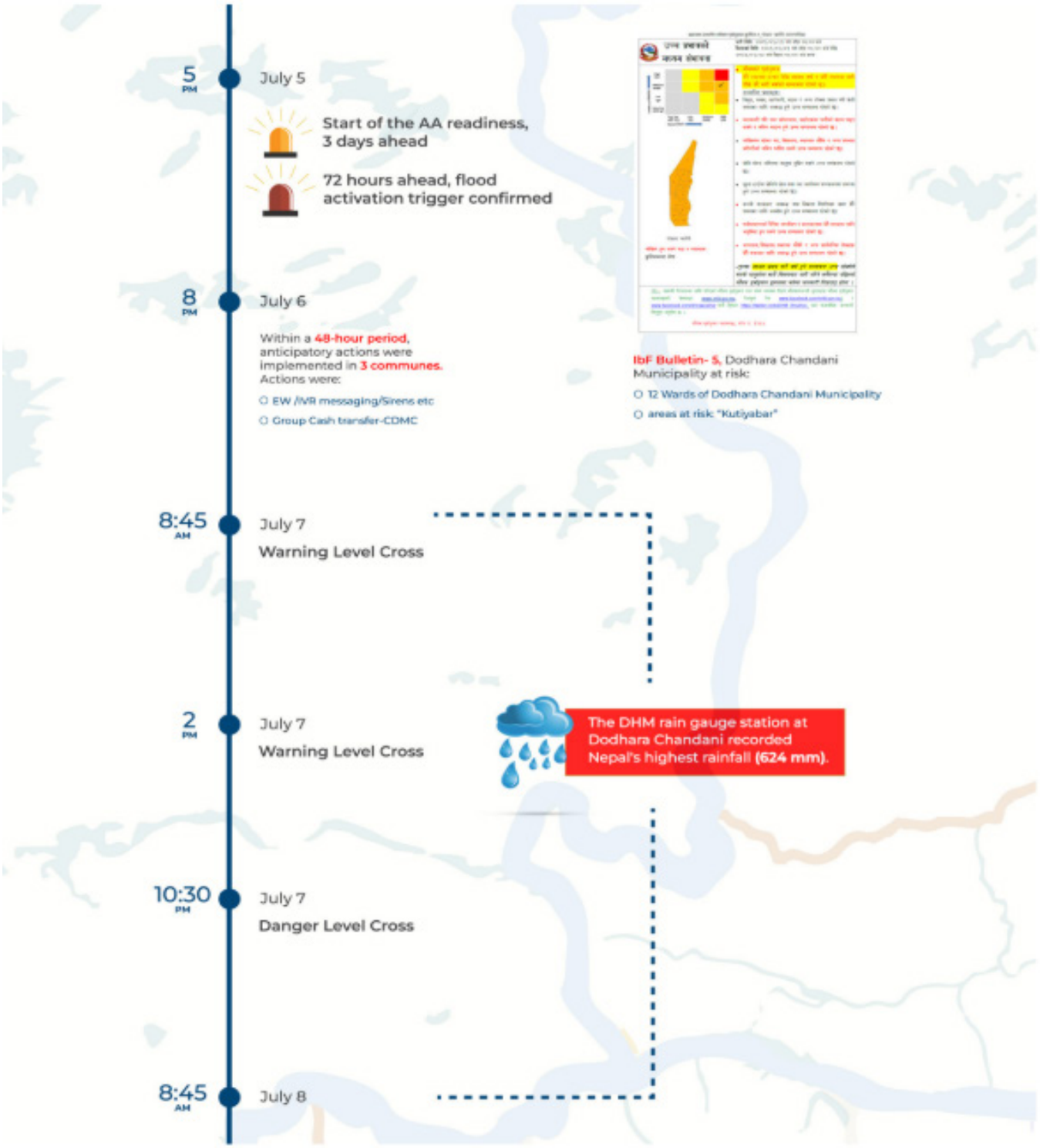
Climate change increasingly drives extreme rainfall events and flooding, leading to more frequent and intense disasters. The cloudburst in Dodhara Chandani Municipality, Kanchanpur, Nepal, during the 2024 monsoon season, highlights the growing vulnerability of regions to such extreme weather, exacerbated by climate change.

Between July 7 and July 8, 2024, a devastating cloudburst unleashed an unprecedented 624 mm of rainfall in just 24 hours, causing severe flooding. This extreme rainfall event led to damages estimated at an approximation of NPR 1.5 billion, severely impacting homes, infrastructure, and livelihoods[6]. "A cloudburst is an extreme weather phenomenon characterized by an intense and short-lived downpour, often leading to flash floods. These events typically occur when moisture-laden air rapidly condenses due to abrupt cooling, quickly releasing a large volume of rain over a confined area." Despite the scale of the disaster, proactive disaster preparedness measures, including pre-drafted early warning messages, timely risk communication, pre-arranged financing, and robust community coordination transformed this potential catastrophe into a remarkable story of resilience and effective disaster management.

6 CLOUDBURST EVENT 7th of July 2024 Dodhara Chandani Municipality, Naxa

TIMELINE OF ANTICIPATORY ACTIONS FOR THE CLOUDBURST

Our approach to anticipatory actions in response to the forecasted cloudburst event in Dodhara Chandani Municipality is broadly categorized into five key steps, as shown in the figure.



STEP 1: PRE-PREPARED EARLY WARNING AND EARLY ACTION MESSAGES

- Before the monsoon season, the project team and local partners collaboratively drafted 69 early warning and early action messages covering different scenarios. These messages were designed to be activated immediately based on pre-defined triggers, ensuring rapid communication during emergencies.
- On July 5, 2024, the Department of Hydrology and Meteorology (DHM) issued an Impact-Based Forecast Bulletin warning about potential high-impact rainfall. This triggered the dissemination of tailored messages, including alerts and actionable steps for at-risk communities.

STEP 2: DISSEMINATION OF MULTI-CHANNEL WARNINGS (JULY 6, 2024, 8 PM)

- Early warning messages were disseminated to 10,000 households via IVR calls, ensuring that communities understood the potential flood risk and steps to take for safety.
- Messages were disseminated through SMS, physical sirens, door-to-door announcements, and digital platforms like WhatsApp and Facebook to ensure maximum reach even in remote areas.
- The Household Disaster Management Plans (HDRMPs) were pre-distributed to families to provide detailed guidance on evacuation procedures and emergency preparedness.

STEP 3: TRIGGERING EARLY ACTIONS (JULY 7, 2024, 2 PM)

- Based on real-time monitoring and escalating flood risks, the municipality officially issued evacuation notices.
- Group Cash Transfers (GCTs) to Community Disaster Management Committees (CDMCs) were activated, evacuating 500 vulnerable individuals to designated safe shelters.
- Local teams coordinated logistics, ensuring priority assistance for the elderly, disabled, and vulnerable groups.

STEP 4: REAL-TIME MONITORING AND RESPONSE (JULY 7, NIGHT)

- The DASTAA platform provided real-time updates on water levels and flood-prone areas, guiding evacuation efforts and resource allocation.
- The project team and local teams navigated rising waters and challenging conditions to ensure no one was left behind, demonstrating effective on-ground coordination.

STEP 5: POST-EVENT RELIEF AND RECOVERY

- Accurate household-level datasets, mainly vulnerable families information facilitated targeted relief distribution, ensuring fair allocation of resources and minimizing duplication.
- The DASTAA system generated damage assessment reports, providing insights into affected areas and guiding post-disaster recovery planning.

WAY FORWARD

Anticipatory action as a concept is gaining traction globally, with projects being implemented in various locations across the world. However, there is no one-size-fits-all approach, as each community faces unique challenges and conditions. In our work in Nepal, we have made a concerted effort to make our lessons applicable to diverse contexts. We aim to ensure that the insights gained can be used to design effective anticipatory action-related interventions and frameworks in different countries, taking into account the specific risks, resources, and capacities of local communities. Through the implementation of the DASTAA and ACT FIRST projects, we have learned that combining local expertise in data and technology with community engagement can significantly improve disaster preparedness and save lives. As demonstrated in Dodhara Chandani, proactive anticipatory actions, such as early warning messages and evacuations, can save lives and protect property. The community's involvement and ownership in these processes were vital to the success of these interventions. However, significant challenges remain.

The way forward lies in strengthening institutional frameworks and embedding anticipatory action within national and local disaster management systems. As the project approaches its end, there are key questions for the future:

- How can we overcome poor data and technological infrastructures in vulnerable regions to enable effective hazard and vulnerability mapping and modelling for early warning systems?
- What strategies can be adopted to prioritize and ensure sustained financial and human resource investments in Impact-Based Forecasting and Anticipatory Actions across global disaster-prone communities?
- How can we effectively institutionalize anticipatory action within local governments and communities to ensure its long-term integration and impact?
- What approaches can be implemented to ensure the availability of ongoing resources and the development of local capacities to drive disaster preparedness and anticipatory actions in the future?
- How can we build and maintain long-term partnerships and foster local ownership to ensure the sustainability of anticipatory action beyond the project lifecycle?

NAXA
Address: Do Cha Marg, Maharajgunj-3, Kathmandu, Nepal
Website: https://naxa.com.np/
Email: info@naxa.com.np
Phone no: 01 4516543

NEPAL FLYING LABS
Address: Janamarg -04, Kathmandu Metropolitan city
Website: https://flyinglabs.org/nepal
Email: nepalflyinglab@gmail.com
Phone no: 9851216126

DANCHURCHAID IN NEPAL
Address: Bijayanagar, Sanepa, Lalitpur
Website: https://www.danchurchaid.org/
Email: sabi@dca.dk
Phone no: +977 1 5455621

NEPAL NATIONAL SOCIAL WELFARE ASSOCIATION (NNSWA)
Address: Mahendranagar, Kanchanpurt, Nepal
Website: https://nnswa.org.np/
Email: info@nnswa.org.np
Phone no: 977-99-522182

INSTITUTE OF HIMALAYAN RISK REDUCTION
Address: Hasapota Ganesh Marg, Jhamsikhel, Lalitpur, Nepal
Website: https://ihrr.org.np/
Email: info@ihrr.org.np
Phone no: +977 01 - 5448938

VIAMO NEPAL
Address: Lalitpur, Nepal
Website: https://viamo.io/
Email: nepal@viamo.io
Phone no: +977 9843030165