

# PHI: BAGUIO CITY SMART FLOOD WARNING, INFORMATION AND MITIGATION SYSTEM

DATA DISSEMINATION AND OUTREACH PLAN

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## ABBREVIATIONS

AASCTF	ASEAN Australia Smart Cities Trust Fund
ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BDRRMC	Barangay Disaster Risk Reduction and Management Committee
CAR	Cordillera Administrative Region
CCA	Climate Change Adaptation
CDRRMC	City Disaster Risk Reduction and Management Council
CDRRMO	City Disaster Risk Reduction and Management Office
CEO	City Engineer's Office
CMC	Crisis Management Committee
CPDO	City Planning and Development Office
CSO	Civil Society Organisation
CSWDO	City Social Welfare and Development Office
D&O	Dissemination and Outreach
DDO	Data Dissemination and Outreach
DFAT	Department of Foreign Affairs and Trade (Australia)
DOST	Department of Science and Technology (Philippines)
DOST-ASTI	DOST Advanced Science and Technology Institute
DOST-CAR	DOST Cordillera Administrative Region
DRR	Disaster Risk Reduction

DRRM	Disaster Risk Reduction and Management
EWS	Early Warning System
FEWS	Flood Early Warning System
GESI	Gender Equality and Social Inclusion
GIS	Geographic Information System
HSO	Health Services Office
ICT	Information and Communications Technology
LGBTQ+	Lesbian, Gay, Bisexual, Transsexual, Queer and other
LGU	Local Government Unit
LVO	Local Volunteer Observer
MITD	Management Information Technology Division
NDRRMA	National Disaster Risk Reduction and Management Authority
NDRRMC	National Disaster Risk Reduction and Management Council
OPCEN	Baguio City Emergency Operation Center
OTJ	On-the-job (Training)
PAGASA	Philippine Atmospheric Geophysical and Astronomical Services Administration
PDAO	Persons with Disabilities Office
PIO	Public Information Office
SCCC	Smart City Command Center
SOP	Standard Operating Procedures

## GLOSSARY OF TERMS

Term	Definition <sup>1</sup>
Affected population	Individuals, families, or communities devastated by the impacts of disasters, who suffer physical harm or economic damages and whose daily functions are interrupted by the disaster
Barangay	The smallest political unit in the Philippines, in urban areas equivalent to a district or neighbourhood
Capacity	A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk, or the effects of a disaster. Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management
Catchment	Area with a natural boundary (for example ridges or mountains) where all surface water drains to a common channel
Communication	The two-way process of distributing and receiving information that involves interaction between senders and receivers
Dissemination	The process of distributing information to relevant recipients
Disaster	A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability, and capacity, leading to one or more of the following: human, material, economic, and environmental losses and impacts
Disaster preparedness	The knowledge and capacities developed by governments, professional response and recovery organizations, communities, and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent, or current hazard events or conditions
Disaster response	The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected. Disaster response is predominantly focused on immediate and short-term needs
Disaster Risk Reduction and Management (DRRM)	The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies, and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster
Early action	Actions taken before a hazard event based on warning information to protect individuals, households, and communities from the impacts of a disaster
Early Warning System (EWS)	An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication, and preparedness activities, systems, and processes that enables individuals, communities, governments, businesses, and others to take timely action to reduce disaster risks in advance of hazardous events (UNISDR)
Emergency	Unforeseen or sudden occurrence, especially danger, demanding immediate action

<sup>1</sup> National Disaster Risk Reduction and Management Operations Center. 2021. Standard Operating Procedures and Guidelines; Mixed Methods Gender and Inclusion Study Report. PHI: Gender Transformative Approach for Strengthened Development, Application, and Replication of the Baguio City Smart Flood Early Warning. AASCTF. August 2021; United Nations Office for Disaster Risk Reduction. N.d. Terminology.

Term	Definition
Emergency Operations Centre (EOC, OPCEN)	A designated facility that is staffed to undertake multi-stakeholder coordination, manage information, and mobilize resources in anticipation of and/or to support incident operations.
Evacuation	Withdrawal of a population from a specific area to prevent the possible disastrous effects of a hazard
Flood risk	The likelihood of a flood event occurring, and the impact caused
Forced evacuation	An evacuation ordered as a resort when a disaster or emergency has been declared and danger of loss of lives is imminent, conditions exist that critically imperil or endanger the lives of those in a defined area
Gender	Gender encompasses gendered roles or expectations, societally enforced gender norms, and gender expression (including gendered attributes of clothing, hairstyles or mannerisms)
Landslide	A massive outward and downward movement of slope-forming materials
Marginalized people	Groups that experience discrimination and exclusion due to unequal power relationships across economic, political, social and cultural dimensions
Mitigation	Effort and actions undertaken to lessen or minimize the adverse impacts of hazardous events
Outreach	The expansion of the information dissemination to marginalized and vulnerable groups
Pre-Disaster Risk Assessment (PDRA)	A process to evaluate a given hazard's characteristics and its possible impacts to the populace. It further determines the appropriate level of response and corresponding actions from concerned agencies, LGUs, and other stakeholders
Resilience	The ability of a system, community, or society exposed to hazards to resist, absorb, accommodate, adapt to, transform, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management
Risk	The combination of the probability of an event and its negative consequences
Risk assessment	A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihood and the environment on which they depend
Shelter-in-place	Instructing or requiring people to remain in their current location until a danger has passed
Sub-catchment	Catchment of a tributary water channel draining into a main channel.
Typhoon	A tropical cyclone with a maximum sustained wind of 118 to 222 km/h (64 – 120 knots or 32.7 to 61.7 m/s)
Vulnerability	The conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards

# EXECUTIVE SUMMARY

The objective of the Data Dissemination and Outreach Plan (DDOP) is to define who is communicating what messages to whom and when, before, during and after a natural hazard event in Baguio city with specific reference to the Flood Early Warning System (FEWS) established with the support from the ASEAN Australia Smart Cities Trust Fund (AASCTF). The FEWS is developed with Baguio Local Government Unit (LGU) and other key stakeholders to improve community disaster preparedness, raise awareness, and ensure ownership.

The terms **Dissemination** and **Outreach** refer to the process of distributing information to relevant recipients (dissemination) and the expansion of the information dissemination to marginalized and vulnerable groups in Baguio (outreach).

This report follows the recommendations of the Baguio City Gender and Inclusion Study,<sup>2</sup> aiming to base the system on the understanding of needs of those most vulnerable and laying the ground for a further development of the FEWS in a collaborative manner with local stakeholders. A gender transformative approach to FEWS means that the system and processes are designed centering on those who might otherwise be considered an afterthought or left behind altogether - and empowering them.

In accordance with the Philippines' National Disaster Risk Reduction and Management Plan (NDRRMP), the country envisions a "Safer, adaptive and disaster resilient Filipino communities towards sustainable development." This will be achieved through specific actions in the four phases in the Disaster Risk Reduction and Management (DRRM) Cycle: (a) Disaster Prevention and Mitigation; (b) Disaster Preparedness; (c) Disaster Response; and (d) Disaster Recovery and Rehabilitation.<sup>3</sup> Following the DRRM cycle in the Communication and Outreach Plan means that different messages and channels are used in the different phases. This is reflected in the subsequent chapters.

The development and implementation of DRRM plans, programs and activities in the city of Baguio is carried out by the City Disaster Risk Reduction and Management Council (CDRRMC) members and Barangay DRRM Committees in every Barangay. The City Disaster Risk Reduction and Management Office (CDRRMO) and Barangay DRRM committees are additionally responsible for risk assessment activities, organizing training and knowledge management, as well as operating the multi-hazard early warning system. At the heart of DRRM activities during disasters lies the Baguio City Emergency Operations Centre (OPCEN). It serves as the central command and control facility responsible for the overview of emergency situations. The command responsibility includes provision of coordination, communication, direction, and control during emergencies.

The Baguio City FEWS, under the ownership of the LGU, is operated and maintained by the O&M Team consisting of LGU staff representing CDRRMO and Management Information Technology Division (MITD) and peer members from key partners and stakeholder organizations. The Baguio Smart City Command Center (SCCC) is to be the anchor for all smart city solutions/initiatives in Baguio, which is a key argument for eventually migrating the FEWS to this center and thereby gathering smart capabilities in one location.

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2 <https://events.development.asia/materials/20210823/aasctf-baguio-city-gender-and-inclusion-study>

3 National Disaster Risk Reduction and Management Plan (NDRRMP) 2011-2028 [https://ndrrmc.gov.ph/attachments/article/1980/National\\_Disaster\\_Risk\\_Reduction\\_and\\_Management\\_Plan.pdf](https://ndrrmc.gov.ph/attachments/article/1980/National_Disaster_Risk_Reduction_and_Management_Plan.pdf)

As Baguio is classified as a highly urbanized city, a common assumption is that large portions of the population are known to have access to various Information and Communications Technology (ICT) equipment, such as televisions, radios, computers (PCs/laptops), mobile phones, and smart devices (such as phones and tablets). While this to a degree is true, this does not consider those who have limited or no access to this equipment due to their economic or social standing, or due to a physical disability. Adopting a varied and redundant, multi-channel communication approach to disseminate disaster preparedness messages and warnings is encouraged. This is to ensure that urgent warning messages are disseminated as wide as possible and reach their intended recipients, regardless of the communication channel they prefer or have access to. This report provides an overview of the different channels and tools, along with the advantages and disadvantages of each channel.

As a general principle, preparedness messages and warnings should (as much as resources allow) make provisions for accessibility. This could be done by designing messages and warnings that can be easily read or interpreted by screen readers or text-to-speech apps (for people who are blind or have visual impairments) or by providing sign language and/or open/closed captioning or audio description (for people who are deaf or hard of hearing).

Recognizing the different concerns of the city's different target groups, a library of key messages centering on pre-disaster preparedness and post-disaster actions has been provided in this report. These key messages can be used by the city government in designing different communication materials for the different target groups. A suggested warning message structure/template for dissemination during disasters is also provided in this report, which includes the basic information that recipients would need to act on the warning. These messages and warnings will need to be validated in the test/validation phase in a stepwise manner, initially by the FEWS O&M team, subsequently by the Mayors' office and eventually by the end users at Barangay and household levels.

Important next steps in the process will be the testing and validation of the FEWS system and the Data Dissemination and Outreach (DDO) system in three phases, the preparation of Standard Operating Procedures (SOP) and eventually the development and testing of DDO material for different recipient groups. General awareness and education activities are important, including the integration of Disaster Risk Reduction and Management education in schools, in coordination with Department of Education and in partnership educational institutions in the city, the establishment of media partnerships to ensure effective delivery of messages and alerts, the development of handbooks/toolkits about flooding, how to prepare, what to do before, during, and after events and informational campaigns.

An Integration of Disaster Risk Reduction and Management education at the barangay level for adults and vulnerable individuals in the community is also important. It is advised to establish a Vulnerability Assessment program to easily identify households with special needs so emergency personnel can easily identify these households and prioritize their (early) evacuation, and not least to partner with NGOs who can help with implementing such a program.

It is further advised to develop a specific Gender and Social Inclusion action to test the messages on vulnerable focus groups and develop a flyer to be disseminated to households/stakeholders with easily digestible infographics and information about flooding, how to prepare, and what to do before, during and after a flooding event.

# 1. INTRODUCTION AND BACKGROUND



## 1.1 ASEAN AUSTRALIA SMART CITIES TRUST FUND PROGRAMME

In April 2019, the Asian Development Bank (ADB) approved the establishment of the ASEAN Australia Smart Cities Trust Fund (AASCTF or the Fund) under the Urban Financing Partnership Facility, with financing provided by the Government of Australia, through its Department of Foreign Affairs and Trade (DFAT). The Fund's envisioned impact aligns with ADB's Strategy 2030, as well as ASEAN's Sustainable Urbanization Strategy which aims to promote high quality of life, competitive economies, and sustainable environments. The expected outcome of the Fund will be that through the adaptation and adoption of digital solutions, across three core functional areas (planning systems, service delivery and financial management), systems and governance in participating ASEAN cities are improved, in particular by way of:

- Strengthening city planning processes by enhancing the collection, storage, analysis and utilization of data on geospatial platforms.
- Promoting the use of integrated and smart network management systems to strengthen operational systems and to improve quality and efficiency of service delivery.
- Introducing integrated financial management information systems to improve institutional credit worthiness and fiscal standing.

AASCTF acts as a mechanism for facilitating and channeling resources and financing for eligible projects, as well as activities agreed between DFAT and ADB for project preparation, implementation, and capacity development.

## 1.2 THE FEWS PROJECT

The ADB, through the AASCTF, is supporting Baguio City in implementing the Smart Flood Early Warning, Information and Mitigation System project. The project will assist the city with both the planning for flood mitigation and the delivery of the services of flood early warning and responses, using smart technologies. The project outcome is improved flood early warning system, responses, and mitigation measures of Baguio City. The project has also three outputs: (i) smart flood early warning information system (FEWS) established and operational; (ii) real-time data capture system established in four river basins in Baguio City; (iii) flood mitigation action plan prepared.

The overall approach followed in producing this project's three outputs is to breakdown the project into working tasks, with each task containing key activities, and where inter-dependencies between tasks/ activities are accounted for by defining milestones while keeping close contact with the project's working group. The project tasks and associated key activities and deliverables are shown in Table 1.

### 3 Introduction and background

**Table 1 Activities and deliverables for Baguio City Smart Flood Warning, Information and Mitigation System.**

Task	KEY ACTIVITIES AND DELIVERABLES
<b>Task 1 – Baseline Assessment</b>	<ul style="list-style-type: none"> <li>• Setup working group, conduct scope consultations, revise workplan</li> <li>• Data and Information Collection</li> <li>• Establish baseline on climate change data and information</li> <li>• Plan the on-the-job (OTJ) training component</li> <li>• <b>D1: Baseline Assessment Report</b> (delivered January 2021)</li> </ul>
<b>Task 2 – Hydraulic model setup, including hazard and risk mapping</b>	<ul style="list-style-type: none"> <li>• Collect additional data, if needed, including river surveys</li> <li>• Confirm boundary conditions and target design levels for the hydraulic model and for inclusion of potential nature-based solutions (NbS)</li> <li>• Develop hydrologic model for all 4 rivers</li> <li>• Develop hydraulic model for the primary drainage system, incl. calibration</li> <li>• Hazard and Risk Assessment</li> <li>• OTJ training</li> <li>• <b>D2: Hydraulic Model and Hazard and Risk Mapping Assessment Report</b> (delivered August 2021)</li> </ul>
<b>Task 3 – Design of a Flood Early Warning System (FEWS)</b>	<ul style="list-style-type: none"> <li>• Planning the framework of the FEWS</li> <li>• Procuring and installing measurement devices in selected locations for pilot river (Balili)</li> <li>• Development of the pilot river real-time data acquisition system</li> <li>• Design the data storage and management system</li> <li>• Overall forecast system framework (database)</li> <li>• Setting up of FEWS at the LGU, and start of the real-time online simulations, before the monsoon</li> <li>• OTJ training</li> <li>• <b>D3.1: FEWS offline setup</b> (delivered September 2021)</li> <li>• <b>D3.2: Flood Early Warning System report</b></li> </ul>
<b>Task 4 – Data dissemination and outreach plan (this report)</b>	<ul style="list-style-type: none"> <li>• Design dissemination and outreach activities, including: Website/Dashboard, web applications – SMS alerts, mobile apps, e-mail chimp, etc.</li> <li>• Define dissemination roles and responsibilities among key stakeholders</li> <li>• Development and dissemination of FEWS O&amp;M plan. Maintenance will be undertaken during the monsoon period (documented in D3.2)</li> <li>• OTJ training (documented in D3.2)</li> <li>• <b>D4: Data Dissemination and Outreach Plan</b> (this report)</li> </ul>
<b>Task 5 – Flood Mitigation Action Plan</b>	<ul style="list-style-type: none"> <li>• Review and gap analysis of urban drainage data, including recommendations for actions.</li> <li>• Finalization of review of drainage data, documents, and guidelines for drainage infrastructure, initiated in task 2.</li> <li>• Development of multifunctional NbS typology toolbox, including key enabling criteria for implementation of typologies.</li> <li>• Demonstrate applicability and benefits of NbS typologies for 3 pilot-sites, including preliminary site-specific hydraulic calculations.</li> <li>• OTJ training</li> <li>• <b>D5: Flood Mitigation Action Plan</b> (delivered December 2021)</li> </ul>
<b>Task 6 – Replication of real-time data capture, and Monitoring &amp; Evaluation</b>	<ul style="list-style-type: none"> <li>• Procuring and installing measurement devices in the remaining three rivers</li> <li>• Evaluation of the FEWS (post-monsoon period)</li> <li>• Finalize data assimilation and forecast modelling</li> <li>• System Performance Assessment</li> <li>• OTJ training</li> </ul>
<b>Task 7 – Project completion</b>	<ul style="list-style-type: none"> <li>• Wrapping up everything</li> <li>• <b>D6: Final Report</b></li> </ul>
<b>Task 8 – Targeted Capacity Building Programme to Enhance Delivery of a Sustainable FEWS</b>	<ul style="list-style-type: none"> <li>• Implementation of 3-module Targeted Capacity Building Programme led by DHI and supported by Ramboll</li> <li>• E-Learning Platform with course material and training videos</li> <li>• <b>D2.5A: Scoping &amp; Training Course Design Report</b> (delivered April 2022)</li> <li>• <b>D2.5B: Module 1 and Module 2 Course Evaluation Reports</b> (delivered August 2022)</li> <li>• <b>D2.5C: Module 3 Course Evaluation Report</b> (delivered December 2022)</li> </ul>

### 1.3 SCOPE AND OBJECTIVE OF AN UPDATED DATA DISSEMINATION AND OUTREACH PLAN

The terms **Dissemination** and **Outreach** refer to the process of distributing information to relevant recipients (dissemination) and the expansion of the information dissemination to marginalized and vulnerable groups in Baguio (outreach). Hence, the objective of the Data Dissemination and Outreach plan is to define who is communicating what messages to whom and when, before, during and after a natural hazard event in Baguio city.

The FEWS is developed with Baguio Local Government Unit (LGU) and other key stakeholders to improve community disaster preparedness, raise awareness, and ensure ownership. The FEWS is also set to become an integral element within the overall vision of Baguio City to become a truly resilient, dynamic, and smart city.

The terms **Dissemination** and **Communication** are often used covering overlapping actions. In this publication, we differentiate between dissemination, being one-way information send through publications, social media, websites, SMS etc. Communication is a two-way process and involves interaction between senders and receivers of information, which may be needed in some cases, when dealing with marginalized and vulnerable groups.

### 1.4 INTENDED AUDIENCE OF THE PLAN

The intended audience of the plan are the key stakeholders at a local level:

- The City Disaster Risk Reduction and Management Council (CDRRMC)
- The City Disaster Risk Reduction and Management Office (CDRRMO) and its Emergency Operations Centre (OPCEN)
- The Barangay DRRM Committees in every Barangay
- Private and NGO emergency responders

## 1.5 WHY AN UPDATED DATA DISSEMINATION AND OUTREACH PLAN FOR BAGUIO CITY?

Baguio City is located in the northern part of the Philippines, one of the most hazard-prone countries in the world.<sup>4</sup> The high exposure to floods, landslides, typhoons, and earthquakes, combined with Baguio City's mountainous location and growing population, threatens its long-term economic stability and safety.

After the disastrous impact of typhoons Ondoy and Pepeng in 2009, which resulted in more than 3000 people affected by flooding (Figure 1), the International Centre for Water Hazard and Risk Management (ICHARM) study concluded that main causes were limited drainage capacity due to waste buildup, as well as urban sprawl. The uncontrolled population growth of Baguio City partially responsible for the urban sprawl also causes a rapid development of unplanned settlements in high-risk and overcrowded areas, further exacerbating flood and landslide vulnerability of the residents.

The already high risk of disasters is expected to be exacerbated by climate change, which is likely to increase the frequency and intensity of extreme rainfall events, worsening Baguio's exposure to floods and rain-induced landslides.

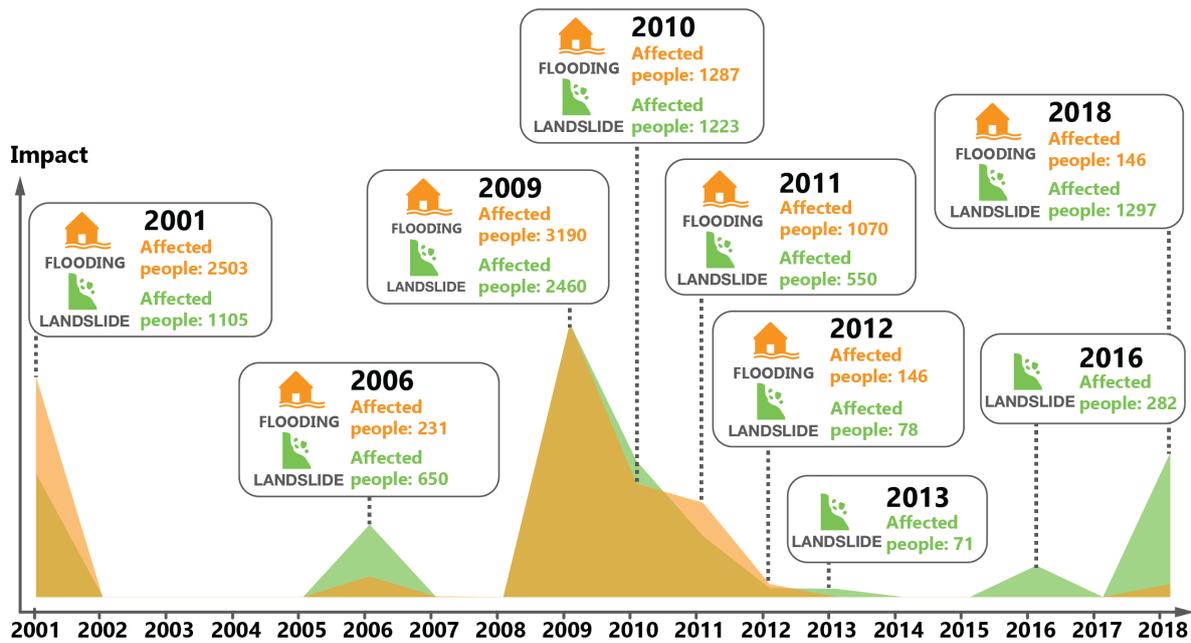
The ADB, through the AASCTF, supports Baguio City in implementing the Smart Flood Early Warning, Information and Mitigation System (FEWS) project. The project will assist the city with both the planning for flood mitigation and the delivery of the services of flood early warning and responses, using smart technologies. The project outcome is the establishment of an inclusive flood early warning system, a system of real-time monitoring stations in the rivers of Baguio City, and the preparation of a flood mitigation action plan. An important task in the project is the preparation of a Data Dissemination and Outreach plan.

The FEWS is developed with Baguio LGU and other key stakeholders to improve community disaster preparedness, raise awareness, and ensure ownership. The FEWS is also set to become an integral element within the overall vision of Baguio City to become a truly resilient, dynamic, and smart city.

The hydrodynamic modelling presented in the *Hydraulic Model and Hazard and Risk Mapping Assessment Report*<sup>5</sup> shows the most flood-prone catchments and barangays. The scope of Dissemination and Outreach activities presented in this plan will concern the entirety of Baguio City. However, special focus in its implementation should be brought to the most-at-risk areas outlined in Appendix A.

4 A. Bruca, V. Roezer, D. D.S, R. Byrnes, M.-L. Ravago, F. Cruz and G. Narisma, "Disaster impacts and financing: local insights from the Philippines," Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London, 2020.

5 Hydraulic Model and Hazard and Risk Mapping Assessment Report, Phi: Baguio City Smart Flood Warning, Information And Mitigation System, AASCTF, July 2021



**Figure 1: Historical disasters in Baguio City**

Source: Based on CDRRMO. 2020. Disaster Data Analysis. Baguio City

## 1.6 THE STRUCTURE OF THE PLAN

The Data Dissemination and Outreach Plan (DDO plan) is structured around the WHY, WHO, HOW, WHAT and WHEN (see Figure 2). Initially, the report presents why the plan is necessary and for whom it is intended from institutional level to end-users, including the vulnerable groups in Baguio city. Subsequently, the Plan will introduce how the warnings will be transferred into different messages and to the relevant recipient using different channels. Examples of different messages and channels and messages will be presented and discussed. Finally, a stepwise plan for testing and validation will be presented.



**Figure 2: The approach of the DDO plan**

Source: Ramboll

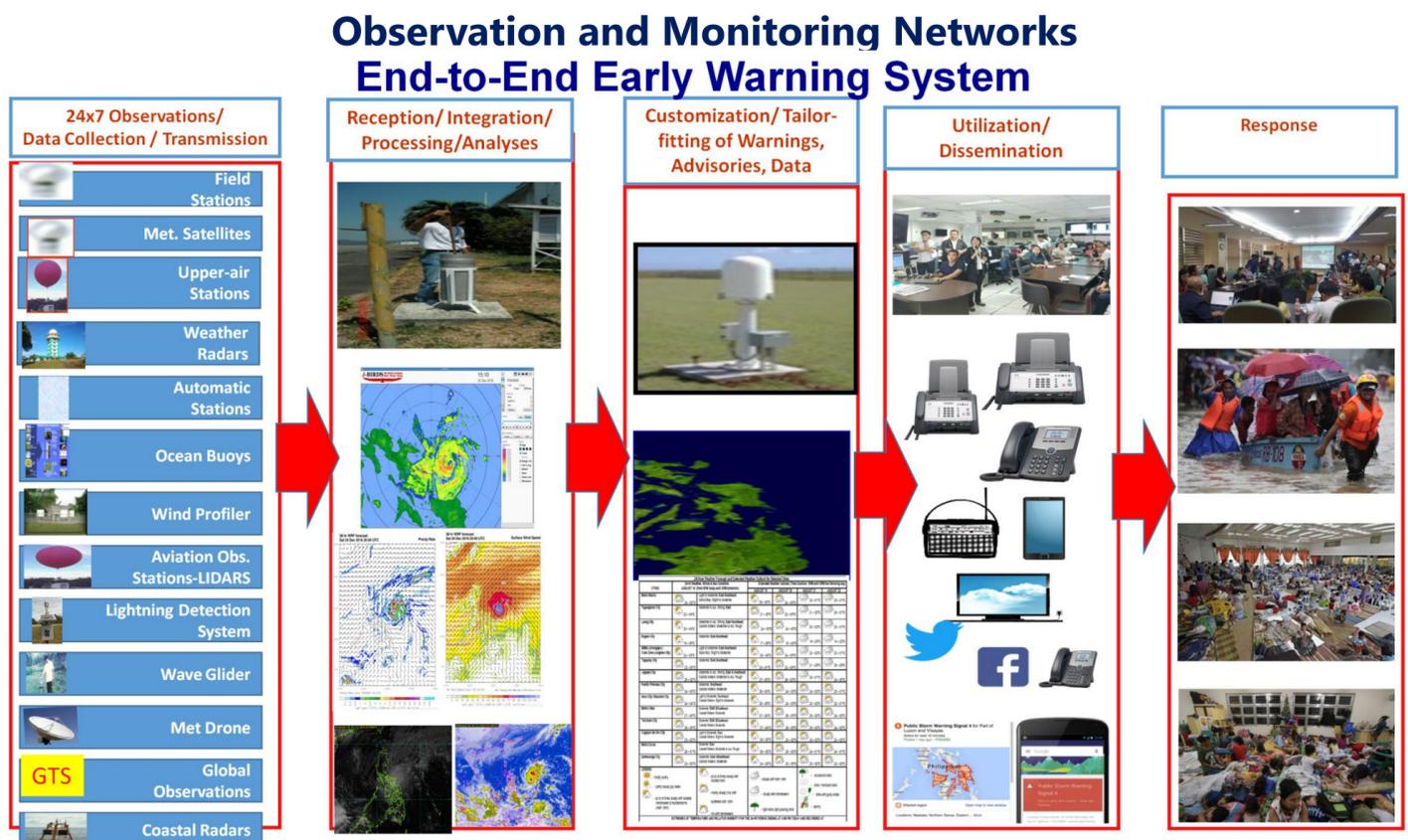
After a brief introduction, the background, context and the concept of People-centric Flood Early Warning, the plan will present the key stakeholders and their responsibilities, main channels of dissemination and communication, the recipients, incl. vulnerable groups, trusted authorities, and key messages for dissemination. Finally, the plan will present recommendations for testing dissemination of information under the FEWS in Baguio and ways forward.

## 2. EARLY WARNING SYSTEMS



Multi-hazard Early Warning Systems in the Philippines can be divided into five stages from end-to-end (Figure 3), consisting of:

- Data collection and automatic transmissions
- Processing and Analysis
- Tailoring – Advisory development
- Dissemination and Outreach
- Response – physical actions



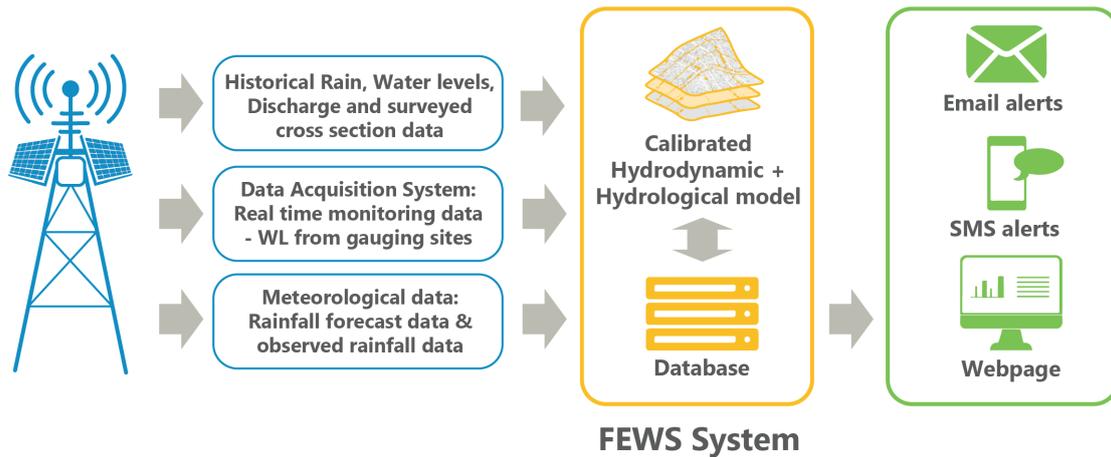
**Figure 3: Multi-Hazard Early Warning System (MHEWS) in the Philippines**

Source: A. Monteverde et. al. DOST-PAGASA, UNCC workshop, Bangkok, February 2020<sup>6</sup>

The technical design of the Flood Early Warning System for Baguio City focuses on the first three stages, and the present Data Dissemination and Outreach Plan deals primarily with step 4, Dissemination and outreach from the Baguio City Emergency Operations Centre (OPCEN) to the public and other stakeholders, mentioned in the Recipients chapter.

6 [https://www.unescap.org/sites/default/files/2a\\_Lorenzo%20Moron\\_Multi%20Hazard%20Early%20Warning%20System%20in%20the%20Philippines.pdf](https://www.unescap.org/sites/default/files/2a_Lorenzo%20Moron_Multi%20Hazard%20Early%20Warning%20System%20in%20the%20Philippines.pdf)

The design approach for FEWS system in Baguio is presented in Figure 4 and will include real-time data collection through river gauges/sensors, rainfall gauges/sensors, as well as weather and rainfall forecast (WRF) data. The hydrodynamic and hydrological models are calibrated using historical data. Through real-time operation of the FEWS, areas at-risk of flooding can be identified and the outcomes of the FEWS are transferred into specific warnings/alerts in the form of emails and/or webpages for internal use within the LGU. These messages will subsequently be scrutinized and transferred into specific messages intended recipients, e.g., specific barangays.



**Figure 4: The design approach for the FEWS in Baguio**

Source: Ramboll

The following technical outputs of the Baguio FEWS system will be used when developing the specific messages to specific recipients identified in the Dissemination and Outreach plan:

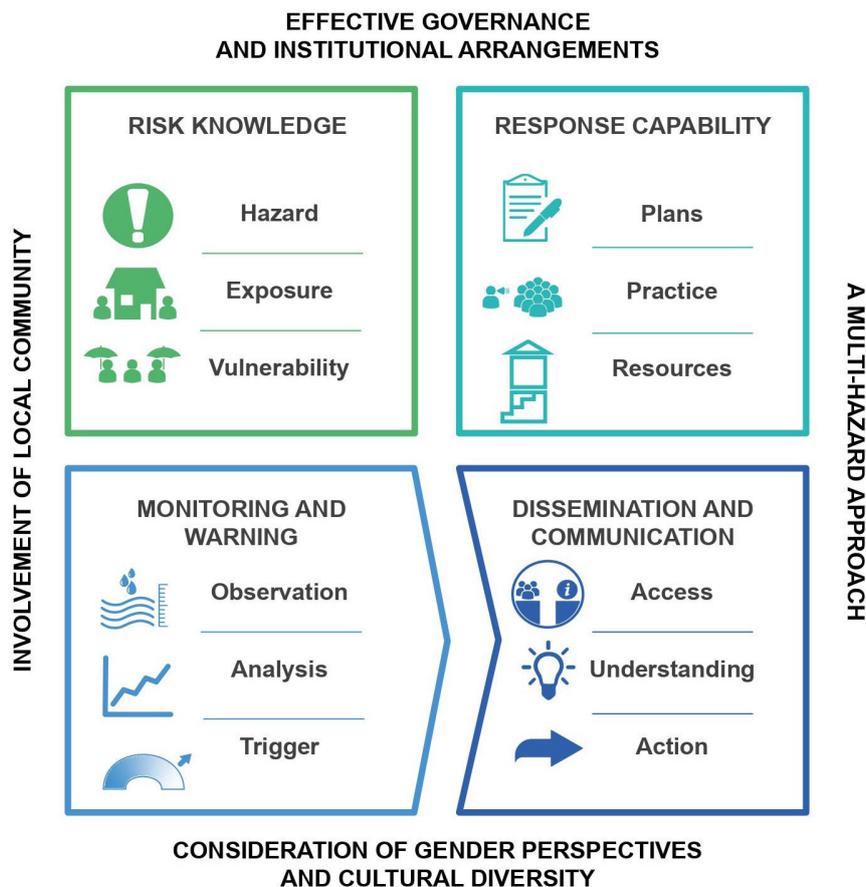
- Water level forecasts and real-time monitoring
- Rainfall forecasts and real-time monitoring
- Warnings/Alerts when water levels exceed the norm

The quantitative output from the FEWS will be translated into qualitative warning messages to be disseminated to the public following a testing and validation period. As an example, qualitative warning messages can be generated for expected overtopping of riverbanks at specific locations.

## 2.1 PEOPLE-CENTRIC FLOOD EARLY WARNING

According to the *Baguio City Gender and Inclusion Study*,<sup>7</sup> an effective, people-centric FEWS implies appropriate and timely early reaching the last mile, including the most vulnerable. It comprises of 4 core components outlined in Figure 5: i) Risk Knowledge, ii) Response Capability, iii) Monitoring and Warning, and iv) Dissemination and Communication. This is complemented by four cross-cutting areas which an effective FEWS needs to include throughout: i) effective governance and institutional arrangements, ii) a multi-hazard approach, iii) involvement of local community, and iv) consideration of gender perspectives and cultural diversity.

7 Mixed Methods Gender and Inclusion Study Report. PHI: Gender Transformative Approach for Strengthened Development, Application, and Replication of the Baguio City Smart Flood Early Warning. AASCTF. August 2021



**Figure 5: Elements of an effective early warning system**

Source: Practical Action, 2020, adapted from World Meteorological Organisation, 2017

The Baguio City Gender and Inclusion Study provides a further frame for analysis with 9 main themes that have particular relevance to creating a Gender Transformative Early Warning System:

1. Impact and Vulnerability,
2. Risk Knowledge,
3. Monitoring and warning,
4. Communication and Dissemination,
5. Preparedness,
6. Evacuation,
7. Evacuation facilities,
8. Post-Event Relief and Longer-Term Recovery, and
9. Governance and Participation.

Out of the nine themes suggested by the study, the present publication focuses on Communication and Dissemination, including how warning messages may reach the marginalized and vulnerable groups. This report follows the recommendations of the Baguio City Gender and Inclusion Study, aiming to base the system on the understanding of needs of those most vulnerable and laying the ground for a further development of the FEWS in a collaborative manner with local stakeholders. A more detailed description of recommendations from the study and how it applies to this plan can be found in Appendix B.

# 3. INSTITUTIONAL SETUP



This chapter provides an overview of the legislation concerning disaster risk reduction and management in The Philippines, as well as the relevant stakeholders and their responsibilities on a national, regional and local scale.

The country has a long history of disaster risks, with approaches to addressing them evolving over the decades. This has created a rich institutional and legal landscape that a new FEWS needs to be aligned with in order to function effectively and make efficient use of the knowledge exchange and communication between the many stakeholders involved in DRRM activities. A thorough understanding of that landscape and anchoring the FEWS in the relevant local institutions ensures long-term sustainability of the system and allows for early identification of potential barriers and capacity gaps, but also opportunities to develop the FEWS further.

### **3.1 DISASTER RISK REDUCTION AND MANAGEMENT LEGAL FRAMEWORK**

Since the 1970s, Philippines has made progress in creating and updating the country's DRRM policy, moving away from a preparedness and response-oriented approach to one focused mainly on disaster risk reduction.

This change in mindset was marked by the signing of the Strategic National Action Plan (SNAP) of 2009-2019, which introduced a 10-year roadmap of disaster risk reduction and was guided by the international Hyogo Framework for Action (HFA). In addition to shifting from a technical, reactive approach to a more proactive one, the SNAP put more emphasis on community resilience, poverty alleviation, sustainable development, land use planning, and multi-stakeholder coordination on a national and local scale.

One of the main priority actions of SNAP was to create a comprehensive, multi-sectoral, multi-hazard DRRM law consistent with international standards to provide the basis for all DRRM activities in the country. This took shape in the Republic Act 10121 – ‘An Act Strengthening the Philippine Disaster Risk Reduction and Management System, Providing for the National Disaster Risk Reduction and Management Framework and Institutionalizing the National Disaster Risk Reduction and Management Plan, Appropriating Funds Therefor and for Other Purposes’ also known as the *Disaster Risk Reduction and Management (DRRM) Act of 2010*.

The DRRM Act of 2010 recognizes four distinct, but mutually enforcing thematic areas, which are consistent with the four phases of the DRRM cycle (see: section 4.1 of this report):

1. disaster prevention and mitigation,
2. preparedness,
3. response,
4. recovery and rehabilitation.

The DRRM Act, as well as the National DRRM Framework established in 2011, aim to mainstream DRRM in national and sectoral plans, prioritize the most vulnerable groups, strengthen the capacity of local communities, LGUs and civil society organizations, and establish a DRRM Fund both locally and nation-wide. New organizations such as the National DRRM Council were created or remade from previous institutions to coordinate DRRM activities in the country (see: section 3.2).

Appendix C provides an overview of the main DRRM acts and documents, as well as related domestic and international policies.

### 3.2 STAKEHOLDERS

Strong stakeholder partnerships are essential in ensuring success and sustainability of the FEWS. Through stakeholder partnerships with public and private organizations as well as academia, the LGU can gain knowledge, experience and innovation improving the overall impact and usefulness of the FEWS for the City of Baguio.

The Philippine Disaster Risk Reduction and Management Act of 2010, gives the overview of the organizations responsible for coordinating DRRM activities on the national, regional, and local level and underlines the importance of collaboration between key stakeholders to ensure proper knowledge exchange and rapid communication in developing and operating a local FEWS. Figure 6 shows an overview of the flow of communication among DRRM councils on different levels, NDRRMC member agencies and other related stakeholders.

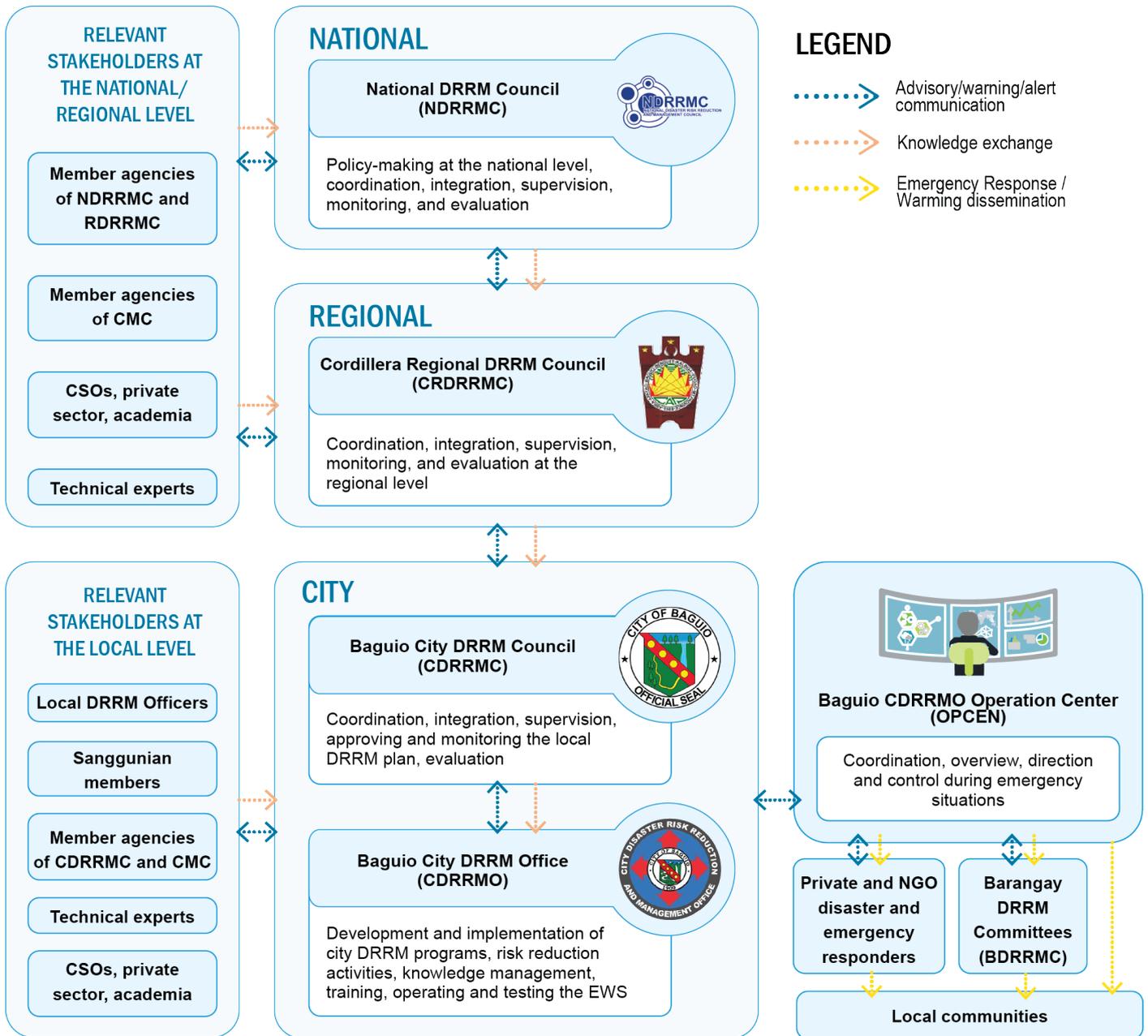


Figure 6: Stakeholders in disaster risk reduction on national, regional, and local level

Source: Ramboll

### 3.2.1 NATIONAL STAKEHOLDERS

The National Disaster Risk Reduction and Management Council (NDRRMC) is the highest policy-making platform in disaster risk reduction in the country, responsible for managing and coordinating nationwide DRRM programs. It is also responsible for integration, supervision, monitoring, and evaluation of DRRM activities. The NDRRMC advises the Office of the President on the status of prevention, mitigation, disaster preparedness, disaster response, and disaster recovery and rehabilitation efforts.<sup>8</sup>

The NDRRMC board members include:

- Department of National Defense (DND) – Chairperson of the NDRRMC
- Department of Science and Technology (DOST) – Vice-Chairperson for Prevention and Mitigation
- Department of Interior and Local Government (DILG) – Vice-Chairperson for Preparedness
- Department of Social Welfare and Development (DSWD) – Vice-Chairperson for Response
- National Economic and Development Authority (NEDA) – Vice-Chairperson for Rehabilitation and Recovery
- Office of Civil Defense (OCD) – Executive Director of the NDRRMC
- Office of the President (OP)

In addition to departments and government agencies, the NDRRMC members include financial organisations, local government units, civil society organisations and private sector representatives. The full list of NDRRMC member agencies can be found in Appendix D.

The Office of Civil Defence (OCD) is the operating arm of the NDRRMC. The institutional integration of DRRM and CCA activities on the national, regional, provincial, municipal, and barangay scales is supported by the OCD's nationwide vertical network.

### 3.2.2 REGIONAL STAKEHOLDERS

The national council has its regional counterparts in the Regional Disaster Risk Reduction and Management Councils (RDRRMCs), composed of regional-level executives of government agencies making up the NDRRMC. With the exception of the policy making function of the NDRRMC, the RDRRMCs, similarly, carry out coordination, integration, supervision, monitoring, and evaluation functions.

The DRRMCs at the national and regional level may call upon other government and non-government organisations for assistance. These stakeholders include:

- Member agencies of the NDRRMC and RDRRMCs,
- Member agencies of the National/ Regional Crisis Management Committee (CMC),
- Technical experts (to help in risk assessment and provide other technical information) such as:
  - Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) for hydro-meteorological hazards,
  - Mines and Geosciences Bureau (MGB) for rain-induced landslides,
  - Climate Change Commission (CCC) for climate-related hazards,
  - CSOs, private sector organisations.

### 3.2.3 LOCAL STAKEHOLDERS

#### 3.2.3.1 City Disaster Risk Reduction and Management Council

At the local level in Baguio City, the main planning, coordination, integration, supervision, monitoring, and evaluation functions lie with the City Disaster Risk Reduction and Management Council (CDRRMC), with the City Mayor acting as chairperson.

The development and implementation of DRRM plans, programs, and activities within the city is carried out by the CDRRMC members - key departments, national agencies in the city, civil society organizations, professional organizations, academia, and private sector. The full list of CDRRMC members can be found in Appendix E.

CDRRMC is additionally responsible for approving and monitoring the implementation of the City's DRRM Plan and its consistency with other national, regional, and local planning programs, as well as ensuring the integration of DRRM and CCA into local development programs and budgets. In emergency situations, it is the CDRRMC who recommends the implementation of forced or pre-emptive evacuation. The DRRM Act of 2010 reinforces the role of CDRRMC as a key player in pursuing the mission of creating a 'sustainable and enabling environment that increases community consciousness on hazards, aims for zero casualty and reduce human suffering, decrease property damage, and protect environmental sensitive areas from all types of disasters'.

#### 3.2.3.2 City Disaster Risk Reduction and Management Office

The CDRRMO serves as the secretariat and executive arm of the CDRRMC. Its responsibilities include:

- Setting the direction for development, implementation, and coordination of DRRMS programs in Baguio City, implement risk reduction measures, implement policies, plans and programs of the CDRRMC,
- Designing and coordinating DRRM programs, projects, and activities consistent with NDRRMC's standards in collaboration with relevant local organizations,
- Facilitate risk assessment and contingency planning activities, consolidate local risk information,
- Conduct training and knowledge management, both on a broader awareness raising level, as well as training and equipping DRRM staff and local response teams,
- Operate the multi-hazard early warning system,
- Formulate and implement a comprehensive local DRRM Plan,
- Continuously monitor hazards, vulnerabilities, and risks,
- Disseminate information on these hazards, vulnerabilities, and risks,
- Coordinate disaster response, carry out evacuation, recovery activities,
- Strengthen the collaboration with relevant agencies, CSOs, private sector organizations and volunteers.

The CDRRMO and Barangay DRRM committees are additionally responsible for risk assessment activities, organizing training and knowledge management, as well as operating the multi-hazard early warning system.

At the heart of DRRM activities during disasters lies the Baguio City Emergency Operations Centre (OPCEN). It serves as the central command and control facility responsible for the overview of emergency situations (Figure 7).

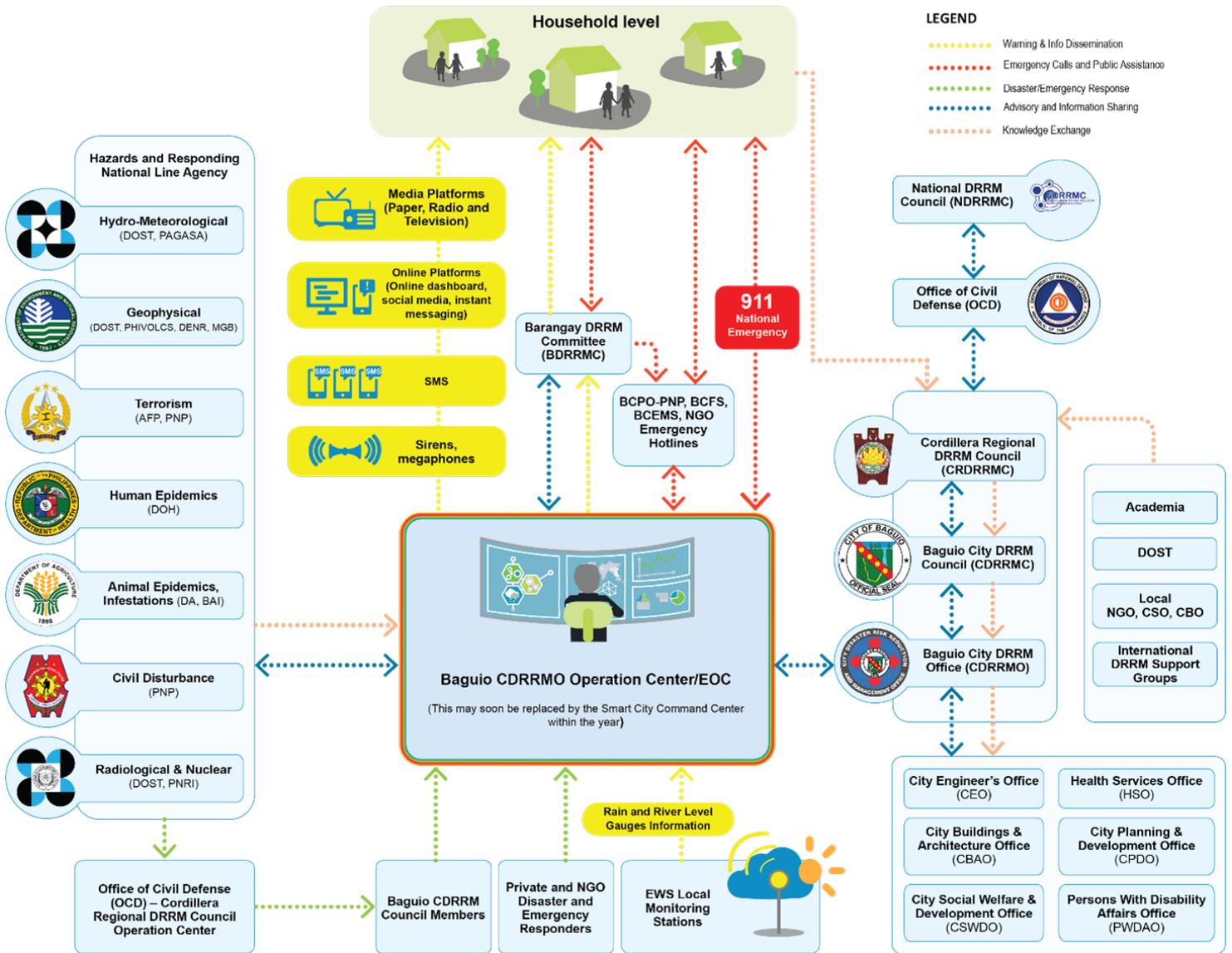


Figure 7: Baguio City CDRRMO OPCEN operational flowchart including local stakeholders

Source: Ramboll

The Baguio City CDRRMO OPCEN is responsible for provision of coordination, direction, and control during emergencies. It collects information from monitoring stations, partner agencies, emergency responders, and directly from the affected communities through NVOs and emergency hotlines to create an overview of the situation. OPCEN’s responsibility also includes the dissemination of warnings.

### 3.3 INSTITUTIONAL SETUP FOR THE BAGUIO CITY FEWS

In addition to the stakeholders involved in all DRRM activities at the national, regional, and local level described thus far, this section will address local stakeholders most closely linked to the Baguio City FEWS. Baguio LGU maintains ownership of the FEWS. Within LGU, the system is anchored between three bodies: CDRRMO and its OPCEN, Management Information Technology Division (MITD), and Baguio Smart City Command Center (SCCC). It was essential to place the FEWS into the already established organisational structure to leverage the connections between LGU staff and peer organisations, to facilitate knowledge exchange, and ensure long-term effectiveness beyond the completion of the pilot project in December 2022.

The FEWS operations and maintenance team consists of LGU staff with support from peer organisations, such as PAGASA, DOST-CAR, DOST-ASTI, Saint Louis University, University of Cordilleras, and District Engineering Office. These partnerships provide two-way benefits, where the partnering organizations gain access to the data and outputs from the FEWS. By partnering with the LGU on the FEWS the partnering organizations can demonstrate their support and commitment to protecting the citizens of Baguio by ensuring timely and inclusive flood warnings. The full composition and responsibilities of the FEWS O&M Team can be found in the *Flood Early Warning System Report*.<sup>9</sup>

#### 3.3.1 MANAGEMENT INFORMATION TECHNOLOGY DIVISION (MITD)

The Management Information Technology Division (MITD) is a division under the Baguio City Mayor's Office. Its main functions include managing information and communications technology (ICT) projects, provision of information and database management, systems development, and maintenance, managing and administration of network infrastructure and IT equipment in the City Government of Baguio.

The FEWS servers are currently anchored at the MITD with the staff of the MITD and Baguio City Smart City Command Center (SCCC) working closely together and supporting each-other. Eventually, it is recommended to migrate the FEWS to the SCCC when the on-site set-up allows for it.

#### 3.3.2 BAGUIO SMART CITY COMMAND CENTER

The Baguio Smart City Command Center (SCCC) was established in 2021 with the aim of collecting, gathering and analysing data; making decisions that protect life and property, maintaining continuity of the organization within the scope of applicable laws; and dissemination of decisions to all concerned agencies and individuals'.

It contains a state-of-the art platform which consolidates all system applications and digital data for a smarter city. The major components include the integrated command center for disaster monitoring and response, artificial intelligence-enabled video surveillance system, environmental monitoring, smart traffic signalization, smart mobility as well as serving as a digital hub for all data and information that are accessible to the policymakers, local planners, and the public.

The SCCC is to be the anchor for all smart city solutions/initiatives in Baguio, which is a key argument for eventually migrating the FEWS to this center and thereby gathering smart capabilities in one location. The ambition for SCCC is to be a center that allows for data-driven decisions in near real-time which is truly in line with the scope of the FEWS.

9 Flood Early Warning System Report. PHI: Baguio City Smart Flood Warning, Information and Mitigation System AASCTF. 2022.

# 4. COMMUNICATION IN THE FOUR DRRM CYCLE PHASES



This chapter describes the four phases of the DRRM cycle, and the key actions undertaken in each of the phases. This is followed by an overview of the current flow of communication and the responsible stakeholders in Baguio City in the four DRRM Cycle phases, as indicated by the CDRRMO OPCEN standard operating procedures, which can be found in Appendix F.

A clear line of communication and awareness of stakeholders' responsibilities during each phase of the DRRM cycle is crucial for maintaining an overview of emergency situations and short reaction time needed for an effective FEWS. In this section and the following ones, focus is brought to the communication chain during the preparation and response phases, during which the dissemination of warnings takes place and the OPCEN operates in full attention.

## 4.1 FOUR PHASES OF THE DRRM CYCLE

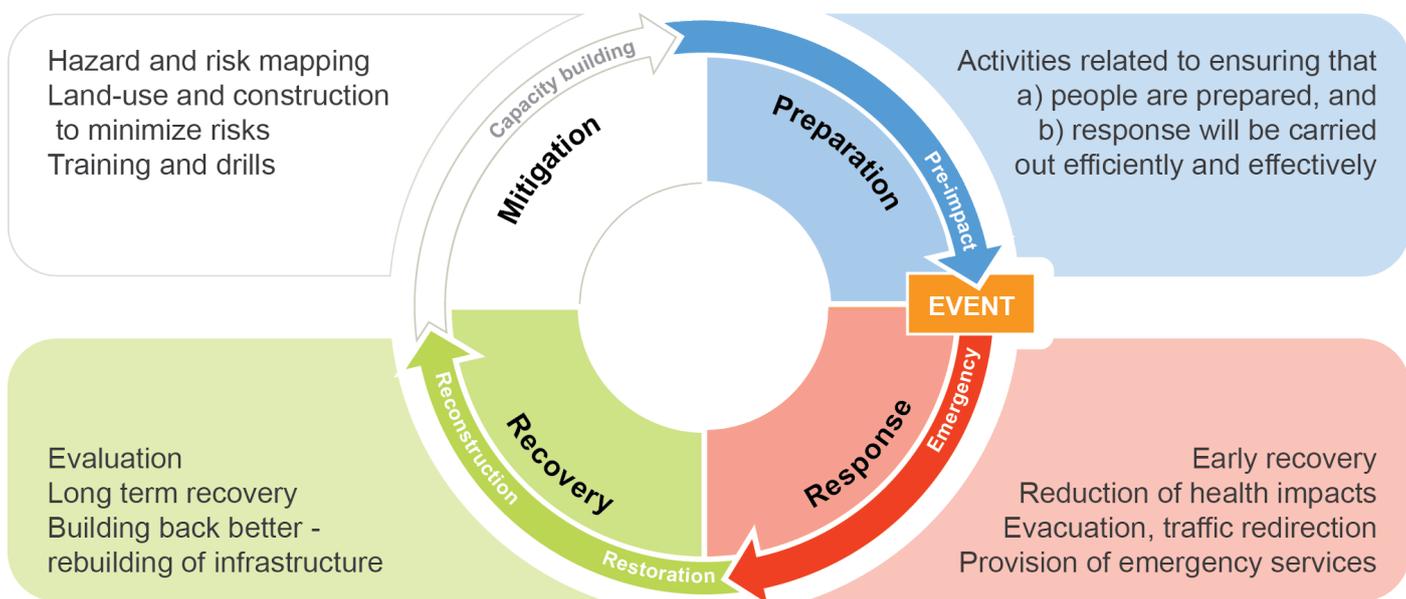
Disaster risk management involves numerous actors and activities to prevent and mitigate disaster events, prepare for specific events, respond when events are occurring and, in the aftermath, recover, restore and reconstruct. Often Disaster Risk Reduction and Management (DRRM) is explained as a cyclic process, as disaster events are often recurring, although often with unknown frequencies and strengths.

In accordance with the Philippines' National Disaster Risk Reduction and Management Plan (NDRRMP), the country envisions a "Safer, adaptive and disaster resilient Filipino communities towards sustainable development." This will be achieved through specific actions in the four phases (a) Disaster Prevention and Mitigation; (b) Disaster Preparedness; (c) Disaster Response; and (d) Disaster Recovery and Rehabilitation.<sup>10</sup>

The DRRM cycle shown in Figure 8 consists of four phases: 1) Mitigation, 2) Preparation, 3) Response, and 4) Recovery. Following the DRRM cycle in the Communication and Outreach Plan means that different messages and channels are used in the different phases. This is reflected in the subsequent chapters.

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10 National Disaster Risk Reduction and Management Plan (NDRRMP) 2011-2028  
[https://ndrrmc.gov.ph/attachments/article/1980/National\\_Disaster\\_Risk\\_Reduction\\_and\\_Management\\_Plan.pdf](https://ndrrmc.gov.ph/attachments/article/1980/National_Disaster_Risk_Reduction_and_Management_Plan.pdf)



**Figure 8: DRRM Cycle**

Source: Ramboll, adapted from Baguio CDRMP (2020)

### Phase 1 Mitigation

The mitigation phase involves the initial risk mapping and the development of physical structures to prevent landslides and flood events, and the construction of emergency shelters, safeguarding water and sanitation in risk prone areas, construction of safe passages, and not least implementing capacity building of stakeholders at all levels from national, regional and LGU to communities and vulnerable stakeholders on how to prepare and act during events. During this phase so-called “drills” will also take place, where all the stakeholders involved will physically train their roles in a response situation. The mitigation phase may sometimes be referred to as “peace time” and given the color code “white” or “pink”.

### Phase 2 Preparation

The preparation phase is the phase where there is an elevated risk for an event to occur, and all stakeholders will thus have to prepare for a possible event. National and regional institutions will be more on guard (i.e., more people and time is required) and will follow weather patterns and data gathering from multiple sources more closely, as well as information the local stakeholders on the development hour by hour. Local stakeholders will start preparing responsive actions, guiding citizens, communities, and businesses to take preparatory actions, e.g., to move vulnerable groups, children and elderly, and by closing off areas, streets, shops, schools and informing people on the ground on potential hazards and preemptive actions. Community based organizations, supported by public and private stakeholders, will make emergency response equipment ready, including shelters, barricades, sandbags etc. The preparation phase may sometimes be given the color code “blue”. The current communication chain between relevantstakeholders in Baguio City is illustrated in Appendix F, section 1.2.

### **Phase 3 Response**

The response phase starts with the onset of an event or a series of hazardous events - heavy rains, floods, landslides, or a combination of different hazards. All local public and private stakeholders are on high alert, with all necessary and available staff on duty, assisting with physical barricades to prevent water entering critical infrastructure, private homes, redirecting water to safe spots, redirecting traffic, evacuating, and relocating vulnerable groups, etc. The LGU OPCEN will play a crucial role in managing the city's response to citizens' needs, organizing specific interventions, and not least communicating messages via different media to different groups. The response phase may sometimes be given the color code "red" or "orange". The current communication chain between relevant stakeholders in Baguio City is illustrated in Appendix F, section 1.3.

### **Phase 4 Recovery**

The recovery phase starts with an overview of human casualties, damages and costs, and an immediate overview of the need for repairs of essential infrastructure, i.e., electricity, water, and sanitation. The immediate recovery phase will also include relocating displaced citizens to where homes have not been damaged. The long-term recovery phase can take months or years depending on the need for restoration, reconstruction and repairing after the events. The recovery phase will also include an important stakeholders' evaluation of the preparation and response phases, highlighting what went well and what needs to be improved for future events. The recovery phase may sometimes be given the color code "green" or "blue". The current communication chain between relevant stakeholders in Baguio City is illustrated in Appendix F, section 1.4.

## **4.2 BAGUIO CITY FEWS – COMMUNICATION IN THE FOUR PHASES**

The recipients of warnings, communication channels, tools, and the sample contents of warning messages which are sent out during the preparation and response phases and which form the dissemination and outreach part of the FEWS, will be described in the following chapters. The standard operating procedures specifying the channels and contents of communication between key stakeholders and the dissemination of warnings to Baguio City residents will be shaped during the testing and validation phase over the upcoming monsoon seasons (see: chapter 9).

# 5. RECIPIENTS OF WARNING MESSAGES



In this chapter, focus is on the different group of recipients of early warning messages at city level, their roles and concerns during the preparation and response phases of the DRRM cycle.

Table 2 contains a general overview of the different stakeholders/target recipients of early warnings and their concerns. The primary target groups being Group 1: Communities directly affected by the emergency and Group 2: Vulnerable groups directly affected by the emergency. However, these groups being the prime target groups for the FEWS does not imply that they should be “guinea pigs” in the testing and validation phases. To avoid misunderstandings and misbehaviors, e.g. unnecessary relocation of vulnerable groups, the FEWS DDO needs to be tested on selected City staff (the FEWS O&M team) and officials first, and then gradually expanded to include more groups.

Understanding the key stakeholders and their concerns makes it easier to tailor messages and select means of communication explicitly. It is important to acknowledge that different recipients have different concerns and needs, and tailoring messages becomes crucial when wanting to get the messages across in a clear and swift manner before and during emergency situations. A “one size fits all” approach is not applicable to early warning messages, as the diverging needs, abilities, preferences, and access to communication channels might mean that the warning doesn’t reach the last mile and puts the vulnerable community members at a disproportionate risk.

Table 2: Concerns of target recipients during emergencies<sup>11</sup>

Target recipients	Concerns
<p><b>Group 1: Communities directly affected by the emergency</b></p>	<ul style="list-style-type: none"> <li>• Personal safety</li> <li>• Family safety</li> <li>• Access to essential goods/services during emergencies (e.g. food/water/shelter/medical assistance, etc.)</li> <li>• Property security/damage</li> <li>• Loss of livelihood</li> <li>• Disruption to normal activities</li> </ul>
<p><b>Group 2: Vulnerable groups directly affected by the emergency</b>, including:</p> <ul style="list-style-type: none"> <li>• People with disabilities (PWDs) and their families</li> <li>• Older persons with mobility and/or medical issues and their families</li> <li>• Indigenous People</li> <li>• Single mothers/women-headed households and their families</li> <li>• Women in especially difficult circumstances (WEDC)<sup>12</sup>: physically or sexually abused; victims of illegal detention, recruitment, prostitution or trafficking; emotionally abused; neglected/abandoned; women in detention</li> <li>• Children in especially difficult circumstances (CEDC)<sup>13</sup>: physically or sexually abused; victims of illegal detention or trafficking; emotionally abused; neglected/abandoned; orphans, emancipated children; victims of prostitution/pedophiles, youth offenders and drug dependents; street children; working children/child laborers; children in cultural communities; victims of disasters</li> <li>• Members of LGBTQ+ community</li> <li>• Migrant families</li> <li>• Tourists who are unfamiliar with the city</li> <li>• Other marginalized groups (such as the homeless, indignant, etc.)</li> <li>• Families with pets/large livestock</li> <li>• Families living in flood- and landslide- prone areas</li> </ul>	<ul style="list-style-type: none"> <li>• Personal safety (especially for WEDCs and CEDCs)</li> <li>• Family safety</li> <li>• Access to essential goods/services during emergencies (e.g. food/water/shelter, etc.)</li> <li>• Access to feminine hygiene products or private breastfeeding stations</li> <li>• Access to adequate WASH facilities in evacuation centers</li> <li>• Provide for comfort, warmth, and cooking essentials/facilities in evacuation centers</li> <li>• Availability of facilities/services that can accommodate those with special needs (such as PWDs, the elderly, sight- or hearing-impaired, or those with mobility issues)</li> <li>• Property security/damage</li> <li>• Loss of livelihood</li> <li>• Disruption to normal activities</li> <li>• Temporary shelter for household pets or livestock</li> <li>• Discrimination due to gender identity, appearance, or belonging to a minority group</li> </ul>

11 Using guidance based on the U.S. Department of Health and Human Services Center for Disease Control and Prevention. 2018 (update). Crisis + Emergency Risk Communication: Messages and Audiences.

12 Definition based on Section 30 the Philippines Magna Carta of Women (RA 9710).

13 Definition based on Philippine Commission on Women's Glossary on Violence Against Women and Children and Other Related Concepts (For Statistical Purposes). 2001

Target recipients	Concerns
<p><b>Group 3: City officials</b>, including:</p> <ul style="list-style-type: none"> <li>• Schools/educational/scientific institutions</li> <li>• Health and social welfare groups/institutions</li> <li>• Members of the Operations Center/Smart City Command Center</li> <li>• Barangay officials: Barangay Captains, Barangay Kagawads, Barangay Health Offices, Barangay Disaster Response Team, Barangay Tanods</li> <li>• Elected leaders – Mayor, Vice-Mayor, Councilors/ Sangguniang Panlungsod ng Baguio, Barangay Captains, Barangay Kagawads, Sangguniang Kabataan</li> <li>• Heads/staff of city departments/offices: City Public Information Office, City Disaster Risk and Reduction Management Office, City Planning and Development Office, City Engineering Office, City Environment and Parks Management Office, City Social Welfare and Development Office, City Health Services Office, City Engineer’s Office, City Police Office, City Fire Station, City General Services Office, City Veterinary and Agriculture Office, City Tourism Office, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Professional responsibilities in the interest of public safety and security</li> <li>• Keeping the public informed</li> <li>• Availability/allocation of resources</li> <li>• Opportunities to express concern</li> <li>• Liability and reputation management</li> <li>• Disruption to normal city services</li> <li>• Personal safety</li> <li>• Family safety</li> <li>• Property damage</li> <li>• Activation of operations center</li> <li>• Ensuring clear chain of command and direct communications with agency heads</li> <li>• Access to support from national government or neighboring municipalities</li> <li>• Providing temporary shelter for pets and livestock</li> <li>• Activating emergency preparedness and response protocols</li> <li>• Ensuring evacuation facilities and equipment are in place</li> <li>• Ensuring emergency rescue facilities and equipment are operational</li> <li>• Keeping roads clear to facilitate continuous emergency operations</li> <li>• Ensuring that health and hygiene protocols are followed in evacuation centers and response protocols</li> </ul>
<p><b>Group 4: National/provincial agencies</b>, such as:</p> <ul style="list-style-type: none"> <li>• NDRRMC</li> <li>• Office of Civil Defense</li> <li>• DILG / Emergency 911 National Office</li> <li>• Department of Education (DepEd)</li> <li>• Department of Social Welfare and Development (DSWD)</li> <li>• Department of Agriculture (DA)</li> <li>• Department of Public Works and Highways (DPWH)</li> <li>• Department of Health (DOH)</li> <li>• Philippine National Police (PNP) and Philippine Military Academy (PMA)</li> <li>• Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)</li> </ul>	<ul style="list-style-type: none"> <li>• Professional responsibilities in the interest of public safety and security</li> <li>• Availability/allocation of resources</li> <li>• Coordination with local city counterparts</li> <li>• Keeping the public informed</li> <li>• Coordination with the international community, in case additional resources are needed</li> </ul>

Target recipients	Concerns
<p><b>Group 5: Community leaders</b>, such as:</p> <ul style="list-style-type: none"> <li>• faith-based organizations,</li> <li>• non-governmental organizations,</li> <li>• cultural groups, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Their role in emergency response efforts</li> <li>• Safety of communities</li> <li>• Representing community needs</li> <li>• Listening to community members</li> <li>• Taking part in decision-making</li> <li>• Opportunities to express concern</li> </ul>
<p><b>Group 6: Partner organizations with an official role in emergency response efforts</b>, such as</p> <ul style="list-style-type: none"> <li>• Volunteer organizations (such as Philippine Red Cross, Volunteer Fire Brigades, etc.)</li> <li>• Telecommunications companies (such as Globe/Smart/PLDT)</li> </ul>	<ul style="list-style-type: none"> <li>• Their role in emergency response efforts</li> <li>• Coordination with other response organizations</li> <li>• Involvement in decision-making process and chain of command</li> <li>• Access to information, reputation management</li> </ul>
<p><b>Group 7: Media</b></p> <ul style="list-style-type: none"> <li>• Local broadsheets</li> <li>• Community newspapers</li> <li>• Television stations</li> <li>• Radio stations</li> <li>• Digital media organizations (incl. social media)</li> </ul>	<ul style="list-style-type: none"> <li>• Getting access to information right away</li> <li>• Meeting rapid deadlines</li> <li>• Keeping the public informed</li> </ul>
<p><b>Group 8: Businesses, trade, and industry sector</b>, including:</p> <ul style="list-style-type: none"> <li>• Offices (e.g., Department of Trade and Industry, or Department of Labor and Employment)</li> <li>• Local businesses</li> <li>• Agricultural sector</li> <li>• Hotels/tourism sector</li> <li>• Chambers of commerce</li> </ul>	<ul style="list-style-type: none"> <li>• Employee/client safety</li> <li>• Security/protection of assets from damage</li> <li>• Disruptions in business</li> <li>• Loss of revenue</li> <li>• Liabilities and reputation</li> <li>• Recovery</li> </ul>
<p><b>Group 9: International community</b> (organizations and other countries that can be partners in emergency response and provide aid/assistance). including International Federation of Red Cross and Red Crescent Societies Aid organizations, such as Save the Children, etc. Foreign embassies in the Philippines</p>	<ul style="list-style-type: none"> <li>• Capacity and level of readiness for a similar emergency</li> <li>• Any restrictions on trade and travel to protect their citizens</li> <li>• Their role in response partnership</li> </ul>
<p><b>Group 10: Communities outside of affected areas</b></p>	<ul style="list-style-type: none"> <li>• How they can keep the emergency from affecting them</li> <li>• How they can help affected communities</li> <li>• Risks to self and family</li> <li>• Disruption to normal activities</li> </ul>



# 6. COMMUNICATION CHANNELS/TOOLS FOR INFORMATION AND WARNING DISSEMINATION



This chapter focuses on communication channels and tools relevant for the different recipients of early warning messages at city level and their pros and cons to help authorities ascertain which channels or tools are appropriate depending on their specific needs/circumstances.

Adopting a varied and redundant communication approach to disseminate disaster preparedness messages and warnings is encouraged to ensure that urgent warning messages are disseminated as wide as possible and reach their intended recipients regardless of the communication channel they prefer/ have access to. Such a multi-channel approach also addresses the recommendation in the *Policy and Practice Recommendations: Towards a Gender Transformative Flood Early Warning System in Baguio City*,<sup>14</sup> specifically:

*"Encourage redundancies in the dissemination system – multiple simultaneous dissemination channels are critical, ensuring no one is left behind and ensuring the system is not left vulnerable if a main dissemination channel fails."*

The effectiveness of the channels and tools that follow are only as good as the disaster preparedness programs/activities and warning messaging. It is therefore important to design an effective disaster preparedness strategy/campaign implemented during the preparedness phase, as well as establish clear warning messaging strategy for deployment during disasters.

Tables 3 and 4 provide an overview of the various communication channels and tools for use in the dissemination of pre- and post-disaster messages, as well as warning alerts during disasters. It gives inputs on their advantages, disadvantages, and various points of consideration, such as each channel's reach/ coverage, speed and flow of communication, maintenance and electricity dependence, accessibility, and limitations in terms of which target audience will be excluded from the sole dependence on each channel. Further descriptions of all communication channels and tools can be found in Appendix G.

Further work is expected to be done during the testing and validation phase of the FEWS to help the Baguio LGU identify the best communications channels to use for the FEWS and its integration into the FEWS standard operating procedures (see chapters 9 and 11).

14 Policy and Practice Recommendations: Towards a Gender Transformative Flood Early Warning System in Baguio City PHI: Gender Transformative Approach for Strengthened Development, Application, and Replication of the Baguio City Smart Flood Early Warning. AASCTF. September 2021

### 31 Communication Channels/Tools for information and warning dissemination

**Table 3: Characteristics of communication channels**

LEGEND													
	Two-way communication		In-person warning		Broad audience/public		Yes/present		Independent		Slow (>1h)		Pre-disaster preparedness messages
	One-way communication (dissemination)		Broadcast		Officials/emergency responders		No/absent		Limited		Medium (up to 1h)		Disaster alerts/warnings
	Local broadcast		Potential		Fast/instantaneous		Post-disaster messages						

Channel	Direction of communication	Broadcast coverage	Audience	Currently in place?	Independence from power supply	Active maintenance required	Speed	Agency responsible	Best used for
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Online Dashboard								OPCEN	
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Additional advantages	Additional disadvantages	Limitations (not suitable for)
<ul style="list-style-type: none"> <li>One-stop reference for all disaster-related information that will allow residents access to information/data which could help them decide for themselves actions that they can take to prepare for, during and/or after a flood event/disaster.</li> <li>Helps establish integrity of data sources</li> <li>Shows residents that the local government is on top of the situation by having the relevant data that facilitates both government and personal action.</li> </ul>	<ul style="list-style-type: none"> <li>Would need to be updated frequently via various data sources.</li> <li>Would need rapid information verification to ensure that information is timely and accurate before making it publicly available.</li> <li>Budget implications in terms of dashboard development and maintenance (e.g., webhosting, domain, cloud/server storage, data security, etc.).</li> </ul>	<ul style="list-style-type: none"> <li>Persons who are blind or with vision impairments (unless dashboard has provision for screen readers/text-to-speech apps).</li> <li>Those without access to ICT equipment or the internet.</li> </ul>

SMS								OPCEN	
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Additional advantages	Additional disadvantages	Limitations (not suitable for)
<ul style="list-style-type: none"> <li>Relatively inexpensive cost to send a text message (No more than Php 1 per text).</li> <li>SMS can be easily forwarded to family, friends, neighbors, and colleagues, therefore potentially widening its reach.</li> </ul>	<ul style="list-style-type: none"> <li>Need to structure and prioritize information to include in message due to character restriction per message (usually 160 characters/message). In excess of, additional charges usually apply.</li> <li>Mobile phones need to be charged to receive messages, which is a problem during a blackout and when there is no available backup power or power bank to charge the phone's battery.</li> <li>Cellular towers are prone to damage, which may cause mobile service disruption during heavy rainfall/winds/landslides.</li> <li>Cost implications, as the platform needs to be loaded with sufficient credits/load to be able to forward or broadcast advisories/warnings to recipients.</li> </ul>	<ul style="list-style-type: none"> <li>Persons who are blind or with vision impairments (unless phone has accessibility options set up).</li> <li>Those without access to a phone.</li> <li>Residents living in areas with limited to no coverage (usually in isolated or mountainous areas).</li> </ul>

Interactive Voice Response (IVR)								OPCEN	
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Additional advantages	Additional disadvantages	Limitations (not suitable for)
<ul style="list-style-type: none"> <li>Can be a reliable source of pre-recorded flood event information, such as information on how to prepare, warning alert levels, etc.</li> <li>Can be made available 24/7 for standard information requests.</li> <li>Can be linked to an emergency hotline operated by Baguio OPCEN where people can call to ask for help.</li> </ul>	<ul style="list-style-type: none"> <li>Budget, time, and effort required to acquire and set-up the system, and train personnel who will use and maintain the system.</li> <li>Fee(s) incurred by mobile users to call the hotline.</li> <li>Possibility of line congestion if call traffic is high. If not designed properly, users can get frustrated or impatient with waiting for voice prompts during an active call session.</li> <li>Needs to be constantly updated depending on the situation, which may be prone to delays related to the updating of information.</li> </ul>	<ul style="list-style-type: none"> <li>Persons who are deaf or hard of hearing.</li> <li>Those without access to a phone.</li> </ul>

Channel	Direction of communication	Broadcast coverage	Audience	Currently in place?	Independence from power supply	Active maintenance required	Speed	Agency responsible	Best used for
Direct messaging platforms								OPCEN	
	Additional advantages			Additional disadvantages			Limitations (not suitable for)		
	<ul style="list-style-type: none"> <li>Free to download and use.</li> <li>Widely accessible by those with smartphones and access to WIFI internet and mobile data.</li> <li>Able to accommodate more information since character restrictions are very generous (20,000 characters for Facebook Messenger, 7,000 for Viber, 1,024 for WhatsApp, 4,096 for Telegram, and 5,000 for WeChat).</li> </ul>			<ul style="list-style-type: none"> <li>Requires subscription to mobile data, which may be cost-prohibitive to some users and therefore would have no way to access DM platforms.</li> <li>Mobile phones need to be charged to receive message, which is a problem during a blackout and when there is no available backup power or power bank to charge the phone's battery</li> <li>Dependent on recipient's internet connection status (i.e., person needs to be online to receive timely messages/warnings).</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are blind or with vision impairments (unless phone has accessibility options set up).</li> <li>Those without access to a smart phone/tablet or the internet.</li> </ul>		

Baguio in My Pocket (BIMP)								OPCEN	
	Additional advantages			Additional disadvantages			Limitations (not suitable for)		
	<ul style="list-style-type: none"> <li>Free to download and use.</li> <li>Already being rolled out by City of Baguio, with some 50% of residents already registered.</li> <li>Can be connected to an SMS blast for urgent messages/warnings.</li> <li>Widely accessible by those with smartphones and access to WIFI internet and mobile data.</li> </ul>			<ul style="list-style-type: none"> <li>Requires subscription to mobile data, which may be cost-prohibitive to some users and therefore would have no way to access DM platforms.</li> <li>Mobile phones need to be charged to receive message, which is a problem during a blackout and when there is no available backup power or power bank to charge the phone's battery.</li> <li>Dependent on recipient's internet connection status (i.e., person needs to be online to receive timely messages/warnings).</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are deaf or hard of hearing.</li> <li>Those without access to a phone.</li> </ul>		

Television broadcasts								PIO	
	Additional advantages			Additional disadvantages			Limitations (not suitable for)		
	<ul style="list-style-type: none"> <li>A reliable and visual medium that can help in the delivery of risk and preparedness information, as well as timely disaster warnings to the public.</li> <li>In times of emergencies/disasters, local television stations are highly interested and motivated to share important risk/preparation information, situation updates, and warnings to the public.</li> </ul>			<ul style="list-style-type: none"> <li>Not all residents may have access to a television (e.g., indigents and homeless people) as they are relatively expensive to buy.</li> <li>Power outages can render televisions useless when no backup power is available.</li> <li>May need significant budget to secure ad/public service placements.</li> <li>Coverage of emergencies/disasters may be influenced by bias or distorted reporting.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are blind or with vision impairments (unless broadcast has provision for audio description) and those who are deaf or hard of hearing (unless broadcast has open/closed captions and sign language).</li> <li>Those without access to a TV.</li> </ul>		

Radio broadcasts								PIO	
	Additional advantages			Additional disadvantages			Limitations (not suitable for)		
	<ul style="list-style-type: none"> <li>Basic radios are relatively inexpensive to procure compared to televisions or mobile phones.</li> <li>Radios often have provisions to be operated via battery, so they can remain operational in the event of power blackouts.</li> <li>Does not require a fee/subscription to receive signal.</li> </ul>			<ul style="list-style-type: none"> <li>Power outages can render the radio useless if no backup power is available or if radio cannot be powered by a battery.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are deaf or hard of hearing.</li> <li>Those without access to a radio.</li> </ul>		

### 33 Communication Channels/Tools for information and warning dissemination

Channel	Direction of communication	Broadcast coverage	Audience	Currently in place?	Independence from power supply	Active maintenance required	Speed	Agency responsible	Best used for	
Print media (i.e. newspapers, magazines, etc.)								PIO		
	Additional advantages			Additional disadvantages			Limitations (not suitable for)			
	<ul style="list-style-type: none"> <li>Established organizations with an existing readership base.</li> <li>Majority have digital editions or social media channels, which could serve as alternative sources of information for residents.</li> </ul>			<ul style="list-style-type: none"> <li>Diminishing number of people who rely on print newspapers for information.</li> <li>Print newspapers are usually not free and need to be purchased by residents.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are blind or with vision impairments (unless content is in braille).</li> <li>Those without a subscription or access to buy newspapers.</li> </ul>			
Social media								PIO		
	Additional advantages			Additional disadvantages			Limitations (not suitable for)			
	<ul style="list-style-type: none"> <li>Widely used by those who have access to WIFI internet or mobile data via smart devices (i.e. phones, tablets, smartwatches, voice assistants) or computers/laptops.</li> <li>Posts are easily sharable, making dissemination relatively easy.</li> </ul>			<ul style="list-style-type: none"> <li>Not all residents may have a social media account.</li> <li>Depends on access to WIFI internet or mobile data, which might be disrupted during a flood event.</li> <li>Less tech-savvy users (such as the elderly, those who have physical disabilities, or indigents) may have difficulty using online platforms to send flood reports or emergency rescue requests due to the nature of the reporting process and may need support from family or friends.</li> <li>Prone to misinformation and disinformation, so effort is needed to establish official/authoritative profile and ensure all content has been verified before dissemination.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are blind or with vision impairments (unless videos have provision for audio description or graphics have provision for screen readers/ text-to-speech apps) and those who are deaf or hard of hearing (unless videos have open/closed captions and sign language).</li> <li>Those without access to a smart phone/tablet or the internet.</li> </ul>			
Community Volunteer Brigade										
	Additional advantages			Additional disadvantages			Limitations (not suitable for)			
	<ul style="list-style-type: none"> <li>Not dependent on internet connection or data.</li> <li>Relatively easy to deploy 24/7.</li> </ul>			<ul style="list-style-type: none"> <li>Reach is limited depending on the speed of those assigned to deliver the warnings, as well as the tools to make warnings easier to hear.</li> <li>Needs to be accompanied by a more active visual and/or audio indicator to cater to visually- or hearing-impaired community members.</li> </ul>			-			

OPCEN - Baguio City CDRMO Operations Centre  
 PIO - Public Information Office

Source: Ramboll

Table 4: Characteristics of communication tools

Tool	Direction of communication	Broadcast coverage	Audience	Currently in place?	Independence from power supply	Active maintenance required	Speed	Agency responsible	Best used for
<b>LEGEND</b> Two-way communication One-way communication (dissemination) In-person warning Broadcast Local broadcast Broad audience/public Officials/emergency responders Yes/present No/absent Potential Independent Limited Slow (>1h) Medium (up to 1h) Fast/instantaneous Pre-disaster preparedness messages Disaster alerts/warnings Post-disaster messages									
Flags									
	Additional advantages			Additional disadvantages			Limitations (not suitable for)		
	<ul style="list-style-type: none"> <li>A visual way to convey warning messages.</li> <li>Can be developed as part of a community-based warning system.</li> <li>Relatively low cost to develop.</li> </ul>			<ul style="list-style-type: none"> <li>Only effective if people are educated on the meaning and action required behind each flag.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are blind or with vision impairments.</li> </ul>		
Static or electronic signages									
	Additional advantages			Additional disadvantages			Limitations (not suitable for)		
	<ul style="list-style-type: none"> <li>Static signages are relatively easy and cost-effective to produce.</li> <li>Can be designed to have some degree of mobility so it can be transferred as needed.</li> </ul>			<ul style="list-style-type: none"> <li>Electronic signages need to be connected to electricity or rechargeable batteries to work.</li> <li>Electronic signages may be prone to damage and will need regular maintenance.</li> <li>Messages/warnings need to be succinct/clear due to space constraints.</li> <li>Not designed for visually impaired individuals, and so it will need to be complemented by audio warnings, such as sirens or bells.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are blind or with vision impairments.</li> </ul>		
Portable megaphones									BDRMC
	Additional advantages			Additional disadvantages			Limitations (not suitable for)		
	<ul style="list-style-type: none"> <li>Megaphones are highly portable, easy to operate, and is light enough to be carried to different areas (especially areas which cannot be reached by vehicle-based sirens) by assigned communicators.</li> <li>Can be used for door-to-door, in-person warnings.</li> <li>Not reliant on electricity to operate and can last for several days or hours (depending on usage) on a single charge.</li> </ul>			<ul style="list-style-type: none"> <li>Broadcast reach is limited to those in the immediate vicinity.</li> <li>May be hard to hear depending on the rain/wind strength and other environmental noises.</li> <li>Not designed individuals who are hearing-impaired or are hard of hearing.</li> <li>Dependent on units being fully charged before or during an emergency/disaster response operation.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are deaf or hard of hearing.</li> </ul>		
Sirens or bells								BDRMC	
	Additional advantages			Additional disadvantages			Limitations (not suitable for)		
	<ul style="list-style-type: none"> <li>Ability to broadcast an audible warning to a specific area at a given time.</li> <li>Based on real-time data from authoritative data-gathering instrumentation.</li> <li>Backed-up by emergency power generators in case of power outages.</li> </ul>			<ul style="list-style-type: none"> <li>Siren warnings are only effective if residents are aware of what these warnings mean.</li> <li>Effective audible area can be limited by a) the number of sirens distributed throughout a specific area, and b) rainfall/wind strength which could lessen the effective distance of the siren.</li> <li>Wired siren systems need regular maintenance to ensure that they are operational at all times (cost implications for maintenance and replacement).</li> <li>Can be prone to damage during a typhoon/flood event.</li> </ul>					

### 35 Communication Channels/Tools for information and warning dissemination

Tool	Direction of communication	Broadcast coverage	Audience	Currently in place?	Independence from power supply	Active maintenance required	Speed	Agency responsible	Best used for	
Mobile sirens								BDRRMC		
	Additional advantages			Additional disadvantages			Limitations (not suitable for)			
	<ul style="list-style-type: none"> <li>Not dependent on internet connection or data to be made publicly available;</li> <li>Always available 24/7.</li> <li>Can be updated by the community at an agreed frequency/interval or as significant information changes.</li> </ul>			<ul style="list-style-type: none"> <li>May not be able to access certain areas, such as those without road access.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are deaf or hard of hearing.</li> </ul>			
Walkie-talkies								BDRRMC		
	Additional advantages			Additional disadvantages			Limitations (not suitable for)			
	<ul style="list-style-type: none"> <li>Able to travel to multiple areas/ barangays.</li> <li>Flexible – can change routes and (in case of PA System) messages quickly.</li> <li>Able to broadcast visual and audible warnings.</li> </ul>			<ul style="list-style-type: none"> <li>May not be able to access certain areas, such as those without road access.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are deaf, hard of hearing or non-verbal.</li> </ul>			
Local community information boards								BDRRMC	  	
	Additional advantages			Additional disadvantages			Limitations (not suitable for)			
	<ul style="list-style-type: none"> <li>Not dependent on internet connection or data to be made publicly available;</li> <li>Always available 24/7.</li> <li>Can be updated by the community at an agreed frequency/interval or as significant information changes.</li> </ul>			<ul style="list-style-type: none"> <li>Broadcast reach is limited to those in its immediate vicinity.</li> <li>Needs to be accompanied by a more active visual and/or audio indicator to cater to visually- or hearing-impaired community members.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are blind or with vision impairments.</li> </ul>			
Road signages										
	Additional advantages			Additional disadvantages			Limitations (not suitable for)			
	<ul style="list-style-type: none"> <li>Can be installed permanently in low-lying, flood-prone stretches of road.</li> <li>Available 24/7.</li> <li>Static road signs do not need physical human intervention to operate.</li> </ul>			<ul style="list-style-type: none"> <li>Both static and electronic road signs will need to be regularly maintained to ensure that they are visible and operational at all times.</li> <li>More advanced road signs are more expensive and will need to be maintained by a trained professional.</li> <li>Static road signs are not designed for the blind or visually impaired, unless combined with an alternative, audio-based warning.</li> </ul>			<ul style="list-style-type: none"> <li>Persons who are blind or with vision impairments.</li> </ul>			

BDRRMC - Barangay Disaster Risk Reduction and Management Committee

Source: Ramboll

## 6.1 FEEDBACK ON CURRENT CHANNELS USED FOR WARNING DISSEMINATION

During the Data Dissemination and Outreach Workshop held on 10 June 2022 (see Appendix K), participants were asked about the channels through which they currently receive warning messages. The responses the team received indicate a wide range of channels used. These included TV, radio, social media, and SMS text blasts. More community-based methods such as sirens, phone calls, and even local “gossip” were also cited as helpful warning channels.

Some participants also indicated that the daily weather forecast issued by DOST-PAGASA was how they received the warning, while participants involved in disaster operations also cited that the situation report (SITREP) issued by OCD-CAR was also useful. These two channels are able to provide more detailed information related to warnings.

While the workshop gave an indication of the breadth of warning channels employed, there were still participants who specified that they did not receive any warning at all. The FEWS project provides an opportunity to enhance current warning methods by exploring some of the communications tools/channels outlined in this report.

Participants were also asked about their preferred channel for receiving early warnings, and the feedback received emphasized the need to communicate early warnings as widely as possible using various channels. As anticipated, warnings through SMS, social media, and radio were among the top warning channels cited by participants.

Participants also indicated that it would be helpful to have more community-based warning channels, such as a PA system, megaphone, or a siren in each barangay to ensure that warnings are heard by community members, especially affected families. In the case of sirens, the project team noted that sirens are not deployed in all high flood risk barangays, and even in areas where there are sirens, the alerts are hard to hear for those who live further away, especially when the sound of rain and wind are loud. This highlights the need for a multi-channel approach throughout Baguio City to ensure an even coverage of warning messages that reach all residents regardless of their location, disabilities, literacy, education level or languages spoken (see: chapter 11).

## 6.2 OTHER IDENTIFIED HIGHLIGHTS AND ISSUES REGARDING WARNING DISSEMINATION

During the Data Dissemination and Outreach Workshop held on 10 June 2022 (see Appendix K for the tabulation of participant responses), participants also communicated additional issues related to the dissemination of warnings in the past. One main issue cited was the limited resources available to the CDRRMO and barangay participants, which prevents barangays and the CDRRMO from deploying additional equipment and personnel to help with actions/activities relating to early warning.

Other challenges identified were more behavioural in nature, such as some community members' susceptibility to misinformation, and the tendency to be reactive and wait until it is too late to act. Such challenges might benefit from a pre-flood event information campaign to emphasize reliable sources of information and educate the community on the benefits of early preparation, immediate response to official warnings, and the consequences of responding late or not listening to these warnings (such as rescue workers having difficulty reaching severely impacted areas or putting emergency workers' lives at risk).

Another challenge was related to the management of solid waste in the city. In particular, trash indiscriminately thrown by citizens was mentioned as a big problem, as it blocks drainages and subsequently contributes to flash flooding in certain areas in the city. This challenge also might benefit from a pre-flood event information/ educational campaign or a community clean-up activity to reinforce the importance of proper waste disposal and its impact on flooding, in tandem with solid waste clearing operations that the city is already implementing.

Despite the challenges cited above, participants were quick to highlight positive feedback on the city's current disaster management activities, including the effective leadership and quick response of officials in flooded areas, the conduct of various seminars/training related to disaster management (including flooding), as well as the high level of volunteerism from community members. Participants also mentioned that due to flood events in the recent past, people are becoming more aware of what they need to do when flood events are imminent, and not even waiting for a warning when deciding to evacuate.



# 7. TRUSTED AUTHORITIES



This chapter focuses on trusted persons in the local communities and their roles in communicating to the different recipient groups during the preparation and response phases of the DRRM cycle.

Trust is defined as a belief in the reliability, truth, ability, or strength of someone or something, and nowhere is this more important than in emergency and disaster management.<sup>15</sup> Building and maintaining public trust is seen as a crucial element to the success of any emergency/disaster communications and response activity.

Given the above, it is therefore crucial to understand the various factors that affect credibility and trust of authorities who are disseminating disaster information and warnings. In the context of disasters, mistrust can obstruct critical emergency planning and response processes, which can potentially result in unnecessary loss of life and livelihoods, and lost opportunities to build resilience for the next threat.<sup>16</sup>

The following factors have been found to affect the way people receive, interpret, and evaluate disaster-related information and warnings:<sup>17</sup>

- **Public perception:** perceived lack of transparency, accountability, and corruption surrounding the authority issuing the information/warnings;<sup>18 19 20</sup>
- **Accuracy of information:** should be based on information validated by subject matter experts;
- **Consistency of information:** even if information is disseminated through various platforms;
- **Speed of release:** ensuring that warnings are released in a timely manner, thus minimizing outdated information/warnings;
- **Empathy:** demonstrating an understanding or acknowledgment of how people may be feeling during a flood event;
- **Transparency:** being upfront with the public why information is not available at a specific time and being open to questions and public dialogue.

15 Trust. 2022. In Merriam-Webster.com. Retrieved March 25, 2022, from <https://www.merriam-webster.com/dictionary/trust>.

16 IFRC and UNICEF. 2020. Building Trust Within and Across Communities for Health Emergency Preparedness. p 5.

17 Based on guidance from the U.S. Department of Health and Human Services Centers for Disease Control and Prevention. 2019. Crisis + Emergency Risk Communication: Messages and Audiences.

18 I. Abarquez and N. Parreño, "Review of Gender Equality in Disaster Risk Reduction and Management," World Bank, Metro Manila, 2014.

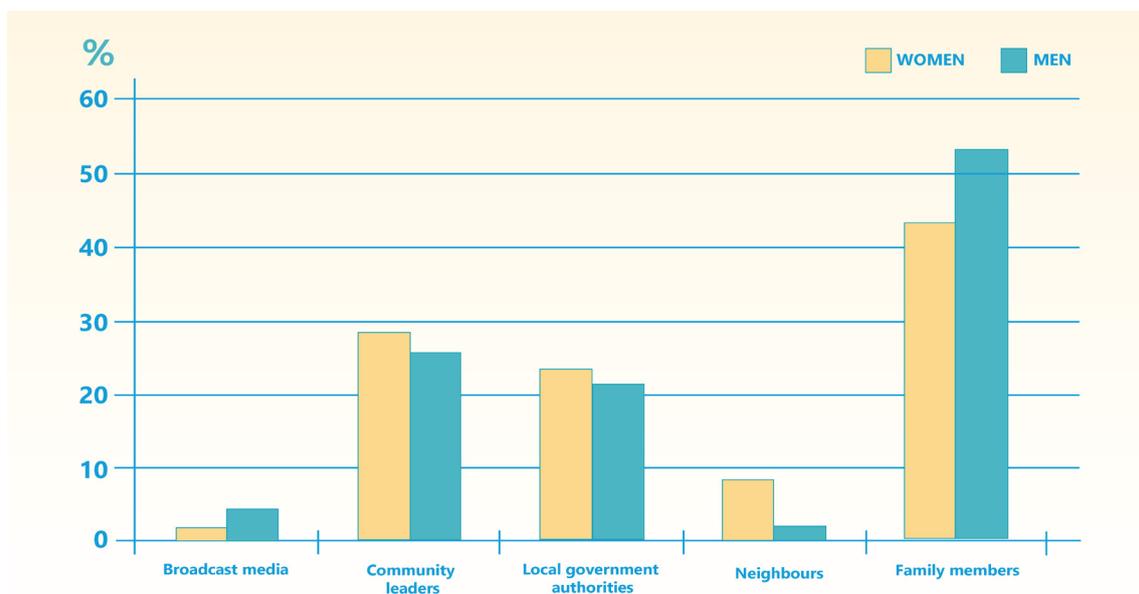
19 G. Bankoff, "The Politics of risk in the Philippines: comparing state and NGO perceptions of disaster management," *Disasters*, vol. 33, no. 4, pp. 686-704, 2009.

20 S. Domingo and A. Manejar, "Disaster Preparedness and Local Governance in the Philippines," Philippines Institute for Development Studies, Quezon City, 2018.

## 7.1 TRUSTED AUTHORITIES IDENTIFIED IN THE GENDER AND INCLUSION STUDY

It is important to note that findings from the *Baguio City Gender and Inclusion Study*<sup>21</sup> indicate that despite the high levels of mobile phone ownership, internet access, and the broadcast media, disaster warnings don't seem to be reaching all members of the community.<sup>22</sup> This, combined with the respondents' preference for in-person warnings,<sup>23</sup> emphasizes the importance of building relationships with community partners as an important first step in communicating disaster preparedness information and warnings.

Figure 9 shows respondents' most trusted sources of information that respondents trust the most in terms of early warning information.



**Figure 9: Trusted sources of information by gender**

Source: Mixed Methods Gender and Inclusion Study Report. PHI: Gender Transformative Approach for Strengthened Development, Application, and Replication of the Baguio City Smart Flood Early Warning. AASCTF. August 2021

To ensure that disaster preparedness information and warnings reach marginalized and vulnerable members of the community, it may be beneficial to map informal dissemination channels and networks active in the barangay level to further identify active, trusted intermediaries and key personnel to target risk information and warning dissemination.



## 8. MESSAGE GUIDE



In this chapter focus is on the early warning messages to be sent to the different recipient groups during preparation and response phases of the DRRM cycle.<sup>24</sup>

The following sections focus on the important key and supporting messages during the preparation and response phases. These key messages can be used as a guide to develop more specific messages for use in multi-platform disaster preparedness/awareness materials or campaigns. Such final messages should be carefully crafted, and be succinct, easy to understand (using principles of plain language), and useful for those receiving such messages to facilitate the necessary preparedness and response. Samples of current messages for reference can be found in Appendix I.

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24 Some messages in this section are based on guidance from the International Federation of Red Cross and Red Crescent Societies. 2021. Public awareness and public education for disaster risk reduction. <https://www.ifrc.org/public-awareness-and-public-education-disaster-risk-reduction>

## 8.1 LANGUAGE OF MESSAGES/WARNINGS

Local authorities should consider localizing the messages/warnings issued into the following languages, as indicated in Key Informant Interviews. Doing so helps to ensure that indigenous groups are also able to understand these warnings and enable them to take action:

- English
- Filipino
- Ilocano
- Aplai
- Ifugao
- Kankana-ey

## 8.2 PRE-TESTING MESSAGES/WARNINGS FOR EFFECTIVENESS

Pre-testing the translated information and warning messages is crucial to validate whether the information meets people's needs and is well understood. To ensure effectiveness and suitability for different target audiences (specifically those who have specific disabilities or needs), the conduct of a focus group discussion/workshop or survey is recommended to consult and involve representatives from the different target audiences in the development of these messages and preparedness materials and their format (written text, visual, audio, etc.).

## 8.3 PRE-FLOOD EVENT KEY MESSAGES

Messaging during this preparation phase should concentrate on:

- Educating the community on specific hazard risks that the community is subjected to (such as river flooding, flash floods, and landslides) and the different flood alerts/warnings in place to communicate the flood's expected impact and actions they should take;
- Giving guidance on steps the community can take to prepare for flooding such as creating a family disaster plan, assembling an emergency 'Go-bag', how to protect homes from flooding;
- Engaging the community by involving them in community consultations, preparedness planning, trainings and drills to enhance their knowledge and preparation, and create ownership of flood preparedness actions.

Table 5 gives a number of suggested key messages, along with supporting messages to strengthen each key message.

**Table 5: Suggested pre-flood event key messages and supporting messages**

Key messages	Supporting messages	Target audience
<b>Know the meaning of warning messages and symbols</b>	<ul style="list-style-type: none"> <li>• There are (X) different types of early warnings. These are meant to inform people of the nature of the coming hazard and what to do.</li> <li>• [Insert designed graphic of the different warnings and their meanings]</li> <li>• Once warning is received, act quickly and don't wait for further warnings to prepare</li> <li>• Share received warnings with family, friends, and neighbours.</li> <li>• Warnings from the Baguio PIO and Baguio OPCEN are reliable sources of information for preparedness and response information and warnings.</li> </ul>	General public
<b>Be flood-smart: know the basics of flooding</b>	<ul style="list-style-type: none"> <li>• Flooding can cause injury, death, damage to property/infrastructure, erosion/ground instability, landslides, contamination of drinking water,</li> <li>• Flooding can take many forms: river flooding, urban flooding (caused by water run-off from concrete structures, inadequate or blocked drainage, etc), outburst flooding (due to a collapsed dam, etc).</li> </ul>	General public
<b>Dealing with flooding in your home or during evacuation</b>	<ul style="list-style-type: none"> <li>• Monitor the weather closely via reliable and official sources of information.</li> <li>• In deciding on when to go to the evacuation center, plan to go before the typhoon/flooding/landslide arrives in your area.</li> <li>• Take note of flood warnings issued by your local authorities and take note of safe evacuation routes and road closures.</li> <li>• Do not attempt to walk, swim, or drive through raging flood waters. Even fast-moving floodwaters that are only ankle-deep can sweep a person off their feet. If emergency personnel are present, ask for their guidance/assistance.</li> <li>• If you were not able to evacuate in time, look for higher ground, such as the second story of your house/building or higher, or the roof.</li> <li>• Contact emergency personnel as soon as possible for help/rescue.</li> </ul>	General public
<b>Dealing with flooding in your vehicle</b>	<ul style="list-style-type: none"> <li>• When in your vehicle, do not attempt to drive through floodwater.</li> <li>• Do not attempt to crossroads, bridges, or underpasses submerged in standing or flowing water. It is difficult to gauge the depth or the water.</li> <li>• If your vehicle has been immersed in flood water, check your brakes on a safe, clear section of road at low speed.</li> <li>• If your vehicles stall in floodwater, abandon your vehicle and climb to higher ground. Leave your contact details on your dashboard in case authorities need to contact you about your vehicle.</li> </ul>	Car-owners

Key messages	Supporting messages	Target audience
<b>Be landslide-smart: know the early signs of a typhoon/flooding-induced landslide</b>	<ul style="list-style-type: none"> <li>• Observe the surrounding landscape of your home. Check for changes or disturbances in the soil, fallen rocks, trees/plants, fences, retaining walls or utility poles that are progressively leaning, cracks in the ground or pavements, soil that is oversaturated by ground water, or water that breaks through the ground in new locations.</li> <li>• Check your home for doors or windows that suddenly stick or jam, large cracks on walls, floors, or foundations, or walls, pavement or stairs that are leaning or pulling away.</li> <li>• Check for sudden water level decrease in nearby creeks or streams, even when rain is still falling or just recently stopped.</li> <li>• Listen for unusual sounds, such as the cracking of trees/branches, boulders/rocks crashing into each other, or faint rumbling sounds that become louder.</li> <li>• If you live in a landslide-prone area, consider early evacuation to a safe shelter if heavy, continuous rain is forecasted by the weather bureau or when advised by your local authorities.</li> <li>• Be alert when driving along mountainous, sloping, or known landslide-prone roads. Do not attempt to drive through landslide debris flow or look for an alternative route.</li> <li>• Buying a new home? Consult your local city planning office to check if the home you're buying is located in a landslide-prone area, or if previous landslides have occurred in the area. Be aware of emergency and evacuation plans in case of landslides in the area.</li> </ul>	Residents in landslide-prone areas
<b>Be evacuation-ready</b>	<ul style="list-style-type: none"> <li>• Monitor the weather closely via reliable and official sources of information.</li> <li>• Take note of flood warnings issued by your local authorities and take note of safe evacuation routes (by car or by foot) and road closures.</li> <li>• If you have a vehicle, keep your fuel tank filled in case you need to evacuate</li> <li>• If you need more time to evacuate to take family members to evacuation centers and carry emergency supplies, consider evacuating ahead of time.</li> <li>• Your local community officials have your best interests in mind during flood events. If your family has been advised to evacuate, listen to their instructions and evacuate immediately.</li> </ul>	General public
<b>Know if your barangay is susceptible to specific hazards and vulnerabilities</b>	<ul style="list-style-type: none"> <li>• Familiarize yourself with the weather and terrain in your area. Nearby water sources such as dams, rivers, creeks, or water catchment areas can increase flood risks in your area. Be aware of areas that are prone to landslides.</li> <li>• Is your area prone to floods or landslides? Speak to your neighbours or consult your local barangay or city planning office to ask if your barangay experienced any flooding or landslides in the past, and how it has impacted the community. Inquire what measures are being done to address these.</li> <li>• Expect the unexpected. Flood or landslide risk in your area can change over time. Even if your barangay has not experienced any flooding/ landslides in the past, there is still a need to be vigilant and prepare yourself and your family accordingly for future eventualities.</li> </ul>	General public

Key messages	Supporting messages	Target audience
<p><b>Consider relocating or making your home more resilient to flooding</b></p>	<ul style="list-style-type: none"> <li>• If you are looking to build your home, choose an area where the risk of flooding or landslides is low. Talk to your city planning office for guidance and ensure you follow proper land-use procedures when building your home.</li> <li>• If your existing property is in an area prone to severe flooding, consider permanently relocating to a safer place.</li> <li>• If relocation is not an option, consider adapting your house to mitigate flood risks, such as elevating your house, building flood walls around your property, etc.</li> <li>• Keep supplies such as plywood, plastic sheeting, nails, hammers, saws, crow bars, shovels, and sandbags which can be used to protect your home before floods arrive.</li> <li>• Keep a ladder and rope in case your family needs to escape through the roof of your home.</li> </ul>	<p>General public</p>
<p><b>Prepare your family for evacuation</b></p>	<ul style="list-style-type: none"> <li>• Ensure to prepare your home ahead of time.</li> <li>• Prepare your "Go-bag"</li> <li>• If you need more time to make several trips to evacuate family members to carry emergency supplies, consider evacuating earlier than what local authorities would advise.</li> <li>• Your local community officials have your best interests in mind during flood events. If your family has been advised to evacuate, listen to their instructions and evacuate immediately. Let them know if you or any family member needs assistance in evacuating.</li> <li>• If advised to evacuate, unplug your electrical appliances, turn off your electrical fuse box, disconnect your LPG, and lock your doors and windows before leaving the house.</li> </ul>	<p>General public</p>
<p><b>Create a "Go-bag" for your family</b></p>	<ul style="list-style-type: none"> <li>• Creating a "Go-bag" ahead of time will make it easier for your family to act fast and evacuate in times of flooding.</li> <li>• Ensure that your "Go-bag" is water-resistant, or keep it wrapped in plastic to protect it from being contaminated by floodwaters.</li> <li>• Place "Go-bag" in a location where it can be easily grabbed in case of emergencies</li> <li>• Contents of your "Go-bag" should include but may not be limited to the following: important documents such as identity documents (birth and marriage certificates, tax documents, school/company/government-issued IDs), medical records, house/insurance documents; cash or debit/credit cards; communications tools, such as mobile phones, tablets, laptops; medication and prescriptions; flotation devices (such as inflatable boats or swimming rings); portable radio (preferably battery-powered, wind-up, or solar-powered); Flashlight (preferably battery-powered, wind-up, or solar-powered) and extra batteries; Food items that are not easily perishable, such as canned food, energy bars, etc.); Bottled water; First aid kit; Essential toiletries (such as soap, toothpaste, toothbrush, towel, menstrual products, etc); Blankets and pillows; Sets of clothing/underwear; Items that can keep family members entertained, such as playing cards, board games, etc.</li> <li>• Distribute the contents of your "Go-bag" among family members, keeping in mind that they should be able to easily carry their bags during evacuation.</li> </ul>	<p>General public</p>

Key messages	Supporting messages	Target audience
<b>Know where to go if you have to evacuate</b>	<ul style="list-style-type: none"> <li>• Know where your nearest evacuation center is.</li> <li>• If someone in your family is disabled or have special needs, familiarize yourself with evacuation centers or other facilities who can accommodate their needs.</li> <li>• Familiarize yourself with flood-safe routes to the nearest evacuation center and practice using the routes with your family.</li> <li>• If your family are not able to evacuate independently, know who to contact if they need help with evacuation. Remember that they may need more time to evacuate, so it is better to evacuate early.</li> <li>• Plan to meet with family members at a certain location in case you get separated.</li> </ul>	General public
<b>Create a family plan for emergencies</b>	<ul style="list-style-type: none"> <li>• Include in the planning process all members of your household, including extended family members.</li> <li>• Discuss your family's vulnerabilities and plan for specific risks your family is exposed to.</li> <li>• Consider the needs of members who have special needs or have a disability. Identify and leverage their capacities and consider the barriers they face during flooding events.</li> <li>• Identify actions needed to reduce risks, as well as resources and assistance that your family needs.</li> </ul>	General public
<b>Integrate needs of people who have non-visible disabilities</b>	<ul style="list-style-type: none"> <li>• People with non-visible disabilities can include those with cognitive, sensory, or learning/intellectual disabilities which may impede their ability to respond during an emergency.</li> <li>• Work with them to prepare an emergency kit that takes into consideration their needs, such as prescription medication, medical or assistive devices (with spare parts), water and food</li> <li>• Communicate with them in clear and plain language. If needed, rephrase your message or use gestures to help clarify what you want to say. You can also write down your message if there is time.</li> </ul>	Families with members who have non-visible disabilities
<b>Integrate needs of people who are blind or with visual impairment</b>	<ul style="list-style-type: none"> <li>• Work with them to prepare an emergency kit that takes into consideration their needs, such as extra mobility aids (such as canes) or dark glasses (if medically required), portable assistive devices (such as magnifiers, screen readers or text-to-speech devices), an emergency whistle (to attract attention), medication, etc. Include written information that lists down information about your special needs or who to contact in case of emergency.</li> <li>• Label emergency kits in large print or with braille, and keep them in a secure location where they can easily be retrieved in case of emergency.</li> <li>• Keep emergency exits in your home or office clear and free from obstruction for easy access.</li> <li>• Create/design pre-disaster information materials using raised print or braille (for printed materials) or that can be easily read by screen readers or text-to-speech apps or devices).</li> </ul>	Families with members who are blind or with visual impairment

Key messages	Supporting messages	Target audience
<b>Integrate needs of people who are deaf or hard of hearing</b>	<ul style="list-style-type: none"> <li>• Work with them to prepare an emergency kit that takes into consideration their needs, such as extra hearing aids or backup battery for your hearing aids or other communication devices, pens/pencils/markers and a small notebook/whiteboard or braille cards (for deaf-blind) or pre-prepared message cards to help communicate with others.</li> <li>• Ensure that they have access to visual channels where they can receive information about the current situation.</li> </ul>	Families with members who are deaf or are hard of hearing
<b>Integrate the needs of wheelchair- or mobility scooter- users or those who have mobility issues</b>	<ul style="list-style-type: none"> <li>• Include as part of your emergency kit spare parts for their mobility device(s), such as a tire patch kit, spare batteries, etc.</li> <li>• Help them plan their escape route in your home in case of emergencies. The escape route should be accessible and free from obstruction at all times.</li> <li>• In case you they are not able to do a self-assessment, creating a checklist that identifies areas of their body with reduced sensation would be useful so that these areas can be checked for injuries in an emergency situation.</li> <li>• Contact your local authorities to find out which evacuation centers in your area are wheelchair- or mobility scooter-accessible/friendly.</li> <li>• If you would need assistance in case of evacuation, contact your local authorities ahead of time so that they can prioritize your evacuation.</li> <li>• Keep emergency exits in your home or office clear and free from obstruction for easy access.</li> </ul>	Family members of wheelchair- or mobility scooter- users
<b>Include your animals (family pets, service/ companion animals, or livestock) in your emergency evacuation plans<sup>25</sup></b>	<ul style="list-style-type: none"> <li>• You are responsible for managing your pets/service animals/livestock in times of emergencies. Include them in your evacuation plan.</li> <li>• Make reasonable efforts to ensure that your pets or livestock do not pose any danger to other animals or people during evacuation.</li> <li>• Preparing your animals for evacuation requires time and may require a number of trips between your house and your safe area. Make a plan and act early – allow enough time to manage unforeseen problems to reduce the stress both on your animals and yourself.</li> <li>• Evacuation centers may not always be able to accommodate your pets or livestock. Identify a safe and secure place well ahead of time where you can take your animals (such as a relative or friend’s house, or an alternative private facility) in case you need to evacuate your home.</li> <li>• Prepare a “Go” bag for your animals, which should contain essential items you need to take care of your animals – food and treats, food bowl/ bucket, can opener (for canned food), water, medication, toys, bedding/ blanket, towel, litter/litter tray (for cats), poo bags (for dogs). Include items that can help identify your animals in case you get separated during a flood event, such as collars/tags that include your contact information, photos that include unique markings, microchip information, medical records and registration/vaccination papers.</li> </ul>	Pet/ service animals or livestock owners

Key messages	Supporting messages	Target audience
<b>Include your animals (family pets, service/companion animals, or livestock) in your emergency evacuation plans</b>	<ul style="list-style-type: none"> <li>Plan on how you can take your pet or livestock to your safe area safely and securely. Think about alternative routes you can take between your house and your safe area in case roads are closed due to flooding. Prepare items such as animal crates/carriers/cages, harnesses, muzzles, etc. If you have larger animals such as cows or horses, it is important to move them to a safe location well ahead of time, keeping in mind the number of trips you need to take.</li> <li>There are times when it will not be possible for you personally to help prepare your animals for evacuation. Make sure that everyone in the family is aware of the plan, and make sure to leave spare keys to animal crates or gates in an accessible location.</li> </ul>	Pet/ service animals or livestock owners
<b>Monitor the news for reliable and official weather updates, warnings, and advisories</b>	<ul style="list-style-type: none"> <li>Identify reliable sources of flood information and warnings</li> <li>Subscribe to official services that delivers warnings and preparation information</li> <li>Only share flood/landslide information and warnings that have been verified by two or more official sources (such as websites, social media, and media releases from national agencies and city officials).</li> </ul>	General public
<b>Participate in your community's disaster preparedness activities</b>	<ul style="list-style-type: none"> <li>The nature of typhoons and flooding is changing frequently due to climate change. Participate in your city/barangay's regular disaster preparedness activities (such as workshops, drills, and exercises) to ensure you and your family have the latest information and empower you to prepare and act swiftly before, during and after disasters.</li> <li>Contact Baguio CDRRMC or your Barangay's DRRMC to know more about upcoming disaster-preparedness activities or to sign up to participate. [Include information about scheduling, if known].</li> <li>A resilient community is one where all members are disaster ready. Encourage your family, friends, and neighbors to participate in disaster preparedness activities.</li> <li>Contact your Barangay DRRMC to find out about your local emergency/ disaster response plans and resources to help you and your family prepare.</li> </ul>	General public

Source: Ramboll

## 8.4 DURING FLOOD EVENT KEY MESSAGES

Warning messages during this period should focus on clearly communicating the hazard status, actions that people in a specific area need to take at a given point in time, and information that people need to make informed decisions. These can include emergency contact numbers (so people can reach out in case they need emergency assistance), list of evacuation centers, safe evacuation routes to evacuation centers, or road closures.

Table 6 below outlines a sample flood alert/warning classification system, and indicates what each warning classification means, when warnings should ideally be issued, and the corresponding public action expected. It is important to note that the public will need to be educated of this flood warning classification for such a system to be effective. A public awareness campaign is therefore highly recommended as a complementary communications activity to help establish such a system. Further work is expected to be done to help the Baguio LGU develop this flood warning classification further in a FEWS testing and validation phase.

**Table 6: An example flood alert/warning classification**

	Yellow Flood Warning	Orange Flood Warning	Red Flood Warning	De-Escalation Alert
<b>What the warning means</b>	Risk of flooding. Water level is high. Monitor the weather/news and prepare emergency supplies.	Moderate risk of flooding. Water level is very high. Monitor the weather/news and prepare emergency supplies. Prepare for evacuation.	Severe risk of flooding expected/ongoing. Immediate danger to people and property. Forced evacuation being enforced.	Floodwaters have subsided, with minor flooding remaining in certain areas. Exercise caution while returning to your homes.
<b>When the warning is issued</b>	24-72 hours before flooding	24-48 hours before flooding	<24 hours before flooding	Immediately
<b>Recommended public action(s)</b>	<ul style="list-style-type: none"> <li>Continue to monitor the news.</li> <li>Find out safe route(s) to nearest evacuation center.</li> <li>Those with special needs or families needing multiple trips should consider early evacuation.</li> </ul>	<ul style="list-style-type: none"> <li>Continue to monitor the news.</li> <li>Secure emergency supplies and wait for evacuation order from authorities.</li> <li>Follow advice of local authorities.</li> </ul>	<ul style="list-style-type: none"> <li>Follow advice of local authorities.</li> <li>Continue to monitor the news.</li> <li>Secure your property.</li> <li>Turn off gas, electricity, and water utilities.</li> <li>Secure emergency supplies and shelter in place if it's not possible to seek higher ground.</li> <li>Call 911 if you or your family are in immediate danger.</li> </ul>	<ul style="list-style-type: none"> <li>Check your home's structural integrity or for dangerous debris.</li> <li>Check your home's utilities (water, sewage, electricity) for damage or contamination before use.</li> <li>Follow guidance on post-flood cleanup.</li> <li>Contact your local authorities for post-flooding assistance.</li> </ul>

Source: Ramboll

A thorough statistical investigation including multiple years of continuous water level data will be required to determine the thresholds for the different levels of warning (see chapter 9). This investigation would include assessment, at each identified location along the river, of what water levels may be categorized as normal risk, high risk and imminent risk, at what corresponding accuracy of the predicted levels with respect to hours before the expected event.

### 8.4.1 STRUCTURE OF WARNING MESSAGES

Feedback from Key Informant Interviewees from the Baguio City Gender and Inclusion Study cited three pieces of information that needs to be effectively communicated that would enable people to make risk-informed decisions: (i) information on how severe a flood would be, (ii) where a flood would occur, and (iii) when a flood would occur.

Information about safe flood routes to evacuation facilities is also key in ensuring that people are able to reach evacuation shelters safely.

Based on the above, as well as international best practices, flood warnings should include the following key elements:

- Warning title to draw attention to the message;
- Issuing authority, to establish source and credibility of warning message;
- Date and time the warning was issued;
- Specific area where warning is applicable to;
- Type of hazard, including the expected time when hazard will happen, the likelihood that hazard will happen, the severity of the hazard, and the hazard's expected impact/effect on the community;
- Clear advice or recommended action that people need to take in the context of the hazard status
- When the next update is expected to be issued (if known)
- Where to get more information (such as a shortened link to more information for those who can access a web browser);
- Important contact numbers that people can call in case they need emergency assistance or to verify information)
- Visual references of important information, such as a map or evacuation routes, location of evacuation centers, etc. (if relevant, and on appropriate channels such as social media)

Overall, warning messages should be written in a clear and concise manner. Technical jargon should be avoided by using simplified terminology that is more easily understood by the public. It should also be written so that it can easily be read or translated by assistive devices such as screen readers and text-to-speech apps.

The frequency of warning issuance should be based on significant changes to the current status of the hazard risk in a specific area, changes in recommended action/advice that people need to take or based on a prescribed frequency for updates so that recipients know when to expect warning messages/updates. Table 7 shows a sample of information for a short text-based warning message.

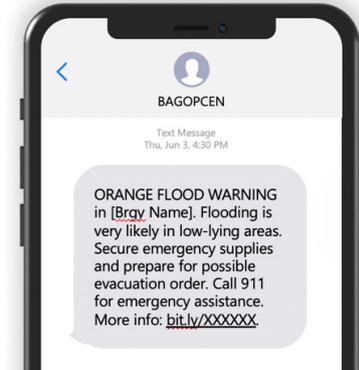
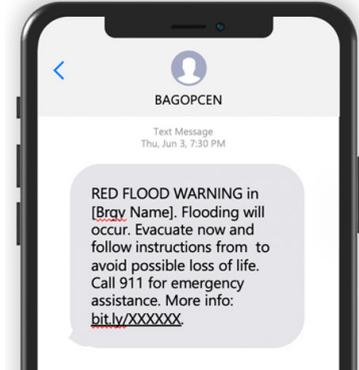
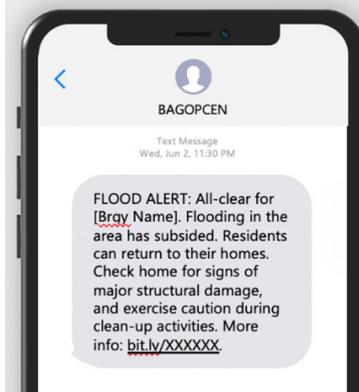
**Table 7: Sample information to include in public warning messages during flood event**

Type of information	Sample message
<b>Issuing authority:</b>	<i>BAGOPCEN</i>
<b>Warning title:</b>	<i>YELLOW FLOOD WARNING</i>
<b>Date and time issued:</b>	<i>3 Jun 2021, 1:30AM</i>
<b>Description of hazard/ threat + Specific area</b>	<i>YELLOW FLOOD WARNING declared in Brgy [Name]. Flooding expected in low-lying areas and near creeks/ rivers and is anticipated to intensify.</i>
<b>Advice or recommended action (call to action)</b>	<i>Monitor the news for weather updates and prepare emergency supplies in case an order to evacuate is given. Households with special needs should evacuate now via [summary of safe evacuation route].</i>
<b>When next update is expected</b>	<i>Next update at 8:00 AM, 3 Jun 2022</i>
<b>Emergency contact #s</b>	<i>Call [emergency #] for emergency assistance.</i>
<b>Where to get more information (optional)</b>	<i>More info: [shortened link]</i>
<b>Visual references (optional)</b>	<i>[Link/Map of safe evacuation routes, list of evacuation centers, etc]</i>

\*Note: For SMS-based warnings, level of detail included may depend on how many characters can be utilized. In this case, warnings should prioritize succinct hazard description, call to action, emergency contacts, and link to more complete information.

Source: Ramboll

Table 8: Sample mockup of SMS flood warnings

Alert classification	Sample mock-up	Sample text
Yellow flood warning		<p><i>YELLOW FLOOD WARNING in [Brgy Name]. Flooding is likely in low-lying areas. Early evacuation for households with special needs recommended. Call 911 for emergency assistance. More info: <a href="bit.ly/XXXXXX">bit.ly/XXXXXX</a>.</i></p>
Orange flood warning		<p><i>ORANGE FLOOD WARNING in [Brgy Name]. Flooding is very likely in low-lying areas. Secure emergency supplies and prepare for possible evacuation order. Call 911 for emergency assistance. More info: <a href="bit.ly/XXXXXX">bit.ly/XXXXXX</a>.</i></p>
Red flood warning		<p><i>RED FLOOD WARNING in [Brgy Name]. Flooding will occur. Forced evacuation in force. Evacuate now and follow instructions from to avoid possible loss of life. Call 911 for emergency assistance. More info: <a href="bit.ly/XXXXXX">bit.ly/XXXXXX</a>.</i></p>
De-escalation alert		<p><i>FLOOD ALERT: All-clear for [Brgy Name]. Flooding in the area has subsided. Residents can return to their homes. Check home for signs of major structural damage, and exercise caution during clean-up activities. More info: <a href="bit.ly/XXXXXX">bit.ly/XXXXXX</a>.</i></p>

Note: Use of graphics in MMS-based warnings, such as photos or maps, may not be visible to message recipients due to MMS restrictions (recipients might also be using a non-MMS compatible handset). It may be better to include a shortened link where they can find more information relevant to the warning (such as a list of evacuation centers, and safe routes that people can take).

Source: Ramboll

### 8.4.1.1 Sample SMS-based warnings

When applied to different communications channels, warnings can be tailored as shown in Table 8 in the case of SMS-based public flood warnings. Further work is expected to be done to help the Baguio LGU develop these SMS flood warnings further while testing and validating the FEWS design in the coming years.

### 8.4.1.2 Social Media warnings

While Baguio CDRRMO’s and Baguio City Public Information Office’s social media platforms currently publish/re-publish useful rainfall warnings and other relevant information applicable to the City of Baguio, it currently does not publish specific flood warnings (refer to Appendix I for an overview of current warnings issued/republished).

Table 9 below shows an example of how a social media-based flood warning message can look like. The warning message should clearly indicate the flood warning classification, the barangays that are expected to be affected, and a clear call to action from people in the affected communities. It should ideally also indicate the date and time when the next official update is expected. Further work is expected to be done to help the Baguio LGU develop these materials further while testing and validating the FEWS design in the coming years.

**Table 9: A draft mock-up of an official flood warning issued via social media**

<b>Alert classification</b>		
Various (to indicate varying flood severities)		
<b>Sample mock-up</b>		
<h1 style="color: red;">BAGUIO OPCEN FLOOD WARNING</h1> <p>ISSUED 4 JUNE 2021 (TUES), 8:00 AM</p>		
 <p><b>YELLOW WARNING</b> Light flooding expected and anticipated to intensify in the following barangays:</p> <p>BARANGAY NAME 1      BARANGAY NAME 2 BARANGAY NAME 2      BARANGAY NAME 3 BARANGAY NAME 4      BARANGAY NAME 5</p> <p><b>TAKE ACTION NOW!</b></p> <ul style="list-style-type: none"> <li>• Be alert and monitor the weather and news</li> <li>• Secure your home, move belongings to a higher location</li> <li>• Prepare your emergency kit in case of evacuation</li> <li>• Consider early evacuation if you or a family member need more time to do so</li> </ul>	 <p><b>ORANGE WARNING</b> Moderate flooding expected and anticipated to intensify in the following barangays:</p> <p>BARANGAY NAME 1      BARANGAY NAME 2 BARANGAY NAME 2      BARANGAY NAME 3 BARANGAY NAME 4      BARANGAY NAME 5</p> <p><b>TAKE ACTION NOW!</b></p> <ul style="list-style-type: none"> <li>• Secure your emergency supplies and evacuate to your nearest evacuation center to avoid being isolated from emergency services</li> <li>• Do not walk or drive on flooded roads</li> <li>• Cooperate with local authorities</li> <li>• Call 911 for emergency assistance</li> </ul>	 <p><b>RED WARNING</b> Severe flooding expected and anticipated to intensify in the following barangays:</p> <p>BARANGAY NAME 1      BARANGAY NAME 2 BARANGAY NAME 2      BARANGAY NAME 3 BARANGAY NAME 4      BARANGAY NAME 5</p> <p><b>TAKE ACTION NOW!</b></p> <ul style="list-style-type: none"> <li>• Evacuate now to avoid loss of life</li> <li>• If unable to evacuate, secure emergency supplies and move to a higher location to keep yourself and your family safe.</li> <li>• Call 911 for emergency assistance</li> </ul>
 www.baguio.gov.ph      CALL 911 FOR EMERGENCY ASSISTANCE      f @BaguioCDRRMC      #FloodAlertBAG		
<b>Sample accompanying text</b>		
Severe weather conditions are expected to affect Baguio City. Flooding of varying severity expected in low-lying or flood-prone barangays and areas near creeks/rivers. Take action and follow the advice of local authorities.		
Next update expected at [Time].		

### 8.4.1.3 Siren warnings

Baguio currently has a flood warning siren located at City Camp Lagoon (one of the high-risk flood areas identified by the city) as a means of warning the residents in the vicinity of impending flooding. The siren is currently being triggered manually by the CDRRMO's Operations and Warning Officer based on the following factors: 1) the water level observed by the water level monitoring station located at City Camp Lagoon; 2) rainfall data from DOST-PAGASA, and 3) visual site observation of inundation in the area.

Table 10 below indicates the conditions observed for the manual triggering of the siren at City Camp Lagoon. While the system is observed by Baguio CDRRMO, they have noted that it has not been formally established city-wide and is restricted to the City Camp Lagoon area. One particular challenge noted by participants during the Data Dissemination and Outreach workshop was that it was difficult to hear the siren and the recorded message that accompanies it from households that are further away from the siren, especially when it is raining.

**Table 10: Current siren warning system at City Camp Lagoon**

Warning category	Siren description	Rainfall trigger	Water level trigger	With on-site observation	Public action required
<b>Alert</b>	Sound + Recorded message (in Filipino language)	30 mm/hr torrential rain	3m water level	Yes	Perform pre-emptive evacuation due to rising water levels
<b>Alarm</b>	Sound + Recorded message (in Filipino language)	Continuous torrential rain for the next 3 hours	5m water level	Yes	Community should have evacuated due to rising water level
<b>Critical</b>	Sound + Recorded message (in Filipino language)	Continuous torrential rain for the next 6 hours	8m water level	Yes	Flooding is imminent, water level has reached its threshold level

Source: Baguio CDRRMO

In order to improve the audibility of the siren warnings, Baguio City could consider the installation of additional outdoor warning sirens strategically placed in other low-lying, high-risk, or flood-prone barangays, and establish a city-wide siren warning system to ensure consistent and audible warnings are heard in critical areas. Table 11 outlines a suggested siren alarm system that adopts a 3-stage warning system based on the rainfall and water level in certain water level stations. Siren sounds for each warning category can be differentiated to help communities easily distinguish the warning category being communicated and what immediate action is required (without the need for a recorded message).

It is important to note that the communities living near the sirens will need to be informed about the meaning of the siren-based warnings for the warning system to be effective. A siren warning awareness campaign is therefore highly recommended as a complementary communications activity to support this.

**Table 11: Suggested city-wide siren warning system**

Warning category	Siren description	Rainfall trigger	Water level trigger	With on-site observation	Public action required
<b>1st alarm</b>	1 minute intermittent sound	X mm/ hr	X meter water level at [water level station]	Yes	Prepare emergency Supplies and standby for possible evacuation order
<b>2nd alarm</b>	3 minute intermittent sound	X mm/ hr	X meter water level at [water level station]	Yes	Evacuate immediately to nearest evacuation center
<b>3rd alarm</b>	5 minute intermittent sound	X mm/ hr	X meter water level at [water level station]	Yes	Forced evacuation in effect

Note: "X" should indicate the appropriate rainfall and/or water level threshold relevant to the vicinity of the siren.

Source: Ramboll

#### 8.4.1.4 Visual warnings

While sirens work well as an audible warning tool, it does not meet the needs of people who are deaf or hard of hearing who may also not have access to traditional channels (such as television, radio, or a mobile phone) and are therefore in danger of being left behind during flood events. One community-based low-technology method that the city government may want to consider is the use of flags, erected in a strategic or high-traffic area within the community to indicate that a flood warning is in effect. Flags can be color-coded to indicate specific flood alert levels and can be used in tandem with other channels/tools for visual warnings (such as signages). Further work is expected to be done to help the Baguio LGU develop these visual warnings system further in while testing and validating the FEWS design in the coming years.

As also mentioned under the siren alarm system, it is crucial that the community is educated about the meanings of these flags to ensure the effectiveness of a flag-based flood warning system.

### 8.4.2 FEEDBACK ON CURRENT WARNING MESSAGES RECEIVED

During the Data Dissemination and Outreach Workshop held on 10 June 2022 (see Appendix K for the tabulation of participant responses), participants were asked if the warnings they received included clear advice on what affected individuals should do, and how they were impacted by this. Several participants cited the generalized nature of the warnings, with no specific areas mentioned in the warnings, and no clear advice on what to do next (such as when and where to evacuate). Some participants also mentioned receiving late warnings and advisories related to the suspension of work and classes, which led to stress from not receiving them earlier. Feedback also indicated that warning messages did not also clearly specify areas where disaster response is being prioritized.

There were also indications that some current warning channels could be improved, as one participant cited that sirens were activated, but could not be heard in areas further from the location of the siren.

Participants also cited positive feedback, as there were also several participants who mentioned that the messages that they were received were clear. They also mentioned that pre-emptive measures were taken by barangay officials even without the issuance of an early warning message, and that visits by CDRRMO personnel before the flood event was also conducted.

## 8.5 POST-FLOOD EVENT KEY MESSAGES

Messages during this period should focus on:

- Guidance on post-flooding cleanup and recovery (such as flood damage assessment, sanitation (sewage, drinking water), household clean-up), including tips on how to purify water in case local drinking water supplies have been compromised;
- Resources, programs, or services offered by the city or barangay to help citizens in home/property cleanup or recovery, or provide support to community members in need of social/psychological/emotional support.
- Getting post-flooding event feedback from affected communities/individuals to the FEWS Operation and Maintenance team anchored at the CDRRMO.

Examples of post-flood event messages can be found in Table 12.

**Table 12: Suggested post-flood event key messages and supporting messages**

Key message	Supporting messages	Target audience
<b>Checking for flood damage</b>	<ul style="list-style-type: none"> <li>• Before settling back into your home, check your home for any major structural damage that might make your home unstable and unsafe for your family to stay in.</li> <li>• If you suspect or see any structural damage, contact your local barangay officials for assistance.</li> <li>• If there are electrical appliances that were submerged, turn off your fuse box/circuit breaker before unplugging the appliance and handling them.</li> <li>• If you suspect or see any electrical damage or issues, contact a professional electrician or your local power utility provider for assistance.</li> </ul>	General public
<b>Ensure that your sanitation facilities are working</b>	<ul style="list-style-type: none"> <li>• Make sure that your home’s sewer line is working before using the toilet.</li> <li>• Check your drinking water sources for contamination before using/consuming them.</li> <li>• If your home’s sanitation/sewer system sustained damage, have them serviced immediately by calling a professional or your local utility provider.</li> </ul>	General public
<b>Purify your water<sup>26 27</sup></b>	<ul style="list-style-type: none"> <li>• After a flooding event, the water may not be safe to drink or use for food preparation, dishwashing, brushing your teeth, or for bathing.</li> <li>• If you are unsure if your water is clean, you can purify your water using one of the following methods:               <ul style="list-style-type: none"> <li>◦ By boiling:                   <ul style="list-style-type: none"> <li>• Remove foreign objects by filtering the water through a clean cloth or letting foreign objects settle at the bottom before pouring the water into a clean container</li> <li>• Boil the filtered water for 3-5 minutes. Let water cool until it can be easily handled.</li> <li>• Store boiled water in a clean, covered container.</li> </ul> </li> <li>◦ With household chlorine bleach:                   <ul style="list-style-type: none"> <li>• (Important note: If using bleach for water disinfection, do not use non-chlorine bleach, scented bleaches, color-safe bleaches, or bleaches with added cleaners. Check the ingredients list before use).</li> <li>• Disinfect your water by mixing 2 drops (0.1 mL) of non-scented household bleach per 4 cups/1 liter of warm water (around 20° celcius). Cover the mixture and let water stand for 30 minutes before drinking.</li> <li>• If the water is very cloudy, double the amount of bleach. Cover and let stand for 1 to hours before drinking.</li> <li>• A slight chlorine smell and taste is normal, but if you want reduce the chlorine taste, let the water stand 1 to 2 more hours before drinking.</li> <li>• If disinfecting water using chlorine tablets, follow the directions on the package.</li> <li>• If the water is heavily contaminated or polluted with chemicals, the boiling and/or bleach disinfection method will not be enough. You need to find an alternative source of potable water. Reach out to your local barangay/city officials for guidance.</li> </ul> </li> </ul> </li> </ul>	General public

26 HealthLink British Columbia. 2021. Disinfecting Drinking Water. <https://www.healthlinkbc.ca/healthlinkbc-files/disinfecting-drinking-water>  
 27 Centers for Disease Control and Prevention. 2021. Make Water Safe. <https://www.cdc.gov/healthywater/emergency/making-water-safe.html>

Key message	Supporting messages	Target audience
<b>Tips on cleaning up your home after a flood/ landslide</b>	<ul style="list-style-type: none"> <li>• Use protective equipment such as gloves, aprons, and eye protection during cleanup.</li> <li>• Use hot water and disinfectant when cleaning.</li> <li>• Carefully rinse paper with clean water before placing them in between sheets of wax paper to dry.</li> <li>• Discard food that has been in contact with floodwater.</li> <li>• Discard porous items that has been in contact with floodwater</li> <li>• Clean and disinfect salvageable appliances, furniture, pots, pans, dishes and utensils with warm water and disinfectant and let them air-dry.</li> <li>• Remove mud and dirt from linens or clothes and wash items with hot water and disinfectant.</li> <li>• Contact your city's waste management or engineering office for assistance in collecting appliances or large furniture for proper disposal, or for help in clearing large flood debris</li> </ul>	General public
<b>Get the support you need to recover post-disaster</b>	<ul style="list-style-type: none"> <li>• Check with your barangay leaders or city officials for any programs related to post-disaster trauma support/ counselling</li> <li>• Reduce stress by reaching out and spending time with loved ones, and taking breaks to take care of yourself.</li> <li>• Seek the support of your family, neighbors or other community members who may be going through the same post-disaster challenges as you.</li> <li>• Be understanding of family members who may be struggling to cope</li> </ul>	General public
<b>Reflect on your experience, and how you can improve your family's preparedness</b>	<ul style="list-style-type: none"> <li>• Revisit your family emergency plan and make the necessary changes to improve preparedness for future flood events;</li> <li>• Continue to practice preparedness measures together with your family.</li> <li>• Did your household receive the necessary information/ warnings that should enable you to act early? If not, contact your local barangay or city officials for guidance.</li> </ul>	General public

Source: Ramboll



# 9. TESTING DISSEMINATION OF INFORMATION UNDER THE FEWS IN BAGUIO



## 9.1 WHY A TEST AND VALIDATION PHASE?

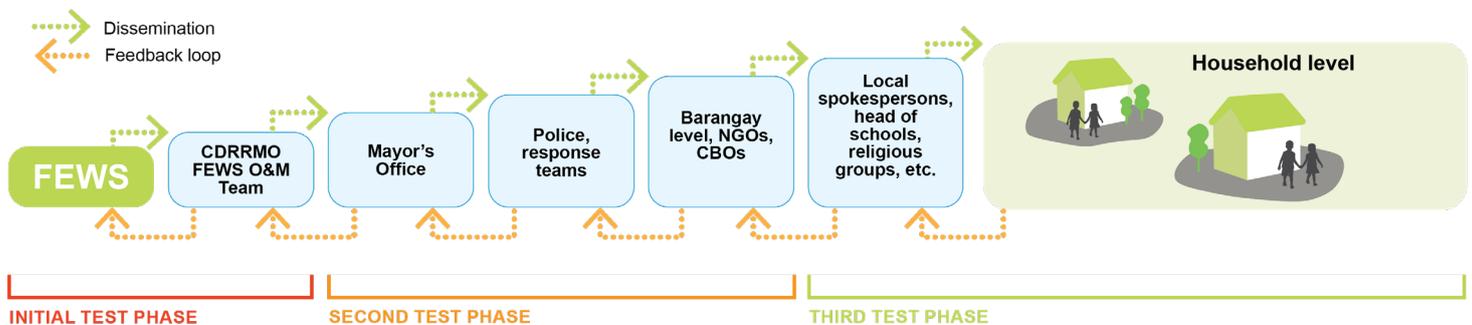
To avoid sending flawed warnings to the wrong recipients at a wrong time, the FEWS in Baguio needs to be tested and the quality of the messages need to be validated in several steps, before sending messages to the end-recipients, the affected residents of Baguio. The completion of full-scale testing is crucial to draw on all the necessary lessons learned, i.e., initiate the loop of adjustments and fine tuning of the system. The need for testing is not limited to one single monsoon season, as any FEWS requires proper validation (several monsoons) before it's publicly launched. Launching a FEWS without proper testing and troubleshooting time can have serious consequences on the credibility of the LGU and ultimately on the confidence in the system itself.

A test and validation phase will last several years, depending on the number of flood events, their severity and the feedback loops established to review the messages and channels.

## 9.2 ORGANIZATIONAL SET-UP AND TEST PHASE(S)

The test phases are outlined in Figure 10 below.

**Figure 10: Organisational set-up during the test phases**



Source: Ramboll

During the initial test phase, the FEWS will only be tested by the FEWS Operation and Maintenance team anchored at the CDRRMO, and the Mayor's office will be informed about the test results on a frequent basis.

The subsequent test phases will gradually involve more levels and eventually include the end-users of the information. It will be a political decision when to include the different levels of recipients, as there will always be a risk involved in either disseminating too little or too late information or too broadly and too much information.

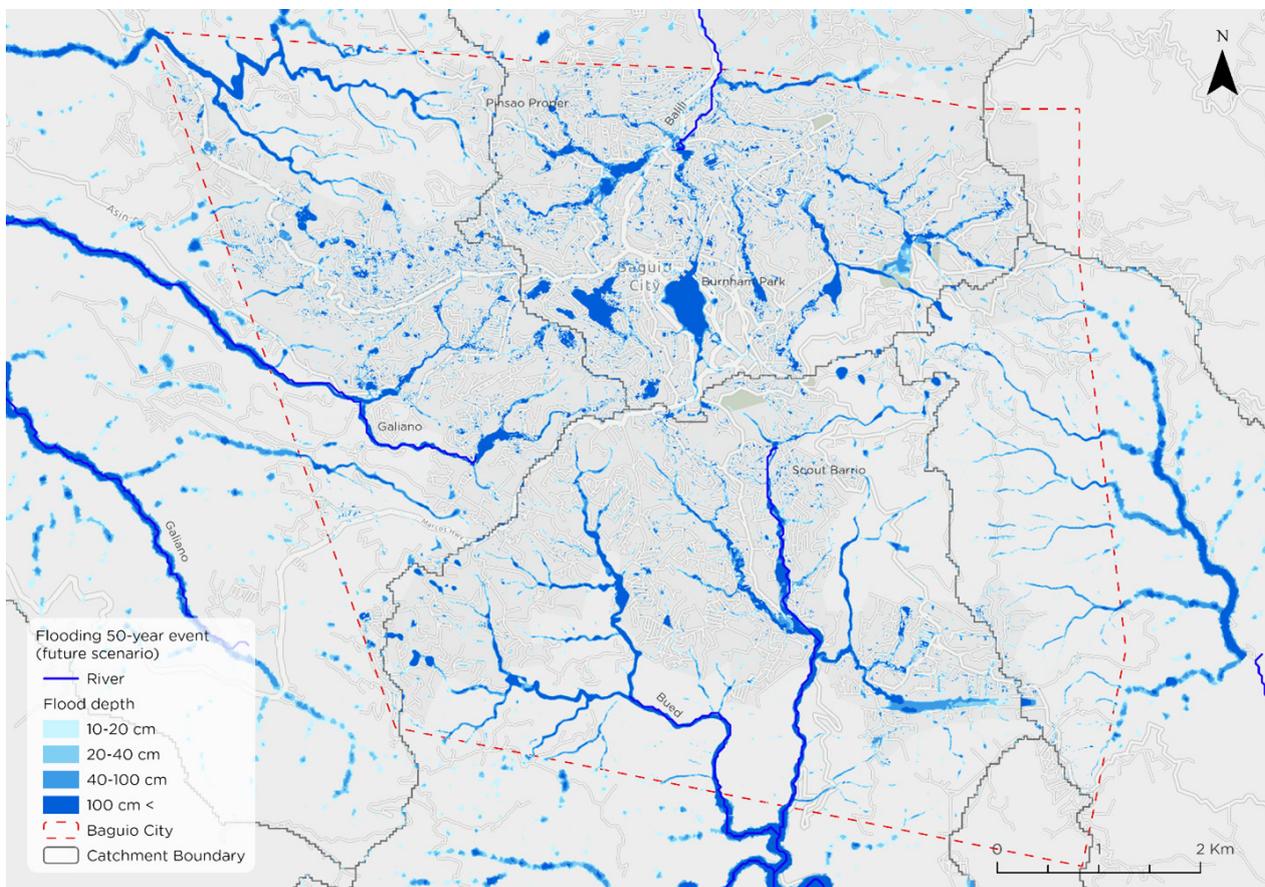
### 9.3 INFORMATION AND MESSAGES DURING TEST PHASE(S)

Information gathered and the messages and channels tested during the test phase will depend on the readiness of the FEWS system during these phases and the link to the national weather forecast system. The list of channels and messages deployed will gradually be extended over the duration of the test phases.

#### 9.3.1 RAIN FORECAST AND IDENTIFICATION OF BARANGAY'S AT RISK OF FLOODING

Based on the flood maps produced for the *Hydraulic Model and Hazard and Risk Mapping Assessment Report*,<sup>28</sup> Barangays at-risk of flooding have been identified for different intensities of rain corresponding to 3-, 10- 20- and 50-year return periods. Figure 11 shows the simulated depth and extent of flooding for a 50-year rainfall event in a future climate scenario. An approach, which could be incorporated in the FEWS, includes correlating rainfall forecasts for 72 hours with these rain intensities in real time to identify the Barangays at-risk and generate warnings accordingly via emails and on the dashboard by color coding the respective barangays based on the magnitude of impact expected.

**Figure 11: Flood map – 50-year event**



Source: Ramboll

### 9.3.2 RIVER OVERFLOW FORECAST

In the selected test areas, it will be possible to test the River Overflow Forecasts. Depending on the site, it will be possible to give warnings of flood risk from river overflow based on exceedance of different water level thresholds.

## 9.4 CHANNELS DURING TEST PHASE

During the test phase, three different channels have been selected to send messages to the CDRRMO and subsequently to the Mayor's office and response teams. In the test phase, key outputs from the Dashboard maintained and operated by the FEWS O&M team will be shared with the key personnel in CDRRMO primarily the Officer In Charge and Deputy Officer in Charge. The system will be set up to send automatic test warning SMS/Text messages and e-mails to key personnel, whenever a) a rain event will create a risk of inundation in the Barangays and/or b) there is a risk of river overflow along one of the rivers.

## 9.5 FEEDBACK LOOPS

Feedback loops are crucial when testing the system. In practice, this means that whenever a warning has been issued via one of the channels, the Officers-In-Charge and/or supporting staff, will move physically to the affected area to check, whether the forecasted events are taking place, and whether the risk level was appropriate. A feedback loop is crucial to check the validity of the forecasts, and to gradually upgrade the system to become more precise in the forecasting of specific events. Gradually, as the system is finetuned utilizing additional available data and lessons learned in the upcoming monsoon seasons, the FEWS should move from relatively coarse predictions to become more and more precise.

Over time the feedback loops will include more and more levels of users, as indicated in Figure 10.

## 9.6 EVALUATION

After a forecasting event has taken place, the forecasting steps and the feedback loops should be evaluated, and a short evaluation report filed and shared with the Mayor's Office. The Evaluation report will evaluate the process, the feedback loops, the precision of the forecasting in time and space, and indicate where the FEWS may be further developed. Over time, more levels may be involved in the evaluation, using relatively simple questionnaires.

# 10. PERFORMANCE MEASUREMENT OF D&O ACTIVITIES



The implementation of the Dissemination and Outreach activities should be monitored closely by the LGU team, and the performance of the system discussed and evaluated among the project partners. The success of this dissemination and outreach plan will be evaluated based on quantitative and qualitative measurements.

## 10.1 PERFORMANCE MEASUREMENT PROCESS

It is suggested to measure the performance on the Dissemination and Outreach activities by monitoring and evaluating the actions and responses among key stakeholders in the two phases, response phase and recovery phase. Key stakeholders being:

- a) The City Disaster Risk Reduction and Management Council (CDRRMC)
- b) The CDRRM Office
- c) The Emergency Operations Centre (OPCEN)
- d) The Barangay DRRM Committees in every Barangay
- e) Private and NGO emergency responders
- f) Affected enterprises
- g) Affected private citizens

## 10.2 KEY PERFORMANCE INDICATORS

Key performance indicators will focus primarily on the operations, timing of messages, the channels and the messages, e.g. the timing, the use of different channels and the quality of the messages in getting the message through to stakeholders/end-users at different times before, during and after a flood event (Table 13).

**Table 13: Suggested KPIs**

Theme	Stakeholders	Quantitative (QN) /Qualitative (QL)	KPI
<b>Operations</b>	a,b,c,d,e	QL	Strengths. What went well during the different phases from response to recovery
	a,b,c,d,e	QL	Weaknesses. What needs to be improved during the different phases from response to recovery
<b>Timing</b>	a,b,c,d,e	QN	Time between warning and response
	f,g	QN	Time between warning and actual hazard event
		QL	How was the timing between messages received, the response needed and the onset and duration of the Hazard event?
<b>Channels</b>	a,b,c,d,e,f,g	QL	Channels used for messages – please state the one most used and why they were used the most
<b>Messages</b>	a,b,c,d,e,f,g	QN	No. of messages received
	a,b,c,d,e,f,g	QL	Language used – please state the languages used for the messages and whether they were appropriate
	a,b,c,d,e,f,g	QL	Information received – please indicate the relevance of the information received

Source: Ramboll

## 10.3 INTERNAL AUDIT

At least once a year following the events and the recovery phase(s), as part of the mitigation phase, an internal audit of the OPCEN procedures, communication channels, messages and response from different stakeholders will need to be executed. Were the official plans and Operational Procedures followed, and what went well and what could be improved for the coming events? These are important questions in the process of revising and strengthening the Emergency response before, during, and after the disaster events.

## 10.4 EXTERNAL AUDIT

An external audit by a professional international team working on Emergency and Disaster Dissemination and Outreach plans in the Philippines or other similar countries in the region would be advisable occasionally, to make sure that the Baguio OPCEN is up to national and/or international standards in implementing new technologies and reaching out to all relevant stakeholders and end users.



Source: Adobe Stock

# 11. WAYS FORWARD



During the process of developing the Data Dissemination and Outreach Plan, a series of actions to move forward have been identified. The primary action being the testing and validation of the FEWS as described in the previous chapter and the development of SOP for DDO activities. Furthermore, a number of challenges and suggestions have emerged, primarily through dialogues with the LGU, and the team working on Gender and Social Inclusion study for Baguio City. Out of these dialogues and research, we suggest the following actions to be covered in the process of testing and validating the Data Dissemination and Outreach Plan.

## 11.1 TESTING AND VALIDATION

As described in chapter 9, the testing and validation phase should include three distinct phases (Figure 10), followed by the development of SOPs for the different stakeholders involved in getting messages across to the recipients/end-users. In the third testing phase, Awareness and Education activities should be developed, as well as media partnerships to ensure the effective delivery of messages. The testing and validation phase is expected to cover multiple monsoon seasons, depending on the frequency of events and resources available to develop the necessary communication tools and channels.

An explicit vulnerability program and specific gender and social inclusion actions will also need to be included, as described in the coming sections.

## 11.2 GENERAL AWARENESS AND EDUCATION ACTIVITIES

The following general awareness and education activities are recommended:

### **Design general flood warning awareness information campaign to:**

- Showcase official flood warning information platforms (such as Baguio City Public Information Office and Baguio CDRRMO official social media) and community-based warning methods (such as siren warnings, sound trucks, and barangay volunteer house-to-house warnings) as reliable sources of flood warning information.
- Educate communities in low-lying, flood prone barangays on the benefits of early preparation and the consequences of responding late or not listening to warnings.
- Educate communities on the importance of proper waste disposal and how it helps to prevent flash floods in the city. Consider involving communities directly through a regular clean-up activity to increase community ownership/commitment.

### **Enhancement of Disaster Risk Reduction education in schools, in coordination with the Baguio Department of Education and in partnership educational institutions in the city:**

- Design flood risk education modules that can be taught to students throughout the year. Activities can involve games or group activities like role playing to share key messages.
- Conduct of regular drills on evacuation/rescue protocol (similar to earthquake drills)
- Develop educational materials that students can bring home to their families
- Give basic first-aid training to students

### **Establish media partnerships to ensure effective delivery of messages and alerts:**

- Develop public-private partnership with telecom providers such as Globe, Smart, PLDT, etc. to ensure that emergency alerts are delivered to their subscribers in the area.
- Design public service announcements (30-second "ads" on Radio and TV or as a social media campaign) on actions to take during the mitigation, preparation, response, and recovery phase.
- Develop a handbook/toolkit about flooding, how to prepare, what to do before, during, and after events.
- Develop Informational campaign - risk knowledge (map of risk areas, connection between rainfall and flood risk, landslides), response capability (what to do, go-bag, numbers/webpages to remember), monitoring and warning (how to read advisories, what to look out for, where to find information), dissemination channels to follow;
- The public service announcements, toolkits, information campaigns and other materials related to preparedness should be developed and tested with members of marginalized groups. This should include people with barriers to understanding majority-targeted content such as language, education, literacy and disabilities.

**Establish Vulnerability program to easily identify households with special needs so emergency personnel can easily identify these households and prioritize their (early) evacuation:**

- Partner with NGOs who can help with implementing such a program, and to disseminate information
- Explore use of information from Baguio in my Pocket app, as the app currently asks for information if there is a Person with Disability (PWD) in the household.
- Develop visual way to “mark” households with special needs so they can be easily identified by rescue/evacuation personnel in the event of a flood event
- Outreach by social welfare officers to homeless residents to ensure they know what to look out for or where to go/evacuate to before flood events.

**Enhancement of Disaster Risk Reduction education in the barangay level (for adults and vulnerable individuals in the community):**

- Partner with NGOs/volunteer groups who can help with implementing such a program
- Implement regular household-level drills on evacuation/rescue procedure
- Hold regular town hall meetings to address residents’ concerns
- Hold regular training for volunteers who want to be part of the disaster response
- Hold first-aid training for families/community

## 11.3 GENDER AND SOCIAL INCLUSION ACTIONS

The following actions for enhancing gender and social inclusion are recommended:

- Test the messages on vulnerable focus groups covering text, audio, visual and different phrases and language, with focus on including people with language, education, literacy and disability-related barriers.
- Communicate with local academia to validate and get feedback on the messaging guide.
- Explore and develop ways to make experience-based knowledge accessible to broader populations, including information on lessons learnt from past floods.
- Develop a flyer to be disseminated to households/stakeholders with easily digestible information about flooding, how to prepare, and what to do before, during and after a flooding event (With clear examples from previous events of impacts and actions.
- Develop clear infographics.
- Conduct survey of community leaders/BDRRMO staff helping out in disseminating warnings during flooding.
- Conduct survey/research on communication preferences and barriers of migrants, newly-arrived residents (such as students) and other individuals with few local connections.
- Conduct consultations/focus group discussions for testing the content of messages with members of marginalized groups (for example those with linguistic, educational, literacy, disability related barriers to understanding majority targeted content), e.g. the following stakeholders/end-users:
  - Local Department of Social Welfare & Development staff;
  - Women’s groups, single parents, LGBTQ+ people;
  - Dept of Education/ public and private schools/ universities/ vocational institutions;
  - Local Department of Social Welfare & Development staff/ organizations representing people with disabilities;
  - Local Department of Social Welfare & Development staff/ organizations representing the homeless.

## **ABOUT THE ASEAN AUSTRALIA SMART CITIES TRUST FUND**

The ASEAN Australia Smart Cities Trust Fund (AASCTF) assists ASEAN cities in enhancing their planning systems, service delivery, and financial management by developing and testing appropriate digital urban solutions and systems. By working with cities, AASCTF facilitates their transformation to become more livable, resilient, and inclusive, while in the process identifying scalable best and next practices to be replicated across cities in Asia and the Pacific.

