# BAGUIO CITY GENDER AND INCLUSION STUDY

FINDINGS AND SOLUTIONS TO INFORM THE BAGUIO CITY SMART FLOOD EARLY WARNING SYSTEM

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**RAMBOLL**

**Practical ACTION CONSULTING**

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| Date | **Catherine Grant (Ramboll); Sarah Brown (Practical Action); Alison Sneddon (Practical** |
| Prepared by | **Action); Mirianna Budimir (Practical Action); Issy Nelder (Practical Action); Barbara Lama (Ramboll); Maria Facchin Asmussen (Ramboll); Annabelle Vitti Valenzuela (Ascott); Melisa Sapdoy (Ascott); Miguel Guioguio (Ascott); Francis Funa (Ascott)** |
| | **Hillarie Cania (Ramboll)** |
| Checked by | **Richard Ward (Ramboll)** |
| Approved by | **This Mixed Methods Gender and Inclusion Study Report is the first deliverable in the proj-** |
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# ABBREVIATIONS

| | |
|---|---|
| AASCTF | ASEAN Australia Smart Cities Trust Fund |
| ADB | Asian Development Bank |
| ALPA | Activity Level Performance Assessment |
| BLISTT | Baguio City, La Trinidad, Itogon, Sablan, Tuba, Tublay |
| CAR | Cordillera Administrative Region |
| CBA | Cost Benefit Analysis |
| CBO | Community Based Organisations |
| CDRRMO | City Disaster Risk Reduction and Management Office |
| CPDO | City Planning and Development Office |
| CSWDO | City Social Welfare and Development Office |
| DFAT | Department of Foreign Affairs and Trade (Australia) |
| 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 |
| IDP | Internal Displaced Person |
| KII | Key Informant Interview |

| KPI | Key Performance Indicator |
|---|---|
| LGBTIQ+ | Lesbian, gay, bisexual, transgender/gender diverse, intersex and queer |
| LGU | Local Government Unit |
| LDRRMP | Local Disaster Risk Reduction Management Plan |
| M&E | Monitoring and Evaluation |
| MV | Missing Voice(s) |
| NbS | Nature-Based Solutions |
| NGO | Non-Governmental Organisation |
| NSO | National Statistics Office |
| OCD | Office of Civil Defence |
| PAC | Practical Action Consulting |
| PAGASA | Philippine Atmospheric Geophysical and Astronomical Services Administration |
| PSA | Philippine Statistic Authority |
| PwD | Person(s) with Disabilities |
| QD | Qualitative Data |
| QPR | Quarterly Progress Report |
| SOGIE | Sexual Orientation, Gender Identity and Expression |
| SOP | Standard Operating Procedure |

# GLOSSARY OF TERMS

| Term | Definition |
| --- | --- |
| Ableist | Discriminatory against people with disabilities |
| Barangay | A barangay is the smallest political unit in the Philippines |
| Cisgender | A person whose gender identity is consistent with their sex assigned at birth |
| Cisnormative | The assumption that all people are cisgender, and the organization of the world on the basis of that assumed norm |
| 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 |
| 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 | Information communicated to stakeholders to advise them of the likelihood of a disaster occurring within a given timeframe |
| Early Warning System | 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) |
| Flood Risk | The likelihood of a flood event occurring, and the impact caused |
| Gender | Gender encompasses gendered roles or expectations, societally enforced gender norms, and gender expression (including gendered attributes of clothing, hairstyles or mannerisms) |
| Gender Binary | The stereotypical categorization of gender into two categories of women and men, and the organization of the world on the basis of that assumed norm |

| Term | Definition |
|---|---|
| Gender Minorities | A category of people whose gender identities are seen as different from the social majority, and are discriminated against on that basis |
| Hazard | A process, phenomenon, or human activity that may cause loss of life, injury, or other health impacts, property damage, social and economic disruption, or environmental degradation |
| Marginalised Gender Groups | Any groups who are marginalised on account of their gender, often including cisgender women and gender minorities |
| Non-binary | An umbrella term for gender identities that are not exclusively boy/man or girl/woman (Gender Spectrum) |
| Preparedness | The knowledge and capacities developed by governments, response and recovery organizations, communities, and individuals to effectively anticipate, respond to, and recover from the impacts of likely, imminent, or current disasters |
| 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 |
| Third gender | A person who has a gender identity that is neither female nor male. Third gender people may also demonstrate fluidity within their gender identity and may occupy social roles typically associated with one or more gender identities. Third gender identities are usually culturally specific, and third gender people may or may not identify as transgender |
| Transgender | A transgender person has a gender identity that does not match the sex they were assigned at birth |
| 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

## Context and Aim

Baguio city, in the Western Philippines, is part of the ASEAN Australia Smart Cities Trust Fund (AASCTF) programme. This programme aims to build livable, resilient, and inclusive cities across South-East Asia, while in the process identifying scalable best practices to be replicated across cities in Asia and the Pacific. Within this initiative, Baguio is aspiring to become an exemplar of effective Risk Reduction and Early Warning.

The city of Baguio has been prioritized because it faces a growing risk of natural hazards. As the city is located on a mountainside with many of its houses built on steep slopes, it faces a growing risk of severe flooding and landslide. A key priority in Baguio is the strengthening of Flood Early Warning across the city.

Effective early warning systems (EWS) are people centred, ensuring appropriate early warning reaches the last mile, including the most vulnerable. An effective and sustainable EWS considers and is designed to meet the needs, capacities, constraints, and priorities of all people, enabling appropriate and timely early action to save lives and reduce losses. Women and marginalised groups including gender minorities are often excluded from disaster risk reduction policies, strategies, and decision-making due to unequal power relations, gender norms, and gendered socioeconomic inequality. In many locations, early warning messages are less likely to reach marginalised women and other marginalised groups, directly impacting their chance of survival. Baguio city aspires to achieve a truly **Gender Transformative Flood Early Warning System (FEWS)**, in a city and system that protects all, where no one is left behind.

This initiative on Gender Transformative Early Warning, aligns with the wider AASCTF supported intervention for strengthening flood risk management and flood early warning across Baguio . It brings together expertise in Gender Transformative Early Warning Systems from across and beyond Asia, through a collaboration between Ramboll and Practical Action Consulting, working within the vision of the AASCTF and the city administration. The project aims to provide a deepened understanding and analysis of the relevance of gender and inequality to flood risk and Flood Early Warning in Baguio. This report, a **Mixed Method Gender and Inclusion Study** of flood risk and early warning in Baguio, is the first output contributing towards the development of a Gender Transformative Flood Early Warning System.

"Sometimes the participation of women in decision-making is overlooked"

"We thought the typhoon has passed because there was just light rain and some winds. Then suddenly, the waters in the canal started rising and then the flood came. The waters were rising and we were all getting nervous. We did not know what to do at first... We did not leave yet because we did not expect the waters to rise that fast. It was so fast."

"The waters raged. I threw our belongings aside because I had to look for my children. My husband was not here. It was just me and the children. My children were still very small. That's why I attended to them first. I had six children... I panicked to the point that I left my other child , in the middle of the street, in the middle of the waters."

"It is in evacuation when gender inequality and discrimination is experienced"

Source: Asian Development Bank

## Methodology

The study brings together a suite of analysis and data collection techniques to deliver a holistic and well-rounded understanding of the connections between flood risk, and gender, marginalisation and inequality within Baguio. The study draws on secondary sources of data through a global and national literature review on areas of inequality and on the influence of gender and inequality on disaster risk. This secondary data is complemented by three types of quantitative and qualitative primary data, including a community survey, key informant interviews, and Missing Voices interviews.

The methodology recognises the importance of intersectionality in our approach and analysis, acknowledging the ways in which multiple axes of identity influence experiences of vulnerability and capacity to respond. It is important to pay special attention to the voices and stories of populations which are marginalised, hidden, and vulnerable, to understand the specific needs, priorities, and perspectives of these groups, to ensure that the EWS is effective for them and that 'no one is left behind.'

The "Missing Voices" methodology is an approach that starts with identification of the groups and individuals likely to experience marginalisation or increased vulnerability in a specific context. It involves starting by talking to community-based organisations, informal support groups and other intermediaries who are themselves members of, work with, know, and are trusted by marginalised communities. These organisations and groups are often able to provide insight into the issues facing specific groups and enable the introduce the research team to start a process of snowball sampling to find, build trust with and listen to individuals who are people they know that would be willing to speak to the research team, face multiple axes of marginalisation and are likely to be left out of traditional dataset and mainstream narratives. Interviews are conducted over the phone (usually with at least two calls), rather than visiting people's homes, providing greater privacy and anonymity, and drawing unwanted attention to individuals who may want or need to avoid attention.

 This approach means that people are able to speak to the research team at times and places convenient for them, and without being inhibited by other household members or neighbours. In this way, the research team is able to hear candid and detailed accounts, often about subjects which, due to their sensitivity, are not heard about in wider community group discussions, such as issues such as of gender-based violence, discrimination, or/and menstrual hygiene in a disaster setting.

This "Missing Voices" approach provides a much more nuanced understanding of how different individuals and gender groups experience floods and FEWS, an understanding that is critical forthe development of actions and procedures to enable for gender transformative FEWS. Our Missing Voices approach ensures that we are informed not only by the average experience of flood risk and early warning, but also are listening to the voices of those facing additional axes of marginalisation.

## Key Findings

In terms of **vulnerability and impact**, caring responsibilities were a key driver of vulnerability, with single parents particularly struggling to safely evacuate with children and with essential supplies. Existing support targeted those with long-standing physical disabilities, without sufficient flexibility to target additional support to those with short-term capacity challenges. There were also concerns on the potential for extremely marginalised groups such as homeless people to be left without sufficient support. The current system relies strongly upon informal social connections, potentially raising the vulnerability of those who are disconnected from or distrustful of local authorities.

 In terms of city-wide **risk knowledge**, risk mapping needs to take account of changing population dynamics, changing exposure, and changing flood risk patterns. At an individual level, knowledge gaps on understanding of weather forecasts and flood risk led to poor decision-making and risky late evacuation. Experience-informed action was highlighted as critical for many respondents, highlighting the importance of sharing insights with new arrivals to Baguio, and maintaining experience-based insights in areas that are infrequently flooded. The research highlighted clear links between a lack of risk knowledge, and poorer decision-making, preparedness and flood response, so efforts to enhance risk knowledge should be a priority within the Baguio FEWS.

In terms of **monitoring and warning**, the current one-size fits all early warning lead time was not effective for all, with differing needs and preferences for early warning. There is also a need to distinguish more clearly between generic weather forecasts, preparedness warnings and instructions for evacuation, with more emphasis on preparedness warnings. Early warning lead times, and thresholds and triggers within the Baguio FEWS need to be co-designed between those who understand the physical and meteorological

hazard, and those who understand social aspects including the actions to be taken. This co-production needs to occur at the design stage, and there also need to be feedback loops and consultations at regular intervals, ensuring the FEWS triggers and thresholds meet user needs.

Within **dissemination and communication**, current warnings are not reaching everyone, with many individuals first being aware of flooding when the water entered their home. In terms of information needs, priorities included knowledge on how severe a flood might be, where a flood would occur and when a flood would occur. This information is more detailed than a simplistic "evacuate" or "don't evacuate" instruction. Those designing early warning messaging can consider how to effectively communicate these three pieces of information, enabling people to make risk-informed decisions.

In terms of **preparedness**, individuals need to know the activities they can take ahead of time to reduce their risk and ensure a safer evacuation. Key informants reported individuals asking about evacuation routes and evacuation facilities at the point of evacuation, and several respondents found their chosen evacuation routes unsafe or precarious, highlighting the ineffectiveness of preparedness planning or practice. Preparedness planning can help individuals plan their key actions, the sequence and timing of preparedness actions, as well as planning in advance how they will get themselves, their critical supplies and their dependents safely to a temporary shelter.

A number of issues contributed towards challenges in **evacuation**. People were taking a decision to evacuate too late, related to poor understanding of risk, resulting in dangerous evacuations. People, and especially single parents, were evacuating twice, with the second evacuation occurring under unsafe circumstances, due to the challenges of evacuating with children and with critical supplies. Some interviewees had wanted to evacuate earlier, but found officials did not want to open evacuation centres until flooding was in progress. Individual incentives and motivations need to inform the design of an evacuation strategy, understanding the reasons why some individuals may be disinclined to early evacuation.

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*"We did not know what to do at first..."*

*"The road that we were passing by was a bit frightening because it was so narrow. It's like a small alleyway. We had to feel through our feet and make sure that we are passing through its cemented section. Because there could be cracks or holes. The road was already flooded"*

*"When I returned to get our belongings, it was no use. The flood already reached our house. It was impossible to get in."*

*"Yes, being a single mother mattered. I cried a lot because I was all alone. I would cry and ask why life is like this. I have a lot of questions and I felt angry"*

Respondents noted a number of challenges to existing **evacuation facilities**, mentioning inadequate WASH facilities, challenges related to overcrowding, privacy and safety, and concerns about keeping children safe and supervised at communal evacuation facilities. In a number of cases interviewees drew on existing social connections to find more suitable alternative arrangements raising a concern about the coping mechanisms of vulnerable individuals or families who are in a similar situation, but without social connections or extended family to draw upon. A lack of comfort, warmth and cooking essentials in evacuation centres incentivised people to return to their houses to fetch blankets, mattresses or cooking supplies during high-risk flood periods, highlighting a need for greater preparedness planning.

In terms of **post-event relief**, concerns were raised about the method of identifying affected or vulnerable individuals. Others focused on the potential for flood impact exacerbating marginalisation, with suggestions for greater support for the most poor, marginalised or vulnerable to enable **longer-term recovery**.

There were also **governance** gaps in terms of feedback loops, accountability processes and opportunities for community engagement within the system. Roles, responsibilities and capacities across the EWS could also be clearer, especially in terms of public education on preparedness, on practicing for response, and on building risk knowledge. Within an EWS that aspires to leave no one behind, there needs to be proactive mechanisms for listening to the experiences of those at the margins, rather than just aiming to understand the average level of satisfaction in the current system. Co-design between the users, producers and communicators of early warning is also a critical aspect of a **people centred EWS**, ensuring more people take effective early action, reducing risk, saving lives and resources, and reducing flood related impacts.

*"We were not able to salvage anything. Just the clothes we were wearing and my papers to the house"*

*"Here in the barangay, we wait for the officials. There is a siren, we live close to it. It sounds off when there's a typhoon. But the reminder comes from the kagawads. The siren sounds off but like us, we move when the kagawads tell us. And sometimes, it's hard to believe when the weather is ok, like when the rains are not that hard"*

*"There is a need to re-educate the public about EWS. In the communication plan, there is a need for people to understand the risks around flooding, especially those in flood-prone areas"*

*"I was so afraid. I am only five feet. I was close to drowning while walking the streets. It was my son and my husband holding me high, my head up high."*

# 1 INTRODUCTION



**Image caption: People waiting in a boat terminal, Philippines**
Source: Frank lloyd de la Cruz

## 1.1 PROGRAMME (AASCTF)

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.

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

## 1.2 BACKGROUND AND PROJECT RATIONALE

The occurrence of flooding and landslides, both regular phenomena in Baguio city, threaten Baguio citizens' lives and livelihoods, and the sustained and long-term economic development of the city. Baguio city is considered the "summer capital of the Philippines", attracting 1.8 million tourists in 2018, with an annual economic growth rate of ca. 16% (Figure 2). In 2009, Baguio was significantly impacted by Typhoon's Ondoy and Pepeng, resulting in more than 3,000 people being affected by flooding, and almost 2,500 people being affected by landslides. By being exposed and having a high vulnerability to climate hazards, combined with the expansion of impervious paved areas within the city and its surroundings, Baguio is experiencing increasing runoff volumes and flood damages. All these impacts are expected to be exacerbated by climate change, which will very likely cause an increase in the frequency and intensity of rainfall events and further exacerbate flooding events and rain-induced landslides.

The ADB, through the AASCTF, is supporting Baguio city in implementing the Smart Flood Early Warning, Information and Mitigation System project, which is assisting 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 intended outcome is improved flood early warning system, responses, and mitigation measures of Baguio. As a complement and to enhance the ongoing Smart Flood Early Warning, Information and Mitigation System project, this project is being implemented specifically to ensure appropriate, applicable, and timely early warning reaches the last mile, including the most vulnerable, recognizing that effective FEWS are people-centric.

Gender is a critical consideration in ensuring an effective FEWS leaves no one behind. EWS that do not explicitly consider gender will likely be gender unequal, increasing the marginalisation and vulnerability of groups who have less power and influence. Gender inequality and social marginalisation increases vulnerability to disasters, affects access to early warning, impacts preferences and capacities for preparation



**Figure 1:  City of Baguio - Location in the Philippines**

and response, and excludes women and marginalised groups from decision-making processes. Proactive efforts are needed to incorporate the needs, priorities, and capabilities of marginalised gender groups, and magnify their voices at every stage of the FEWS.

This project involves a strategic collaboration with Practical Action Consulting (PAC), based on their innovative approach and experience implementing gender transformative FEWS. PAC's approach has been endorsed and taken up by UN Women[1] and is fully consistent with the vision of the AASCTF as elaborated in the Fund's Gender Equality and Social Inclusion (GESI) Strategy[2].

At the same time, this project is addressing the need and interest of the city of Baguio to implement gender transformative approaches to FEWS to ensure all its citizens can benefit from the FEWS development and implementation currently underway as part of the associated project. This project will be 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.

## 1.3   AIMS OF THE STUDY

Broadly, the aims of this project are to:
- Improve the understanding of decision-makers about drivers of gendered vulnerability and how these affect FEWS needs within and between communities;
- Link the needs of vulnerable and marginalised groups to considered and meaningful planning of preparedness and response actions; and
- Improve representation and inclusion of marginalised groups in the FEWS.

Specifically, this report aims to provide the results of the Mixed Methods Gender and Inclusion Study, capturing a diverse range of experiences and perspectives on EWS, and harnessing the perspectives, skills, and knowledge of diverse communities in Baguio. This Report provides the basis for these perspectives and available evidence to be translated into tangible recommended actions and guidance in subsequent deliverables to help ensure the EWS delivers effective early warning for people of all genders.

The study refers throughout to marginalised gender groups, which includes (but is not limited to) cisgender women, transgender women, transgender men, and non-binary or third gender people. The research has predominantly interviewed cisgender men and women; however, the study consciously adopts an inclusive and intersectional approach and aims to acknowledge and reflect the diversity of identities and experiences that are integral to all discussions relating to gender.

**Table 1: Project Tasks and Associated Activities and Deliverables**

| TASK | KEY ACTIVITIES AND DELIVERABLES |
|------|-------------------------------|
| **Task 1 – Mixed Methods Gender and Inclusion Study** (this report) | • Design mixed methods gender and inclusion study<br>• Design study and desk-based data collection<br>• Conduct primary data collection (surveys, interviews)<br>• Analyse data/findings<br>• **D1: Develop Case Studies and finalize Mixed Methods Gender and Inclusion Study** |
| **Task 2- Recommendations and Guidance into FEWS Design and Dissemination** | • Develop practical guidance and recommendations, specific to the project's different stakeholders<br>• Ensure the FEWS communicates and disseminates early warning messages that reach people of all genders<br>• **D3a: Develop policy brief and associated non-technical summary: Recommendations and Guidance into FEWS Design**<br>• **D4a: Develop policy brief and non-technical summary: Recommendations and Guidance into FEWS Dissemination**<br>• Participate in Consultation Workshop on Data Dissemination and Outreach |
| **Task 3 - Standard Operating Procedures for Gender and Inequality Informed Actions** | • Draft Standard Operating Procedures to enhance the Flood Mitigation Action Plan, with actions in relation to gender and marginalised and vulnerable communities in Baguio<br>• Elicit expert feedback and SOP refinement in consultation with stakeholders<br>• **D5a: Finalize SOPs**<br>• Conduct a training workshop to ensure appropriate handover of SOPs and capacity of implementing agencies |
| **Task 4 – Video Product Development** | • Develop video script for video products<br>• **D6a: Video product development** |
| **Task 5 – Monitoring & Evaluation of City Intervention** | • **D7: Project evaluation** |

## 1.4    PROJECT APPROACH

The overall project approach is structured to feed into the Smart Flood Early Warning, Information and Mitigation System project outputs, providing specific, usable, and relevant actions and guidance on gender transformative approaches that can be built into the design and implementation of the FEWS. The project is broken down into working tasks (or stages), with each task/stage containing key activities and deliverables as shown in Table 1.

Under the AASCTF programme, overall frameworks to guide critical cross-cutting aspects of Monitoring & Evaluating (M&E) and Gender Equality and Social Inclusion (GESI) are incorporated into each task order (project). Action plans for this project have being developed and are reported on as part of Quarterly Progress Report (QPR) and through the Activity Level Performance Assessment (ALPA). These action plans guide the activities relating to M&E and GESI to be undertaken throughout project period, including KPIs and targets, as appropriate.

This project is a targeted GESI activity, exemplifying the AASCTF's GESI Strategy in which specific interventions are identified to be undertaken where there is a high potential that the initiative will lead to clear and significant benefits to women and other marginalised groups.

## 1.5    REPORT STRUCTURE

This report is structured as follows:
  • Section 1 in this report introduces the AASCTF programme, describes this project's rationale and overall approach as well as the main aims of this report, and the collaboration by AASCTF with Practical Action Consulting.
  • Section 2 looks at project initiation, including key mobilisation and kick-off activities undertaken, and coordination with the Smart Flood Early Warning, Information and Mitigation System project, and twinning and networking activities.
  • Section 3 deals with the methodology for the Mixed Methods Gender and Inclusion Study.
  • Section 4 provides the gender informed analysis, including impact and vulnerability, risk knowledge, monitoring and warning, communication and dissemination, preparedness, evacuation, evacuation facilities, post-event relief and longer-term recovery and governance and participation.
  • Section 5 provides reflections on gender and Nature Based Solutions
  • Section 6 provides the conclusion to the study.
  • Appendices to the report include Appendix 1 with a list of the Key Informant and Missing Voices interviewees, and Appendix 2 providing the quantitative analysis completed for the Community Survey.

1   S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.

2   Ramboll , "Gender Equality and Social Inclusion Strategy," ASEAN Australia Smart Cities Trust Fund, 2021.

## 1.6    COLLABORATION WITH PRACTICAL ACTION CONSULTING

This project brings Ramboll's expertise and experience in the region together with that of Practical Action Consulting (PAC) International.

Ramboll's core strengths in the collaboration includes bringing experts in gender equality and social inclusion (GESI) with experience working on AASCTF and other projects in the region to the team. The regionally specific expertise on GESI is complemented by Ramboll's extensive experience in smart city infrastructure within water, energy, buildings, and mobility.

Ramboll team members bring smart concepts to the centre of each project through our in-depth understanding of regional and country contexts, and our diverse skills and experience that enable us to assess and meet the evolving needs of he project and allow us to meaningfully connect our project under the AASCTF - ensuring streamlining and continuity at all levels and thus, delivering the results foreseen for this ambitious AASCTF programme.

As outlined in the AASCTF GESI Strategy, working in collaboration is a key way in which Ramboll and the AASCTF can maximise effectiveness and ensure value for money. This partnership between Ramboll and PAC is considered to exemplify the imperative to ensure that AASCTF activities are designed and implemented to meet the needs of vulnerable and marginalised groups in participating cities.

PAC is the UK-based research and technical advisory wing of Practical Action, an international development Non-Governmental Organisation (NGO) active in 45 countries across Asia, Africa and Latin America.

PAC International delivers innovative, people-centred disaster risk reduction research and interventions, working with communities, practitioners and policymakers in hazard-prone contexts to anticipate, prepare for, respond to, and recover from a range of disasters.

PAC International focus on developing early warning systems and climate information services, applying our expertise in research and innovation, last mile early warning and communication, knowledge management, and stakeholder engagement to deliver effective and inclusive solutions to key resilience challenges for vulnerable communities.

The team work across the areas of risk knowledge, monitoring and warning, communication and dissemination, response capability, governance, multi-hazard early warning, and gender and social inclusion to build and strengthen holistic and transformative systems which work for people and communities at risk of disaster.

The focus of PAC International's work is particularly on amplifying the voices of marginalised groups in communities, identifying the ways in which different people experience disasters and risk reduction, so that Disaster Risk Reduction (DRR) policy and practice can include and prioritise the needs and capacities of often overlooked groups in transformative ways.

PAC International recognizes that gender relations and inequalities are fundamental causes of poverty and that women, girls, and marginalised gender groups may face inequality and injustice in access to status, power, and resources. We also recognize that gender inequality and injustice are issues that affect everyone, and that inclusive approaches are vital to achieving meaningful and deeply rooted change. Without addressing the underlying causes of inequality, we cannot achieve the sustainable change for people of all genders that we seek.

The team have undertaken a range of research projects focusing on underlying and intersecting inequalities, their impacts, and what actions we can take to transform those inequalities for effective, inclusive development, which has informed approach to this study.

# 2  PROJECT INITIATION



**Image caption: Children sitting on a sea wall, Philippines**
Source: Asian Development Bank

## 2.1    MOBILISATION AND KICK-OFF

The consultant's team mobilised in late March 2021; conducting internal planning meetings and holding a kick-off meeting with the Baguio City Disaster Risk Reduction and Management Office (CDRRMO) in mid-April. The kick-off meeting included presentation of the project objectives, expected outputs, approach, as well as discussion of how the TO is planned to enhance the existing AASCTF project outputs and be considered as an extension of the Smart Flood Early Warning, Information and Mitigation System project.

## 2.2    COORDINATION WITH THE SMART FLOOD EARLY WARNING, INFORMATION AND MITIGATION SYSTEM PROJECT

The consultant's team mobilised in late March 2021; conducting internal planning meetings and holding a kick-off meeting with the Baguio City Disaster Risk Reduction and Management Office (CDRRMO) in mid-April. The kick-off meeting included presentation of the project objectives, expected outputs, approach, as well as discussion of how the TO is planned to enhance the existing AASCTF project outputs and be considered as an extension of the Smart Flood Early Warning, Information and Mitigation System project.

It is noted that the associated Smart Flood Early Warning, Information and Mitigation System project has experienced schedule delays on key tasks. The delays are not considered material for the conduct of this project. In fact, delays are considered to allow time for gender and marginalisation-specific recommendations and guidance to be fully integrated and considered by the Smart Flood Early Warning, Information and Mitigation System project. Participation of key project personnel in re-scheduled associated project workshops (particularly those workshops planned on outreach and dissemination) will be maintained to fit the revised schedule.

**Table 2: Mapping Associated Project Deliverables**

| Smart Flood Early Warning, Information and Mitigation System Project | Gender Transformative Approach for Strengthened Development, Application, and Replication of the Baguio City Smart Flood Early Warning Project | Interaction Between Projects |
|---|---|---|
| Baseline Assessment Report (D1) | **Mixed Methods Gender and Inclusion Study (D1a)** | Mixed Methods Gender and Inclusion Study would be delivered as a separate report, subsequent to the associated project Baseline Assessment report (which is already completed). This deliverable would provide a "deep dive" into gender/ marginalisation through consultative processes to supplement the associated project Baseline Assessment report. |
| Flood Early Warning System Report (D3) | **Recommendations and Guidance into FEWS Design and Dissemination (D3a and D4a)** | Deliverable 3a: The deliverable will ensure the FEWS communicates and disseminates early warning messages that reach people of all genders. The deliverable will include practical recommendations, specific to the project's different stakeholders, detailing how to design and implement the FEWS in a gender transformative way. Recommendations will feed into the design of an FEWS under the associated project, with a Policy Brief developed that may also be referenced in FEWS design plans/ documents. |
| Data dissemination and outreach Plan (D4) | | Deliverable 4a: The deliverable will include a Policy brief: Recommendations for Gender Transformative Communication and Dissemination; to be provided to the associated project team in advance, such as to inform and enhance the data dissemination and outreach plan. |
| Flood mitigation action plan (D5) | **Standard Operating Procedures (SOPs) for Gender and Inequality Informed Actions (D5a)** | The deliverable will include SOPs to enhance the Flood Mitigation Action Plan, with actions in relation to gender and marginalised and vulnerable communities in Baguio. The SOPs may be an appendix to this Plan and be incorporated as appropriate in the Flood Mitigation Action Plan. SOPs will also be designed to facilitate further learning/capacity building beyond Baguio city. |
| Replication of real-time data capture, and M&E(D6) | **Video Product (D6a)** | This activity will seek to disseminate the learnings from the Project to a wider audience through the development of two (2) media products. |
| | **Project Evaluation (D7)** | The activity will develop/implement GESI and M&E Action Plans covering both the associated project and this project, aligned with the project Design & Monitoring Framework. A project evaluation report will be delivered upon completion of all tasks. |

Ongoing collaboration between both projects teams has and continues to take place, as follows:

- Representatives from the Smart Flood Early Warning, Information and Mitigation System project team are actively involved in this project team's weekly meetings. This provides an opportunity for developments in either project to be shared and for further collaboration and congruency to be discussed.
- Regular (approximately monthly) meetings between the Team Leads has taken place.
- In April a full project team meeting was held with the Smart Flood Early Warning, Information and Mitigation System project Team Lead as a technical question and answer session on the technical FEWS design and implementation plans and progress.
- In April meetings were held with the Outreach and Communication Specialist on the associated project to discuss coordination on fieldwork surveys, and plans and scope for the communications and dissemination aspects of both projects. A subsequent meeting was held with both project team members and representatives of the CDRRMO to hear more about the current EWS communication and dissemination practices, challenges and perceived opportunities.
- In June a meeting with the Smart Flood Early Warning, Information and Mitigation System project team on Nature-based Solutions (NbS) was held. The current plans and approach for NbS was presented and team members were able to explore key aspects with NbS specialists, that may be incorporated and considered from a gender, marginalisation and vulnerability perspective and taken forward through project outputs.

## 2.3   TWINNING AND NETWORKING

Twinning and networking arrangements between Baguio city and relevant sister cities across ASEAN and Australian cities are currently being identified and pursued in collaboration with the AASCTF Core Team, the newly approved Regional Task Order 'Baseline Development and Capacity Building for ASEAN Australia Smart Cities Trust Fund (AASCTF) Participating Cities' team, ADB and city officials. Twining and networking activities have been bundled into that project which focuses specifically on identifying and implementing twinning arrangements, as well as regional capacity building to generate awareness of-, interest in- and engagement with all other actions of the AASCTF. Expected outcomes include the development of a peer network of AASCTF recipient cities (bronze cities) to foster increased exchange of knowledge and best practice in smart city development and implementation. The aims and expected outcomes of twinning and networking arrangements are outlined in Figure 2.

The Networking programme launched in May 2021, where Ramboll facilitated a semi-online introduction workshop in the city of Baguio on the 27th of May. A broad representation of stakeholders from the city government, academia, private sector and local community-based organisations (CBOs) attended the workshop. The workshop consisted of a general introduction to the AASCTF, three learning modules focusing on Smart Cities and a presentation of the Networking and Twinning activities.

In June 2021 approximately 150 city officials and other stakeholders participated in an online survey focusing on needs, interests, digital challenges and smart city priorities. The Twinning activities were presented during a Smart Flood Early Warning, Information and Mitigation System project workshop in Baguio where a preliminary identification of potential Twinning topics was conducted. In June 2021, the Smart Flood Early Warning, Information and Mitigation System project staff supported the Baguio municipality in the process of nominating the Twinning Coordinator. During July and August, the topics for Twinning cooperation will be selected and potential mentor cities identified. The Twinning cooperation is expected to start in September 2021.

Figure 3 shows an overview of the Twinning programme which is divided into the six phases; ASSSES, PLAN, START, IMPLEMENT, MONITOR and SHARE. The city of Baguio are currently in the first phase.

From the perspective of this project, twinning and networking activities relating to gender approaches to EWS have not yet been explored. It is considered that there are strong opportunities for networking with other bronze level AASCTF cities on gender transformative approaches to EWS. This is particularly the case initially in Makassar (Indonesia) where FEWS is identified as an issue/opportunity. There is therefore opportunity to share the results and guidance emanating from this project with other participating AASCTF cities, and this is considered to be more appropriately conducted once the project is further progressed in terms of deliverables and findings that may be shared.

## STATUS

**MAY:** Preliminary identification of twining topics conducted during the Introduction Workshop in Baguio on May 27th

**JUNE:** In the process of nominating the Twinning Coordinator for Baguio

## NEXT STEPS

**JULY / AUGUST:** Identify Mentor city and sign commitment letter

**SEPTEMBER:** Start the twinning cooperation

## EXPECTED OUTCOMES OF TWINNING & NETWORKING ARRANGEMENTS

Capacity-building

Broader networking

Transfer of best practices

Increased holistic thinking

Relationship building

Cross-cultural sensitivity

**Figure 2: Overview of AASCTF twinning and networking programme**



**MONTH 1-2:**
**ASSESS**

AASCTF will conduct a **NEEDS ASSESSMENT** to identify needs, interests, digital challenges and smart city priorities of recipient cities. Stakeholders from mentor cities to be invited to **ASSESS RECIPIENT CITY** challenges & priorities, and identify possible mentor agencies in the city.

**COMMITMENT LETTER SIGNED**

**MONTH 3-4:**
**PLAN**

With support from AASCTF, recipient and mentor cities develop a 12-month **TWINNING PLAN** with specific targets and milestones.

**TWINNING PLAN DEVELOPED**

**MONTH 4:**
**START**

Presentation and discussion of work plan, timeline, and deliverales for the next 12 months during the **KICK-OFF WORKSHOP.**

**MONTH 5-16:**
**IMPLEMENT**

Twinning activities will be implemented with the support of the AASCTF. **STUDY VISITS** will be planned to understand the challenges form recipient cities and learn from solutions from mentor cities. **WEBINARS** and on-line events will complement the twinning activities. The AASCTF will **MONITOR & EVALUATE** progress.

**TWINNING PLAN IMPLEMENTED**

**MONTH 6-18:**
**MONITOR**

Periodic **PROGRESS MEETINGS** to report on progress, give feedback, and agree on new targets/milestones; Midterm evaluation after 6-7 months; Final evaluation after 18 months.

**TWINNING PLAN REPORT**

**MONTH 18 ONWARDS:**
**SHARE**

Recipient and mentor cities participate in **KNOWLEDGE SHARING ACTIVITIES** to exchange experiences and lessons on their twinning activities.
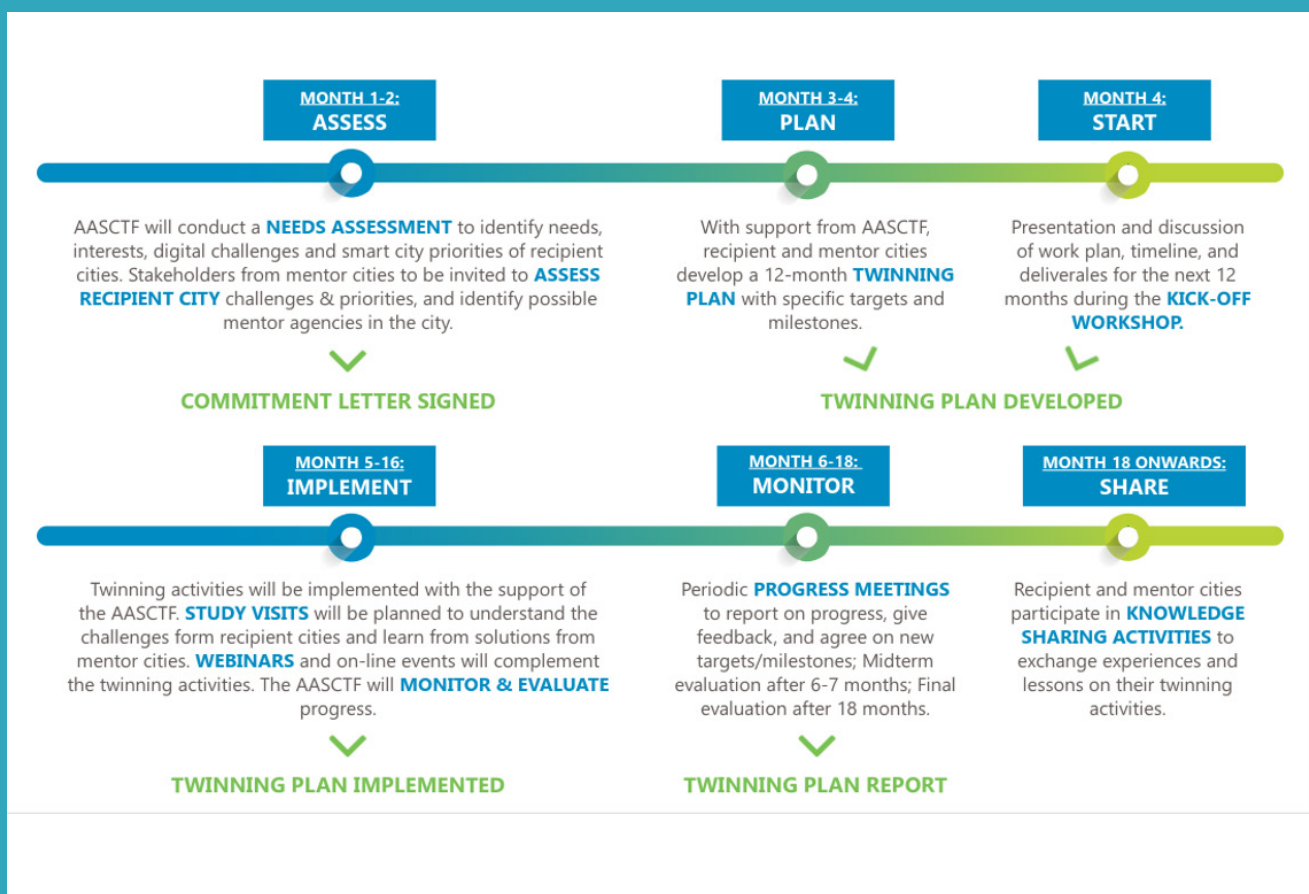
**Figure 3: Timeline of twinning process**

# 3  METHODOLOGY



**Image caption: Boy preparing to sort through piles of garbage in the slums, Philippines**
Source: Asian Development Bank

## 3.1    COMBINED DATA APPROACH

The study brings together a number of different types and sources of data in order build a holistic, well-rounded understanding of the context, needs and perspectives regarding the establishment and implementation of a FEWS in Baguio city. The study draws on secondary sources of data through a literature review, and a range of quantitative and qualitative primary data sources through a community survey, key informant interviews, and Missing Voices interviews. This section details the methodological approaches to each of these sources.

**Notation:** Throughout the report the following notation is used to signpost references, data sources or further statistical analysis. References are assigned a number e.g. 1 with a numbered reference list in annex 3. Quotations from Missing Voices interviews are assigned with the abbreviation MV e.g. MV1 for a quote from Missing Voice Interviewee 1, with details of the Missing Voices interviewees provided in annex 1. Quotations from Key Informant interviews are assigned with the abbreviation KII e.g. KII1 for a quote from Key Informant Interviewee 1, details of Key Informants provided in annex 1. Finally, references to quantitative data analysis are assigned the abbreviation QD, for example QD1 for the first piece of statistical analysis, with further detail in annex 2.

## 3.2    SECONDARY DATA: LITERATURE REVIEW

The literature review involved an assessment of the existing evidence, knowledge and learning about gender and flood early warning through a systematic review of academic and grey literature, including peer reviewed papers, working papers, reports, discussion notes, needs assessments and policy documents. The review considered the global and local context to include generalizable and specific learning outcomes and principles. This range of literature was synthesised and qualitatively analysed to identify and assess the key themes, trends and gaps in knowledge about gendered considerations, needs, priorities and capabilities in relation to flood early warning.

## 3.3 QUANTITATIVE PRIMARY DATA: COMMUNITY SURVEY

A survey questionnaire was developed in direct collaboration with the on-site data collection team in order to ensure contextual relevance and suitability, and the team conducted a virtual training session with survey enumerators to ensure consistency and consensus in the meaning and purpose of the questions and data entry tools. A purposive sampling methodology was agreed with the team to facilitate diversity of gender, age, and household position within respondents.

The survey was tested on a small group of respondents before being carried out in the study sites. In line with the survey eligibility criteria, enumerators conducted a total of 109 questionnaires, two of which were excluded from analysis due to lack of flooding experience. Quantitative analysis has been conducted on the data provided from 107 questionnaires (60 women and 47 men), including descriptive and statistical analysis. Analysis was conducted using Stata software (see Annex 2 for additional data analysis tables).

The community survey sample was taken from 4 Barangay (districts) of Baguio:
- City Camp Central
- Lower Rock Quarry
- Guisad Central
- Lourdes Subdivision Extension

The recent 'Hydraulic model and Hazard and Risk Assessment' conducted as part of the wider AASCTF initiative in Baguio, found the first two of these Barangays to be high flood-risk areas. Lower rock quarry was rated as the 4th highest flood-risk district in the city, with 50% of the district at high or very high risk. City Camp Central was rated as the highest flood-risk Barangay in Baguio, with 75% at high or very high risk. (Note: A barangay is the smallest political unit in the Philippines).
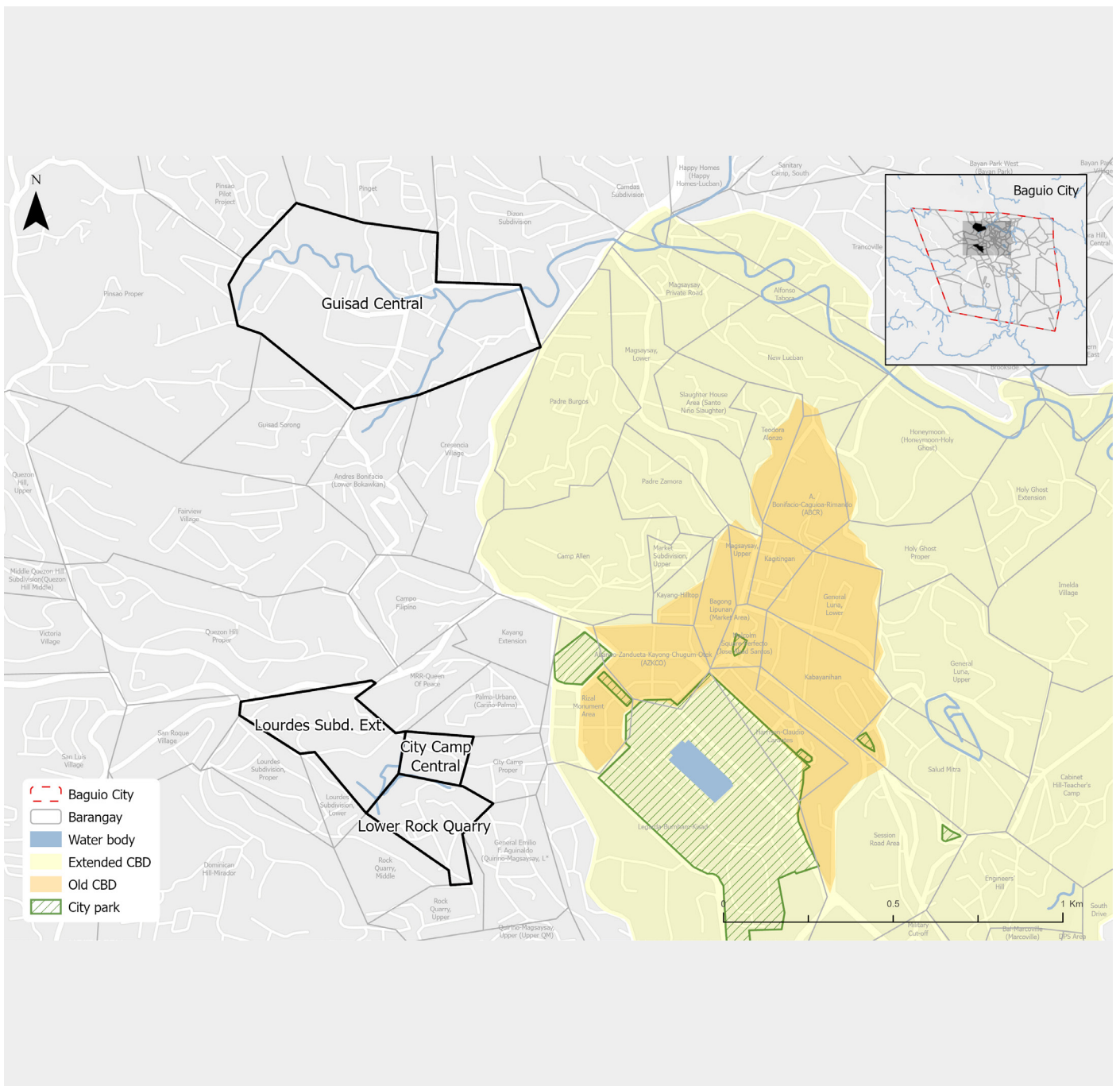
**Figure 4: Community Survey – Priority Districts Sampled within Baguio City**

### 3.3.1   COMMUNITY SURVEY DEMOGRAPHICS

The demographic analysis considered the level of formal education, employment status, housing ownership status, housing construction status, mobile phone access and internet access, as these indicators provide a useful overview of socio-economic profiles. Additionally, gendered gaps in education and access to communication technology are associated with gendered gaps in disaster vulnerability.

### 3.3.2   EDUCATION

More than half of respondents have completed tertiary education. The analysis found no significant gendered difference in educational attainment, with slightly more women than men completing only primary education (13% compared to 11%), and slightly more men than women completing tertiary education (55% compared to 52%). Age was a significant predictor for educational attainment.

### 3.3.3 EMPLOYMENT

Unemployment was found to be significantly gendered (QD1), with 38% of women compared with 17% of men reporting that they are unemployed. The informal sector is the single largest employment group in the study, employing 49% of men and 36% of respondents overall, indicating a high level of financial vulnerability to disaster impacts and losses.

### 3.3.4   HOUSING OWNERSHIP STATUS

81% of respondents overall own their home, with 19% renting their homes. Gender was not found to be a significant factor relating to housing ownership status, with 80% of women and 83% of men reporting being homeowners. Level of education was found to be a significant factor, with respondents who have completed tertiary education constituting the highest proportion of renters. Age is not a significant factor, with renting participants spread across age ranges (QD2).

### 3.3.5   HOUSING CONSTRUCTION TYPE

67% of respondents overall (70% women 64% men) live in houses constructed with concrete rather than housing constructed of light materials (such as wood and/or corrugated iron).

### 3.3.6   MOBILE PHONE ACCESS

94% of respondents had a mobile phone, with the vast majority having their own phone, and only 1% having a shared phone. Gender was not found to be a factor in mobile phone ownership or access (QD3). The six respondents (three men, three women) who did not have access to a mobile phone were all over age 55.
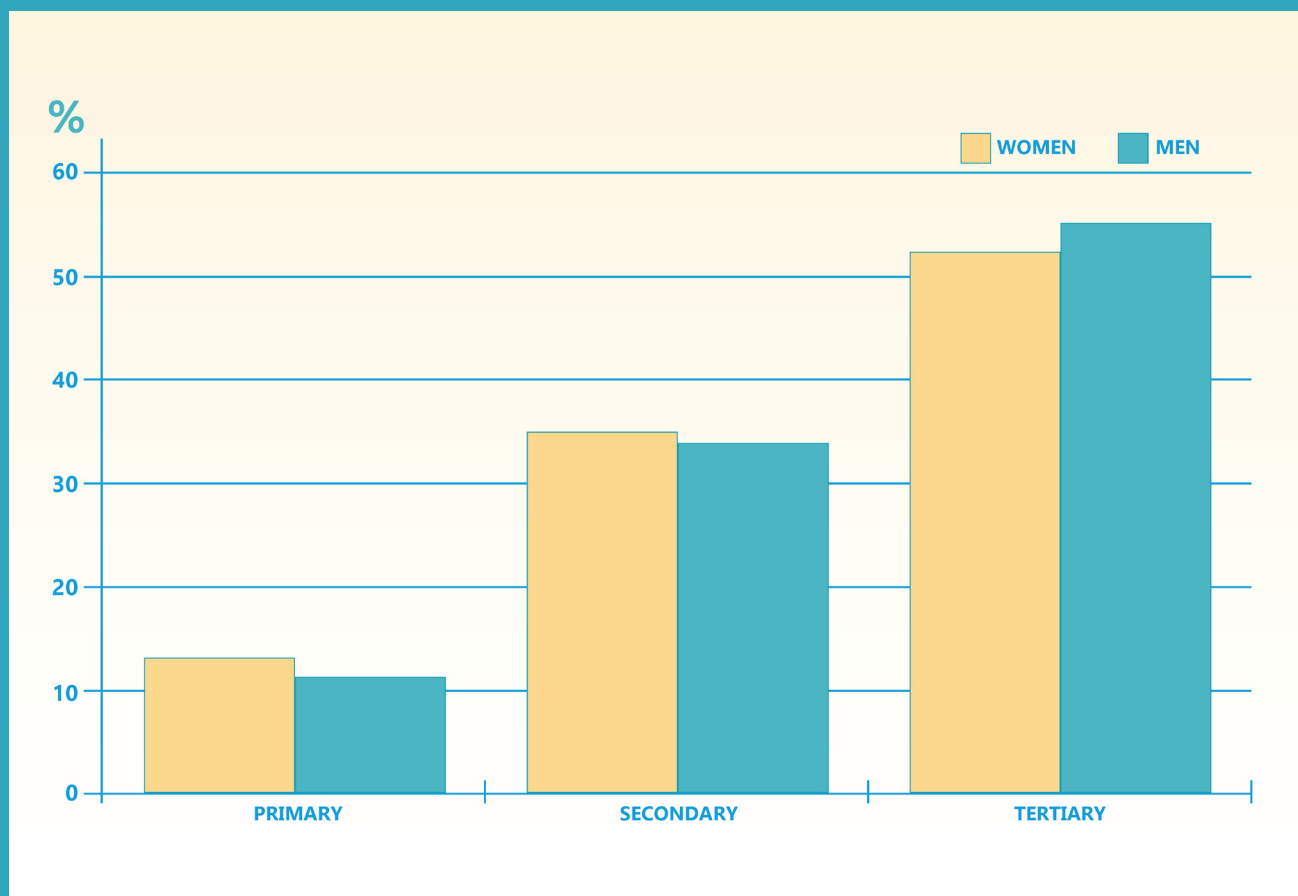
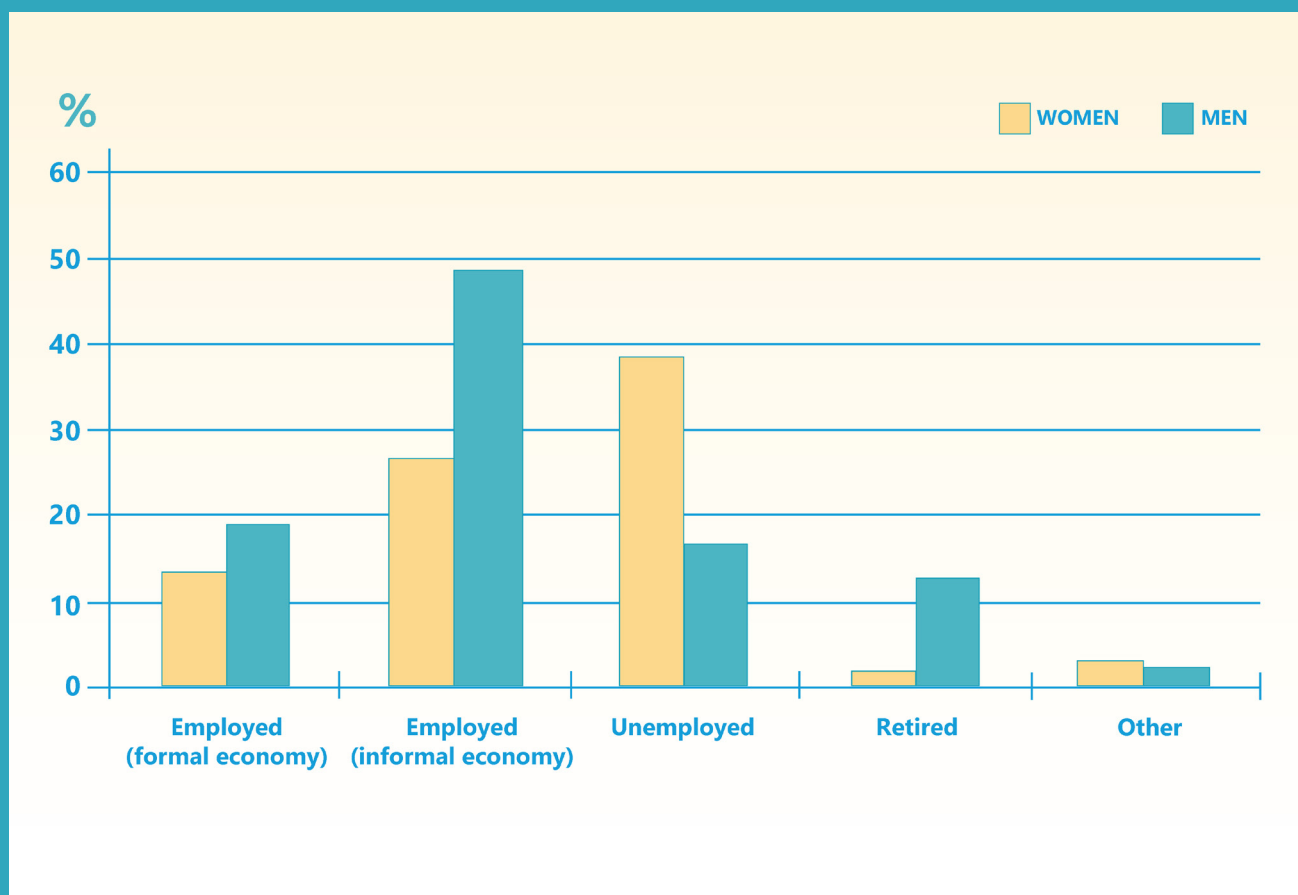**Figure 5:  Gender and level of education completed**



**Figure 6: Employment status by gender**

### 3.3.7  INTERNET ACCESS

86% of respondents have some level of access to the internet, including mobile data, wifi at home, and wi-fi at work or place of study. The majority of respondents (56%) have access to only one source of internet access. 18% of women compared with 9% of men reported having no internet access, although age was a key factor (QD4), with higher levels of over 65s having no access to the internet.

Respondents who are unemployed, employed in the informal economy, or retired, also have significantly lower levels of access than those employed in the formal economy.

## 3.4  QUALITATIVE PRIMARY DATA: KEY INFORMANT INTERVIEWS (KIIS)

Eight key informant interviews were conducted with disaster risk management practitioners, and representatives of local organisations with close links to specific marginalised communities. This approach was designed to contribute to an understanding of the consideration of gender in disaster risk management by different decision-making stakeholders, including experience of key gendered issues and considerations, priorities and challenges. The interviews were semi-structured, enabling comparative qualitative analysis while also enabling flexibility for interviewees to respond in greater depth to the questions and topics about which they are more knowledgeable and experienced, and providing rich insights across a range of perspectives. The list of KIIs is provided in Annex 1.

Interviews were recorded, with participant consent, with transcripts written up and translated into English. These transcripts were uploaded into NVivo for qualitative analysis, exploring themes within the data. Illustrative quotes are provided across the results section of the report, with the care to anonymise contributions.
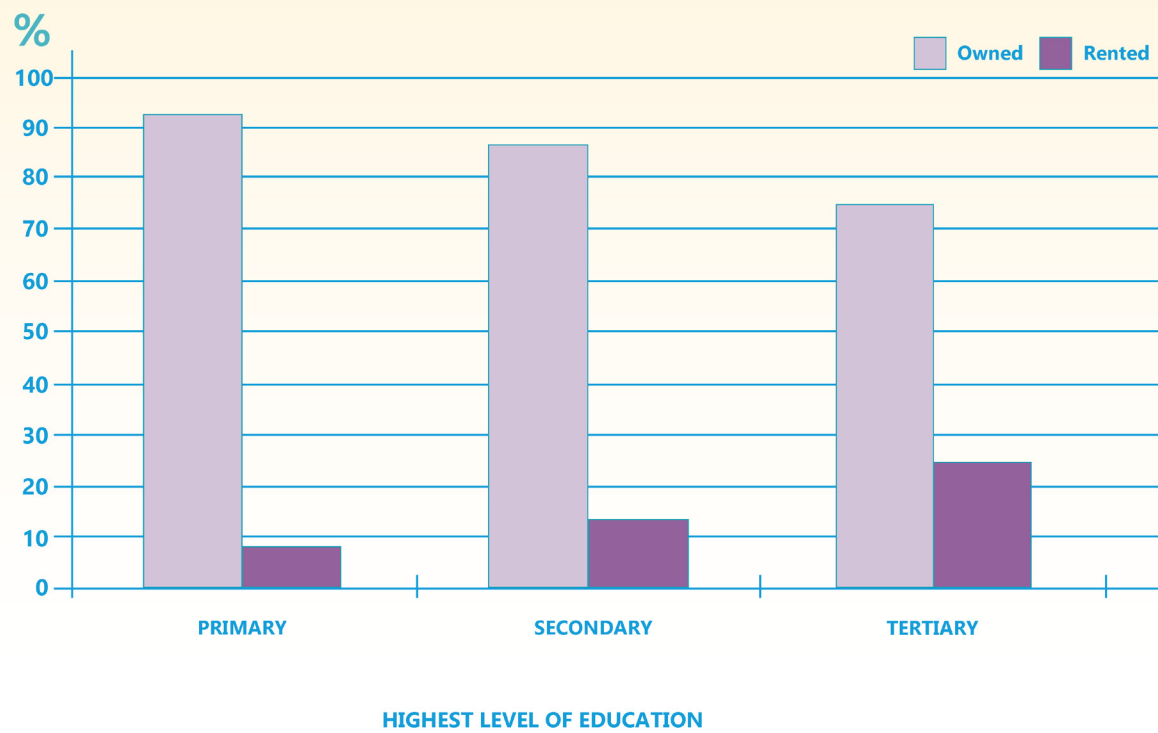
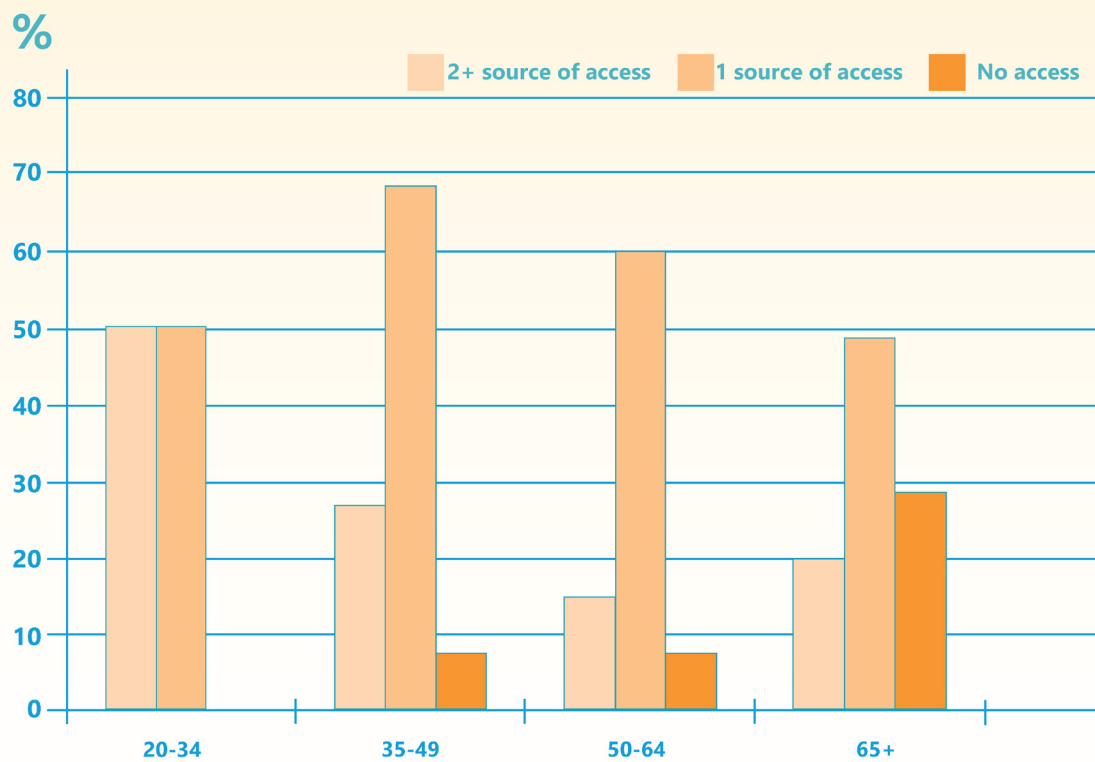**Figure 7:  Housing ownership status by educational level**



**Figure  8: Internet access by age group**

## 3.5 QUALITATIVE PRIMARY DATA: MISSING VOICES INTERVIEWS

We know from evidence and experience that marginalised groups including women and gender minorities are not all equally vulnerable: considerations of the effect of class, caste, race, ethnicity, age, disability, political status, gender identity, sexuality and, in some communities and cultures, marital status all affect individual and collective experiences of vulnerability in a disaster and an individual's capacity to respond to early warning[3, 4, 5, 6].

It is important to take an intersectional approach, paying special attention to the voices and stories of populations which are marginalised, hidden, and vulnerable, to understand the specific needs, priorities, and perspectives of these groups, to ensure that the EWS is effective for them and that 'no one is left behind.' Our Missing Voices (MV) approach ensures that we are informed not only by the average experience of flood risk and early warning, but also are listening to the voices of those facing additional axes of marginalisation.

The Missing Voices methodology is designed to provide a depth of understanding about diverse experiences which traditional data collection does not provide. Existing quantitative data is rarely sufficiently disaggregated, and doesn't capture intersectional vulnerabilities, and while survey data provides a useful overview of a context, it is necessarily limited in terms of what it is able to capture. Key informant interviews can bridge some of this gap by providing more depth and nuance in response and can be more flexible to respond to what the informants provide, but are limited in their inclusiveness because they are based on the voices of people with power in the system.

The Missing Voices methodology is intended to provide a way of listening to those who are most marginalised, shifting the emphasis away from representative and generalizable findings to complement those data with more focused emphasis on specific issues. This part of the combined data approach provides a holistic, nuanced understanding of the complex and diverse communities we work with, and how we can deliver an early warning system that works effectively and inclusively for everyone.

3   S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.
4   E. Enarson and L. Meyreles, "International perspectives on gender and disaster: differences and possibilities," International Journal of Sociology and Social Policy, vol. 24, no. 10, pp. 49-93, 2004.
5   A. Gorman-Murray, S. McKinnon, D. Dominey-Howes, C. Nash and R. Bolton, "Listening and learning: giving voice to trans experiences of disasters," Gender, Place & Culture, vol. 25, no. 2, pp. 166-187, 2017.
6   International Federation of Red Cross and Red Crescent Societies (IFRC), "Unseen, unhead: Gender-based violence in disasters," IFRC, 2015.

For this study 14 Missing Voices interviews were conducted (see Annex 1 for details of interviewees). Interview transcripts were written up and translated into English. These transcripts were uploaded into NVivo for qualitative analysis, exploring themes within the data. As with the KIIs, illustrative quotes are provided across the results section of the report and are attributed anonymously to protect the identities of those who have trusted us with their stories.

## 3.6    LIMITATIONS

The research takes note of certain limitations in perspective and analysis, particularly in terms of gaps in whose stories and experiences we were able to include.

Insights were not collected from homeless people, gender minorities, sex workers and migrant students. These groups were not successfully reached for diverse reasons including:

- Timing: The interviews occurred at a time when some groups like migrant students have been relocated by the government outside of the city, in line with local government procedures to ferry temporary residents back to their home provinces. The city government of Baguio had relocated temporary residents as early as March 2020 when the Covid-19 pandemic hit the Philippines.

- Trust: Challenges were encountered connecting with and building trust with poor individuals from marginalised groups including sex workers and gender minorities. Individuals were unwilling to share their experiences, with reasons that are not clear, but may be related both to a lack of trust in engaging with this initiative, and/or this initiative being a lesser priority given existing challenges especially for low income informally employed individuals during a global pandemic. Additional, on the topic of trust, we note these research findings shared very little on the topic of Gender Based Violence. Given findings from research conducted elsewhere, we would expect to hear more on the topic of Gender Based Violence, and the absence of this data should not be taken to indicate that

Baguio is somehow immune to this phenomenon. Instead, we can wonder whether the Missing Voices interviewees had sufficient trust to share more sensitive experiences, or whether those with GBV related experiences were less willing to be interviewed. We can also speculate whether the particular timing of the interviews (during a period of government mandated lockdown due to Covid), made it harder for interviewees to find private space to conduct interviews without being overheard, reducing willingness to talk about sensitive topics.

- Those with additional support needs:  In the case of some homeless people living with mental health conditions as well as people with hearing and speech difficulties, the project interviewers were unable to provide the support needed to gain insights directly from those groups, especially while working remotely. This reinforces this group's particular vulnerability.

- Intermediaries: In other projects with a Missing Voices component, informal and civil society intermediaries were a key vehicle for reaching out to and building trust with Missing Voices interviewees. In Baguio this was less successful, with a majority of KIIs being connected to government and the city administration, and few interviews conducted with intermediary groups who are not connected to the formal structures of the City administration. The difficulty in reaching informal and civil society intermediaries may be related to the timing of the research, taking place when a second round of Covid related lockdowns was imposed in Baguio (March-May 2021). In terms of government associated KIIs, these also demonstrated limitations in terms of the key informants' own understanding of gender and inequality driven aspects of flood risk and early warning and in their understanding of and connections to groups who are particularly marginalised, a finding that is also reflected upon in the results section of this report.

As we draw conclusions from our mixed method approach, where we have identified gaps in our interview-based data, we will make sure to draw more extensively upon insights from other sources, including from global and national literature, with careful attention to the issues and groups who remain missing from our qualitative data. Data limitations are also explicitly considered when defining this report's conclusions and forthcoming recommendations for policy and practice.

# 5-Step Missing Voices Methodology

### Step 1: Identify axes of marginalisation
The first step is designed to understand the complexities of the individual context of the study. In this step, we need to understand who is likely to be missing from the data, and excluded from policy and practice so that we can seek out their perspectives.

### Step 2: Outreach to interviewees via intermediaries
The next step is to reach out to individuals facing multiple areas of marginalisation or vulnerability. The key to this step is to work in partnership with trusted intermediaries such as community-based organisations who specifically provide services for the marginalised populations. Another key aspect of this step is the use of snowball sampling, where we ask interviewees to connect us with their peers who would also be willing to speak with us about their experiences.

### Step 3: Interviews and analysis
The Missing Voices interviews themselves are conducted remotely over the phone. This helps us to speak with people across wide geographical areas, without causing interviewees to experience unwanted scrutiny which may make them feel inhibited or may even put them at risk. Interviews are completely anonymous.
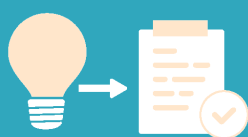
### Step 4: Taking action
The next step is about taking the insights that interviewees have shared with us and acting on the issues they have identified.
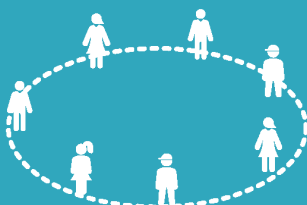
### Step 5: Ongoing engagement and feedback
Finally, we need to ensure we maintain relationships and determine how effective our actions are in meeting the needs and priorities of marginalised groups, identifying how we can improve and develop our actions through consultation and collaboration.

**Figure 9: Overview of the Missing Voices Approach**

# 4  GENDER INFORMED ANALYSIS



**Image caption: Street vendors, Philippines**
Source: JR Padlan

Effective FEWS comprise 4 core components as shown in Figure 10 below. Risk Knowledge is vital, ensuring effective understanding of flood risk both in those managing the FEWS and in those living in flood affected areas, enabling risk informed action. Monitoring and Warning ensures that appropriate observations and thresholds enable appropriate forecasting and triggering of early warning. Response Capability ensures that effective plans, resources and preparedness is in place to take effective action in response to a warning. Dissemination and Communication ensures that understandable, actionable information is communicated to all who need it, enabling timely risk-informed early action. Effective FEWS also require consideration of 4 cross-cutting components:

- Involvement of Local Community;
- Effective Governance and Institutional Arrangements;
- A Multi-Hazard Approach; and
- Consideration of Gender and Cultural Diversity.

A Gender Transformative Early Warning System ensures the system delivers for all, protecting people of all genders and all circumstances, ensuring no one is left behind. This section presents a gender and inclusion informed analysis of Baguio's FEWS.

The components of an effective EWS are explored below. The analysis is framed under nine themes with particular relevance to Gender Transformative Early Warning and Early Action:

- Impact and Vulnerability;
- Risk Knowledge;
- Monitoring and warning;
- Communication and Dissemination;
- Preparedness;
- Evacuation;
- Evacuation facilities;
- Post-Event Relief and Longer-Term Recovery; and
- Governance and Participation.
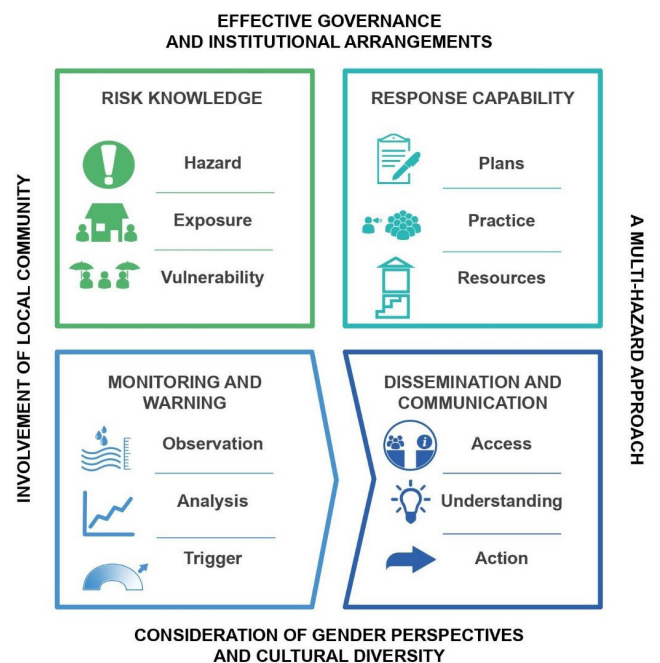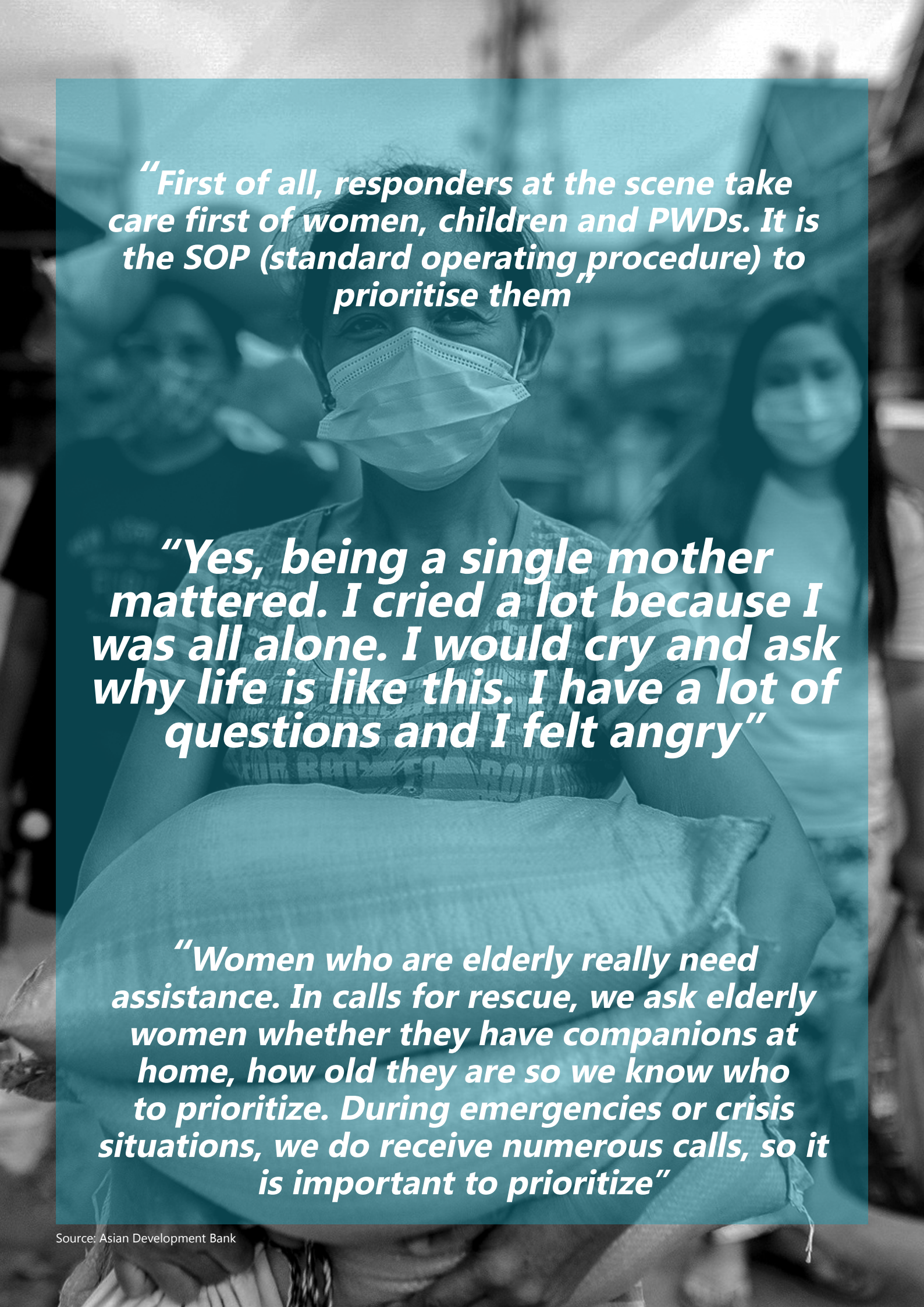


**Figure 10: Elements of an effective early warning system**

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

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3    S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.

4    E. Enarson and L. Meyreles, "International perspectives on gender and disaster: differences and possibilities," International Journal of Sociology and Social Policy, vol. 24, no. 10, pp. 49-93, 2004.

5    A. Gorman-Murray, S. McKinnon, D. Dominey-Howes, C. Nash and R. Bolton, "Listening and learning: giving voice to trans experiences of disasters," Gender, Place & Culture, vol. 25, no. 2, pp. 166-187, 2017.

6    International Federation of Red Cross and Red Crescent Societies (IFRC), "Unseen, unhead: Gender-based violence in disasters," IFRC, 2015.

"First of all, responders at the scene take care first of women, children and PWDs. It is the SOP (standard operating procedure) to prioritise them"

"Yes, being a single mother mattered. I cried a lot because I was all alone. I would cry and ask why life is like this. I have a lot of questions and I felt angry"

"Women who are elderly really need assistance. In calls for rescue, we ask elderly women whether they have companions at home, how old they are so we know who to prioritize. During emergencies or crisis situations, we do receive numerous calls, so it is important to prioritize"

## 4.1    IMPACT AND VULNERABILITY

Global literature on disaster impacts highlights a link between gender inequality, gender norms, social marginalisation and vulnerability. The less economic, political, and cultural power that is held by women and gender minorities prior to a disaster, the greater their suffering during and in the aftermath [7,8,9,10]. Gender norms and roles which prevent girls from learning how to swim or climb, or which tend towards women being responsible for assisting children and elderly people, can also increase their vulnerability[11,12,13,14].

In areas where gender inequality is high, and women and gender minorities have limited access to physical, financial, human, social, and natural capital[15], the impacts of disasters on women and gender minorities are disproportionately high[16,17,18,19,20]. This increased vulnerability can have devastating consequences, with Pincha [21] observing a "glaring gender gap in mortality rates of men and women". As ever, context is key – social vulnerability to disaster is "not uniform or universal whether we problematize gender or ethnicity or age"[22]. Examples of differential impact are context and event specific, often driven by differential exposure and context specific inequalities[23]. Knowledge of axes of inequality in the Philippines are therefore critical to understand who is likely to be at risk of being left behind in an EWS.

The Philippines ranks as one of the most natural hazard-prone countries in the world and is exposed to multiple threats including earthquakes, cyclones, floods, drought and landslides[24,25]. It is estimated that since 1990, such events have affected at least 186 million people in the country[26]. Baguio city itself is highly exposed and vulnerable to natural hazards due to its geographic location, topography, land use and growing population[27].

7,17    A. Gorman-Murray, S. McKinnon, D. Dominey-Howes, C. Nash and R. Bolton, "Listening and learning: giving voice to trans experiences of disasters," Gender, Place & Culture, vol. 25, no. 2, pp. 166-187, 2017.

8,20,23    S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.

9,21    C. Pincha, "Indian Ocean Tsunami Through The Gender Lens," Oxfam America and NANBAN Trust, 2008.

10    J. Gaillard, K. Sanz, B. Balgos, S. Dalisay, A. Gorman-Murray, F. Smith and V. Toelupe, "Beyond men and women: a critical perspective on gender and disaster," Disasters, vol. 41, no. 3, pp. 429-447, 2017.

11    UNISDR, "Making Disaster Risk Reduction Gender-Sensitive: Policy and Practical Guidelines," UNISDR, UNDP and IUCN, Geneva, 2009.

12,16    E. Neumayer and T. Plümper, "The gendered nature of natural disasters: the impact of catastrophic events on the gender gap in life expectancy, 1981-2002," Annals of the American Association of Geographers, vol. 97, no. 3, pp. 551-556, 2007.

13    C. Garcia and L. Reyes Zuniga, "Desastres naturales y vulnerabilidad de las mujeres en Mexico," Instituto Nacional de las Mujeres (INMUJERES) and UNDP, Mexico, 2006.

14    G. E. S. (Genanet), "Mainstreaming gender into the climate change regime," in Tenth Session of Conference of Parties (COP 10), Buenos Aires, 2004.

15    E. Enarson, "Through women's eyes: a gendered research agenda for disaster social science," Disasters, vol. 22, no. 2, pp. 157-173, 1998.

18    B. Wisner, G. J.C and I. Kelman, Handbook of Hazards and Disaster Risk Reduction and Management, Abingdon, UK and New York, NY: Routledge, 2012.

19    M. Mehta, "Gender Matters: Lessons for Disaster Risk Reduction in South Asia," 2007. [Online]. Available: https://agris.fao.org/agris-search/search.do?recordID=QZ2013000067. [Accessed 15 July 2021].

22    E. Enarson and L. Meyreles, "International perspectives on gender and disaster: differences and possibilities," International Journal of Sociology and Social Policy, vol. 24, no. 10, pp. 49-93, 2004.

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

25,26    A. Brucal, 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.

27    M. Paringit, M. Cutora, E. Santiago and M. Adajar, "Assessment of landslide susceptibility: a case study of Carabao mountain in Baguio City," International Journal of GEOMATE, vol. 19, no. 71, pp. 166-173, 2020.

Evidence from the Philippines echoes the wider literature, with vulnerability and disaster impacts being experienced differently depending on gender, sexuality, socioeconomic status, age, religion and ethnicity [28,29,30], with poverty being a significant factor in determining vulnerability[31].

The population of Baguio city has grown significantly and is now at a level much higher than was ever originally intended[32]. Subsequently the city has experienced a rapid development of unplanned settlements with more people now living in hilly and overcrowded areas[33,34,35]. This leaves many exposed and vulnerable to the impacts of natural hazards, for example, one study found that approximately 80% of Baguio city is at risk of landslides[36]. Literature also emphasises that the most vulnerable areas of Baguio city have relatively higher levels of poverty[37]. Additionally, Benguet (the province Baguio city is located in) is home to an estimated 495 child labourers and 81 women who were considered to be living in especially difficult circumstances (in 2018 and 2019 respectively)[38]. Careful attention should be paid to how the existing situations of these individuals may contribute to heightened vulnerability to disasters and their impacts.

The Philippines ranks relatively highly in terms of gender equality[39], yet the literature suggests societal norms and practices still perpetuate a culture of marginalisation, discrimination, and exclusion of minority groups, and particularly gender minorities[40]. Laws and policies within the Philippines acknowledge specific needs of women during disasters, but there is far less regarding the vulnerabilities other gender or sexual minorities face[41]. Additionally, the traditional Western concept of gender as binary has proliferated the Philippines' disaster policy and practice, which research shows serves only to marginalize gender and sexual minorities for whom these categories are insufficient, inaccurate, and inappropriate[42,43]. Literature regarding vulnerability and disaster impacts frequently mentioned sexual and gender minorities[44]. Research has shown that sexual and gender minorities may face discrimination and marginalisation in their everyday lives, where disasters exacerbate this vulnerability[45].

Baguio city is described as a "melting pot of various cultures" and is home to multiple indigenous groups[46]. However, national literature emphasizes that indigenous groups are some of the most marginalised across the country and have less access to financial capital[47,48,,49], resulting in heightened vulnerability to disasters.

28          P. Eadie, M. Atienza and M. Tan-Mullins, "Livelihood and vulnerability in the wake of Typhoon Yolanda: lessons of community and resilience," Natural Hazards, vol. 103, no. 1, pp. 211-230, 2020.

29          Asian Development Bank, "Gender Differences in Access to Health Care Among the Elderly: Evidence from Southeast Asia," ADB, Metro Manila, 2021.

30          Asian Development Bank, "Baguio Situation Assessment: Volume 1 Urban Development and Growth," ADB, 2020.

31,34,37,38,39 I. Abarquez and N. Parreño, "Review of Gender Equality in Disaster Risk Reduction and Management," World Bank, Metro Manila, 2014.

32,33       Asian Development Bank, "Baguio Situation Assessment: Volume 1 Urban Development and Growth," ADB, 2020.

35          Asian Development Bank and egis, "Baguio Situation Assessment: Main Report," ADB and egis, 2020.

36          Asian Development Bank, "Baguio Situation Assessment: Volume 7 Climate Change and Natural Hazard Assessment," ADB and egis, 2020.

40          Asian Development Bank, "Gender Mainstreaming in the KALAHI-CIDSS National Community-Driven Development Program," ADB, Metro Manila, 2018.

41,42       J. Gaillard, K. Sanz, B. Balgos, S. Dalisay, A. Gorman-Murray, F. Smith and V. Toelupe, "Beyond men and women: a critical perspective on gender and disaster," Disasters, vol. 41, no. 3, pp. 429-447, 2017.

43          A. Junio, "Sexual Minorities and Disasters in the Philippines: Where Are They?," [Online]. Available: http://www.kfaw.or.jp/correspondents/docs/27-2_Philippines_E.pdf. [Accessed 15 July 2021].

44,45       J. Gaillard, K. Sanz, B. Balgos, S. Dalisay, A. Gorman-Murray, F. Smith and V. Toelupe, "Beyond men and women: a critical perspective on gender and disaster," Disasters, vol. 41, no. 3, pp. 429-447, 2017.

This is because, despite being a demographic majority in Baguio, the indigenous groups still represent a social minority group whereby marginalisation is experienced due to a lack of access to social capital. Therefore, while there may be high numbers of a given population, those numbers do not translate to holding power or influence in a given system. Indigenous groups in the Philippines face discrimination for a range of reasons including language, social norms and physical appearance[50]. Furthermore, indigenous coping mechanisms and practices regarding disaster risk reduction are often mocked and disregarded leading to further societal marginalisation and vulnerability to disasters and their impacts[51]. There is also a lack of indigenous statistics available in the country except in regions where the indigenous population make up a majority of the population (such as in the Cordilleras and parts of Muslim Mindanao). This absence in national statistics makes indigenous people more invisible to development planners and decision-makers.

Understanding of differential impacts can be critical to understanding vulnerability in a given location. However, datasets of disaster losses often have significant gaps, are extremely poor at accounting for the types or magnitude of losses of the most marginalised, and deficient at disaggregating data in a reliable and meaningful way. A global review of disaster-related data found significant data gaps excluding marginalised groups in all data sets, including at census level, meaning marginalised groups were often invisible in analysis, policy and practice[52]. Exclusion of marginalised groups from datasets reinforces and perpetuates exclusion from DRR, response and recovery. Datasets that did collect disaggregated data tended to treat groups as homogenous, focusing on singular identities (children as a uniform group for example), not capturing the ways in which women or children with multiple vulnerabilities or areas of marginalisation are differentially impacted. Limitations in available disaggregated impact data can serve to mask areas of vulnerability and differential impact.

The use of common categories for vulnerability – women, elderly, PWDs – also misses the identification of multiple vulnerabilities that a person or a group has. Lists also tend to be prepared at the household level, in ways that do not identify special concern vulnerable individuals within it (e.g., those with illnesses like cancer or epilepsy). As a matter of protocol, rapid and post-disaster assessment of losses takes place before and after a disaster event. The disaggregation of data on damages and losses is sector-based, e.g., infra, agricultural, and not at the level of households.

46    Asian Development Bank, "Baguio Situation Assessment: Volume 1 Urban Development and Growth," ADB, 2020.

47    D. De Vera, "Indigenous Peoples in the Philippines: A Country Case Study," in RNIP Regional Assembly, Hanoi, Vietnam, 2007.

48    D. Hilhorst, J. Baart, G. van der Haar and F. Leeftink, "Is disaster "normal" for indigenous people? Indigenous knowledge and coping practices," Disaster Prevention and Management, vol. 24, no. 4, pp. 506-522, 2015.

49    International Fund for Agricultural Development, "Country Technical Notes on Indigenous Peoples' Issues: Republic of the Philippines," IFAD, 2012.50,51

50,51  G. Cuaton and Y. Su, "Local-indigenous knowledge on disaster risk reduction: Insights from the Mamanwa indigenous peoples in Basey, Samar after Typhoon Haiyan in the Philippines," International Journal of Disaster Risk Reduction, vol. 48, no. 1, pp. 1-12, 2020.

52    S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.
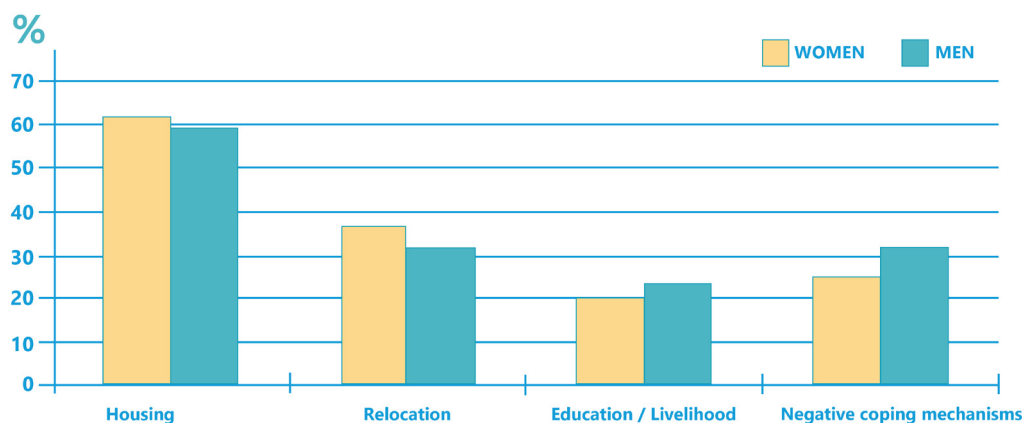
**Figure 11: Flood impacts**

Across the Philippines there is a distinct lack of gender-disaggregated data[53] which is key to developing gender and inequality informed disaster plans and policies[54]. It is estimated that 35.5% of Baguio city's total population belongs to an indigenous group [55], however key documents such as the Comprehensive Land Use Plan 2013-2023, make little mention of these groups, indicating there is an opportunity to better consider  these groups in urban planning and disaster risk management policies.

In Baguio city, interviews with government officials indicated that the city collects sex-disaggregated disaster-related data from evacuation centres, with headcounts made of families with vulnerable groups, including pregnant women, children and elderly, persons with disabilities, and people with significant mobility related disabilities. The afore-mentioned data collection and other documentation on vulnerable groups in the city tends to cover only those that have stayed in evacuation centres, and identified or designated emergency evacuation areas such as churches and school grounds. These lists generated of affected households do not necessarily include those moving in with relatives or private residences, and those unable to access these facilities both logistically or due to their status as a gender minority or marginalised group(s). These lists are furthermore noted to be primarily used for post-event record-keeping purposes.

## 4.1.1   IMPACTS FROM FLOODING IN BAGUIO CITY

Survey data examined the most common losses experienced in Baguio. Damage to- or destruction of housing was the most commonly reported impact of flooding, reported by 61% of respondents (Figure 11). 35% had to relocate following flooding, while 22% experienced disruption to their livelihood or education. 28% of respondents employed a negative coping mechanism in response to flooding (generally taking out loans).

Statistical analysis did not find gender to be a significant driver of impacts overall (QD6-9), with housing construction particularly driving housing related losses. The vast majority of flood affected respondents with housing constructed of light materials or wood experienced damage to or destruction of their homes.

Key Informants highlighted those most adversely impacted by flooding were particularly vulnerable groups including people with disabilities (PWDs) - particularly mobility-related disabilities, homeless people, elderly women, women with children, and individuals without the ability to swim.

53    I. Abarquez and N. Parreño, "Review of Gender Equality in Disaster Risk Reduction and Management," World Bank, Metro Manila, 2014.
54    R. Macalandag, "Examining the (In)Visibility of Gender in Disaster Risk Reduction and Management Plans: Reclaiming a Sidelined Agenda," Holy Name University, Bohol, Philippines, 2016.
55    Ramboll, Questions on urban infrastructure and services for Baguio - Reconnaissance Mission (25 March - 1 April 2020), Ramboll (associated with TO-02: PHI: Baguio City Smart Flood Warning, Information and Mitigation System), 2020.
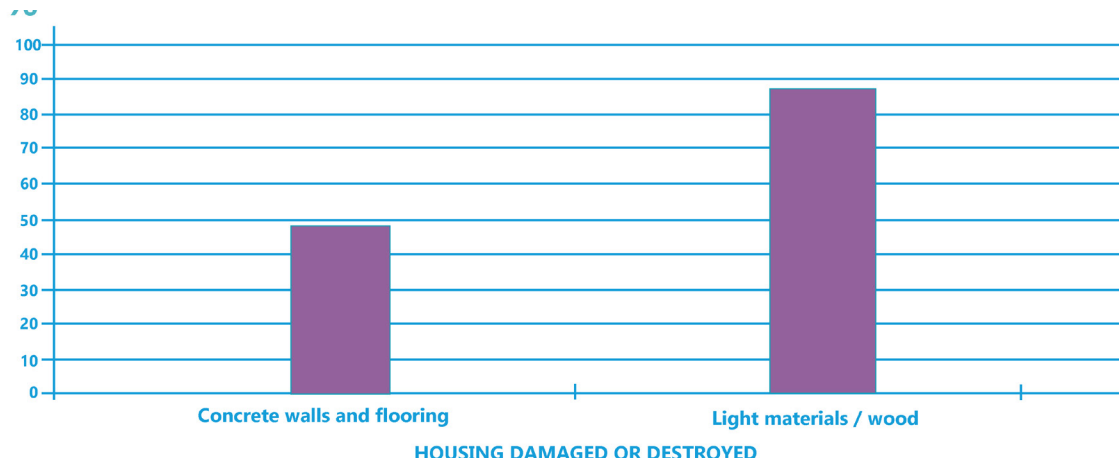
**Figure 12: Experience of housing impacts by housing construction type**

*"First of all, responders at the scene take care first of women, children and PWDs. It is the SOP (standard operating procedure) to prioritise them" [KII1]*

*"In the master list, we tend to deal more with PWDs, and the homeless. Likewise, we help raise priority for them even in rescue" [KII3].*

*"Women who are elderly really need assistance. In calls for rescue, we ask elderly women whether they have companions at home, how old they are so we know who to prioritize. During emergencies or crisis situations, we do receive numerous calls, so it is important to prioritize" [KII4].*

*"Among the PWDs, those at-risk are the physically immobile" [KII4].*

*"There are cases that those left behind are the children, those who are disabled, or the women. People who are not capacitated on how to swim or on basic life skills. They are often the victims. That's why it is important to capacitate the vulnerable so that they can become responders in the future" [KII5].*

Missing Voices (MV) interviewees highlighted the vulnerabilities of single parents, or parents whose partner was away at the time of a flood event, especially those trying to keep multiple children safe single-handedly.

*"The waters raged. I threw our belongings aside because I had to look for my children. My husband was not here. It was just me and the children. My children were still very small. That's why I attended to them first. I had six children … I panicked to the point that I left my other child, in the middle of the street, in the middle of waters. Because I made sure to carry the little ones first, my fourth child was about nine. I was hysterical on the street. I was shouting that one of my children was missing. I was able to find her by hearing her cries. I heard her cry…We were wading through the waters. Holding on to each other. It was a close call" [MV7].*

*"It was hard because dealing with the flood takes a lot of physical effort. Moving the children, looking out for them, making sure they're fed" [MV13].*

*"Yes, being a single mother mattered. I cried a lot because I was all alone. I would cry and ask why life is like this. I have a lot of questions and I felt angry" [MV9].*

*"We thought the flood wouldn't reach us"*

*"It was too late for people to help each other at that time. The waters rose so quickly so everyone was panicking"*

*"There is a need to re-educate the public about EWS. In the communication plan, there is a need for people to understand the risks around flooding, especially those in flood-prone areas"*

Source: Chitto Cancio

## 4.2    RISK KNOWLEDGE

An effective understanding of risk is critical to all aspects of an effective EWS. Effective risk knowledge at a systemic level, particularly for institutional stakeholders, ensures the whole system effectively integrates all dimensions of risk, including varying risk thresholds. Effective risk knowledge for an individual is critical for ensuring those living within the system are informed and equipped to take appropriate early action.

At a systemic level, global literature emphasises the importance of an EWS being informed by a comprehensive understanding of risk, including context specific information on exposure, hazard and vulnerability. Systemic risk knowledge needs to be gender and inequality informed, understanding the ways in which gender or marginalisation can affect risk exposure, both in terms of where people live, and in terms of where they are likely to be at specific times, or in terms of how individuals weigh up decisions about risk. In contexts where female headed households tend to have lower incomes, they are likely to live in areas which are more disaster-prone or in housing which is less disaster-proof. In contexts where gender norms drive occupation, women may be more likely to be at home on their own or with dependents.

Understanding gender-based determinants of exposure is important to understanding who might be at greater risk from certain hazards, based on their locality. Understanding the different risk profiles that individuals live under can also help inform potentially differing styles of risk weighting, which can be critical in understanding how individuals make decisions during hazard events.

In the Philippines and Baguio city, the population is highly mobile and dynamic, which directly affects existing and accurate knowledge about where people are (exposure), and what their vulnerabilities or coping capacities are. There is a high level of internal migration in the Philippines with people moving to find employment[56], and Baguio city itself has a highly transient population, with an estimated 380,000 people visiting daily[57,58]. In addition to this, the City attracts over 1.8 million tourists in the summer months[59] and is the temporary home to many students[60]. These population dynamics pose problems in terms of risk knowledge and disaster management plans and activities. In one example, it was found that many community members who received training on disaster plans had moved within a year of receiving the training[61].

56    R. Abad, "The Asian Face of Globalisation: Reconstructing Identities, Institutions and Resources," The Nippon Foundation, Tokyo, 2002.
57    Ramboll, Introduction - Water Supply Services, Ramboll (associated with TO-02: PHI: Baguio City Smart Flood Warning, Information and Mitigation System), Accessed 2021.
58    Asian Development Bank, "Baguio Situation Assessment: Volume 1 Urban Development and Growth," ADB, 2020.
59    Ramboll, "PHI: Baguio City Smart Flood Warning, Information and Mitigation System. Baseline Assessment Report," Asian Development Bank, 2021.
60,61  K. Allen, "Community-based disaster preparedness and climate adaptation: local capacity-building," Disasters, vol. 83, no. 1, pp. 81-101, 2006.
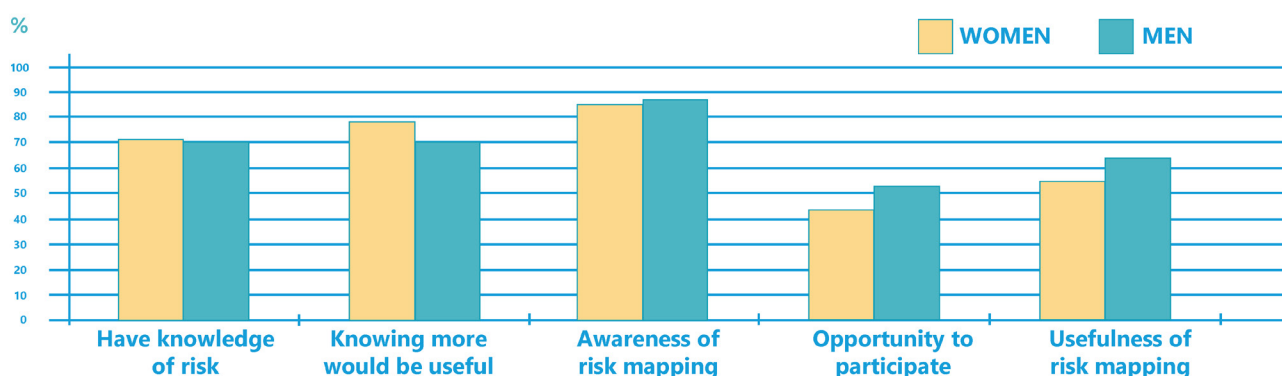
**Figure 13: Risk knowledge**

It is also critical that at-risk individuals understand the risks that they are exposed to, especially in dynamic contexts where risk changes or increases with time. The ability to access risk information to inform decision-making is affected by gender dimensions and marginalisation. In contexts of gender inequality, people of different genders access, process, interpret, and respond to information in different ways, due to the social and cultural organization of gender relations and the gendered division of labour[62].

Research has shown that the gendering of access to risk information in the Philippines is a result of social and cultural norms whereby men spend more time in public spheres so are better able to receive information from a range of sources, compared to women who traditionally remain mostly at home[63]. Evidence also suggests that risk perception is gendered, with men commonly underestimating the hazard severity][64,65]. Prior experience of a hazard was shown to influence risk perception and knowledge of both households and local government units (LGUs)[66,67].

## 4.2.1   UNDERSTANDING OF RISK AND PARTICIPATION

The survey examined levels of risk knowledge amongst at-risk communities in Baguio. Around 70% of respondents thought they understood their local risk exposure, with no statistically significant gendered differences in perceived risk knowledge. Men report higher levels of opportunity to participate in risk mapping (53% of men said they had had the opportunity to participate compared with 43% of women), and men perceived participating in risk mapping to be more useful than women (64% compared with 55%).

62  UNISDR, "Making Disaster Risk Reduction Gender-Sensitive: Policy and Practical Guidelines," UNISDR, UNDP and IUCN, Geneva, 2009.

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

64  P. Eadie, M. Atienza and M. Tan-Mullins, "Livelihood and vulnerability in the wake of Typhoon Yolanda: lessons of community and resilience," Natural Hazards, vol. 103, no. 1, pp. 211-230, 2020.

65  Y. Tanaka and A. Nonoguchi, "Case Study on the Philippines and Sri Lanka: Transforming Gender Relations in Disaster Risk Reduction," Japan International Cooperation Agency and Georgetown Institute for Women, Peace and Security, 2016.

66  V. Bollettino, T. Alcayna, K. Enriquez and P. Vinck, "Perceptions of disaster resilience and preparedness in the Philippines," Program on Resilient Cities and Harvard Humanitarian Initiative, 2018.

67  A. Brucal, 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.

The latter suggests risk mapping could do more to meet the expectations and needs of women in Baguio. Consistent with this gap, a slightly higher proportion of women said that it would be useful for them to know more about local risk (78% compared with 70%).

Caring responsibilities are the most common barrier respondents cited which would make it difficult for them to engage with risk mapping activities to increase their knowledge of local risk, mentioned by 27% of respondents (similar rates for women and men). Other barriers mentioned included workload and time availability. Employment status was found to be significant in terms of the respondents for whom caring responsibilities present a barrier to participating in risk mapping, with 47% of formally employed respondents and 53% of retired respondents saying it would be difficult for them to engage in these activities due to their caring responsibilities.

### 4.2.2  UNDERESTIMATING RISK

Key Informant and Missing Voices interviewees provided insights on a tendency of individuals to underestimate risk, or to underestimate the speed at which a situation could progress to being unsafe.

*"We thought the flood wouldn't reach us" [MV2].*

*"It was too late for people to help each other at that time. The waters rose so quickly so everyone was panicking" [MV6].*

*"But our dogs we left behind. We thought that our pets can fend for themselves, as dogs know how to swim. The waters were not yet high then. We thought our dogs will be safe, believing that the waters will recede fast. (When we returned to the house, we) found our dogs had died" [MV8].*

A number of interviewees were aware of rainfall, but did not understand the likely impacts, suggesting warnings did not adequately communicate the severity of risks. This could be linked to poor hazard risk education and outreach, compounded by a lack of tailored warning messages that provided information on likely personal risk and impact. Many people disregarded warnings if the current weather did not seem severe.

*"There was a warning, but the weather seemed fine" [MV13].*

*"it's hard to believe when the weather is ok, like when the rains are not that hard" [MV13].*

*"I was 9 years old then, in Grade 4. We felt the heavy rains around 2pm and it was already night-time when we realized we have to move out. The waters rose suddenly. Before this, we were told by the barangay officials to leave but we did not follow. We were not bothered at first... After a while, around 5pm, our first floor was nearly under water already. The waters have reached the 9th step of our stairs. We were trapped so my uncle found a way to reach our next-door neighbor and asked them if it's possible for us to climb up to their second-floor window from our rooftop... We were not able to bring anything but our clothes. I was so afraid at that time" [MV14].*

Key informants noted the tendency for individuals to misconstrue warnings or underestimate risk, and a need to improve hazard risk education and outreach activities to support more informed preparedness plans and decision making:

*"There is a need to re-educate the public about EWS. In the communication plan, there is a need for people to understand the risks around flooding, especially those in flood-prone areas" [KII1].*

### 4.2.3   EXPERIENTIAL KNOWLEDGE

Key Informant and Missing Voices interviewees spoke of the value of experience-based risk knowledge; those with past experience of flooding having a greater appreciation of flood risk, and understanding how quickly an unsafe situation can develop.

*"People being long-term resident like me already has ready inkling that flooding will occur soon even if we do not inform them" [KII7].*

*"In (recently flood affected areas) there may be high awareness on early warning. Compared to those areas not reached by floodwaters. There is consciousness, responsiveness in flood-risk areas" [KII1].*

*"Panic set in when floods rose fast" [MV7].*

*"We evacuated once more when typhoon Ompong struck but our house was not that damaged or submerged. We learned our lesson. We evacuated early because we did not want to go through what happened with the previous one" [MV14]*

### 4.2.4  GAP IN FORMAL RISK INFORMATION AND EDUCATION

In Baguio, in areas where floods have occurred less frequently, people are less likely to be able to rely on experience-based knowledge, needing to instead learn from the experience of others, or formal sources of information. A number of respondents mentioned individuals basing their assessment of flood risk purely on current weather conditions (current rainfall intensity), misinterpreting time-lags between rainfall and flooding. This again highlights a gap in hazard risk education in the populations at risk from flooding in Baguio.

*"One instance is that in the course of preparing to evacuate because of signal No. 3 (strong rains and floods), then suddenly the sun shines during evacuation when they already hired transport to bring them to the evacuation centre. In such unpredictability, some families wait for actual rains to pour before moving to the evacuation centre which is more dangerous. On the part of the barangay officials, they always remind their constituents. Since their area is a catchment area for several barangays in Baguio, flooding occurs even if there are no rains since the tunnel passageway where water flows is full of debris. They constantly clean this tunnel. Such flooding occurs around three (3) hours"* [KII7].

*"We thought the typhoon has passed because there was just light rain and some winds. Then suddenly, the waters in the canal started rising and then the flood came. The waters were rising and we were all getting nervous. We did not know what to do at first…We did not leave yet because we did not expect the waters to rise that fast. It was so fast".* [MV11]

*"There were people from the barangay going around our place the day before. These were the kapitan and the kagawads warning us to evacuate early. We did not follow because the rains very not very hard that night. There was a warning but the weather seemed fine. It was in the morning when we felt the need to leave"* [MV13].

*"The issue is not about the receiving information but faith in the information received. The issue is one cannot be sure about the information given. That's why the attitude of people is to wait for the typhoon before evacuating. People are not proactive unless they see it (the typhoon or disaster happening). People still expect that maybe, the typhoon will not strike. Unless they see water levels rising, people will not move"* [KII1].

"We were not able to salvage anything. Just the clothes we were wearing and my papers to the house"

"When I returned to get our belongings, it was no use. The flood already reached our house. It was impossible to get in."

"I was so afraid. I am only five feet. I was close to drowning while walking the streets. It was my son and my husband holding me high, my head up high...My daughter being held by my husband. We saved only some clothes".

## 4.3    MONITORING AND WARNING

Decisions related to how to monitor hazards, and what triggers or thresholds should prompt the issuing of an early warning should be informed by an understanding of diverse needs and capabilities of users and recipients of warning messages. Groups with higher vulnerability are likely to have different preferences for early warning lead times, including (at times) a preference for earlier evacuation[68].

Evidence from the national household survey suggests that approximately 60% of the Philippines population believe that they receive reliable risk information in a timely manner[69]. However, caution should be expressed when analysing these findings given the propensity for household surveys to exclude marginalised voices[70]. Research that focussed on specific events, such as the 2009 Pepeng storm, found that monitoring and warning was insufficient in meeting the needs of the communities. Prior to Pepeng, many people relied on their own indigenous monitoring methods (e.g., observing moon cycles or animal behaviour), but the scale of this particular storm resulted in a call for systems that can better predict and warn of such events[71].

The frequency and severity of hazards is increasing, and it is clear from research in the Philippines that climate projections, models and forecasts are not yet able to accurately account for these changing weather and climate patterns[72]. Not only this, but where information does exist, there is a limited access and understanding of how to utilise the information to take effective action[73]. There is therefore a need to improve both the monitoring and prediction of hazards, as well as the capacity of local disaster risk managers to act on the information available to them[74].

68,70   S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.

69      V. Bollettino, T. Alcayna, K. Enriquez and P. Vinck, "Perceptions of disaster resilience and preparedness in the Philippines," Program on Resilient Cities and Harvard Humanitarian Initiative, 2018.

71      D. Hilhorst, J. Baart, G. van der Haar and F. Leeftink, "Is disaster "normal" for indigenous people? Indigenous knowledge and coping practices," Disaster Prevention and Management, vol. 24, no. 4, pp. 506-522, 2015.

72      Asian Development Bank, "Baguio Situation Assessment: Volume 7 Climate Change and Natural Hazard Assessment," ADB and egis, 2020.

74      A. Brucal, 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.

### 4.3.1 LEAD TIME

The survey examined how much time, in advance of a flood, interviewees had previously received early warning, as well as exploring their preferred lead time. Similar percentages of men and women had received an early warning (83% and 77% respectively), with no statistically significant difference between genders. Gendered differences can be seen in where respondents see themselves fitting in the flow of warning information, with women more likely to think that their neighbours knew before them that the flood was going to happen (38% of women thought their neighbours knew before them versus 18% of men).

Most respondents (43% of women and 50% of men) reported knowing about the flood 1-3 days before it occurred. About a quarter of interviewees reported knowing more than 3 days in advance. 17% of respondents reported being unaware until the flood was happening, with no advance knowledge. There was no statistically significant relationship between gender or other demographic characteristics and the lead time respondents had previously received early warning.

Key Informants from within the current EWS administration considered the current early warning lead time (i.e. a lead time described as less than a day's warning in the example provided) to be sufficient.

*"The people were able to prepare ahead of time. The day before the typhoon came, around 11 in the morning, it was declared that typhoon signal number 3 was likely to happen. The CDRRMO monitored the area and gave the go-ahead for pre-emptive evacuation. The following night was the time heavy rains came" [KII2].*

This perspective is contradictory to the data obtained from survey and Missing Voices interviews, where a longer lead time was preferred and people reported significant challenges evacuating on short notice. This might indicate a gap in the understanding of providers of warning information regarding what users need.

Survey respondents were asked about their preferred early warning lead time. A majority of men and women prefer to receive a warning one to three days in advance of the flood occurring (50% of women and 64% of men). Women were more likely than men to prefer a longer lead time of more than five days (20% of women compared with 15% of men).
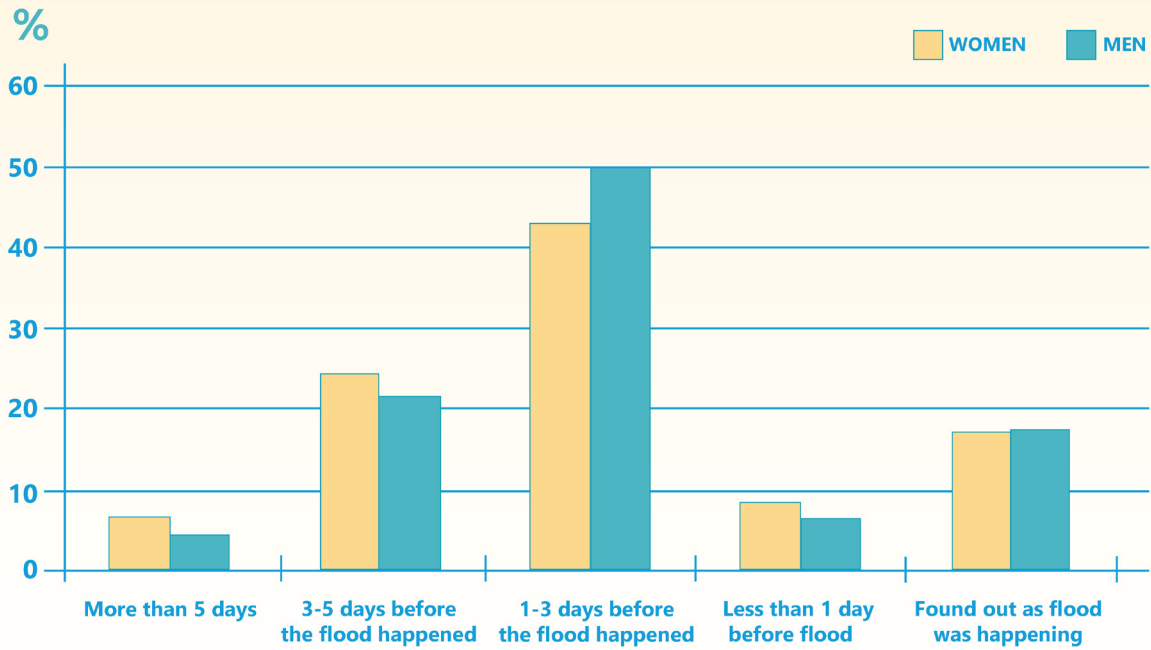
**Figure 14: Lead time experienced by respondents**
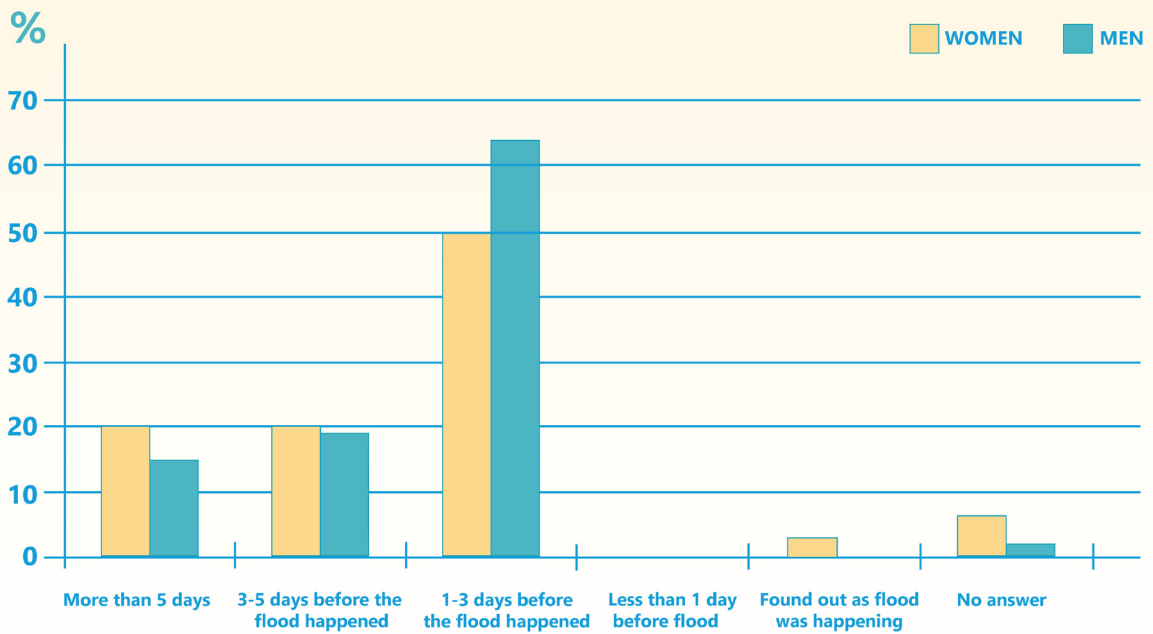


**Figure 15: Preferred early warning lead time by gender**

### 4.3.2   LATE WARNINGS

A large number of MV interviewees reported people receiving warning or taking action too late. A longer lead time is needed to allow people to prepare and act before the flood – particularly those who might have to make two trips (see later section on evacuation) with children and resources:

*"Someone from the CDRMMC was going around with a megaphone telling everyone about a possible flood and that we have to move out. I was still renting at that time. The house was three levels, and we lived on the first floor. I immediately packed our clothes, and because of panic because my children were still very small". [MV9]*

*"We were not able to salvage anything. Just the clothes we were wearing and my papers to the house" [MV3]*

*"The waters rose very fast. We were still packing our clothes upstairs but the waters were reaching the bottom of the stairs". [MV7]*

*"It was too late for people to help each other at that time. The waters rose so quickly so everyone was panicking.  [MV7]*

*"I returned to pack. When I returned, the floodwaters were already up to my waist while walking in the streets". [MV9]*

*"When I returned to get our belongings, it was no use. The flood already reached our house. It was impossible to get in." [MV6]*

*"The floodwaters rose in the evening. It was about 3-4 hours when heavy rains fell, around 5pm-9pm. That's when the people panicked and went up the roof to ask for help. There was nowhere to go at that time. The floodwaters raged from 10pm to 2am the next day". [KII2]*

Last minute evacuation was accompanied by heightened risk, at nighttime, through deep flood water, with concurrent risks from strong winds.

*"We had to leave otherwise we might be trapped. It is hard to wade out here in the open because of the power lines that are drooping. Electric poles might also fall because of the strong winds." [MV3]*

*"I was so afraid. I am only five feet. I was close to drowning while walking the streets. It was my son and my husband holding me high, my head up high...My daughter being held by my husband. We saved only some clothes". [MV8]*

*"We noticed that the waters were still rising. We can see the waters rising. In that instance, we decided to move out again. Because if not, we could get trapped. And worse, we have no way out but to swim on floodwaters. So, this is what we did. We went up and walked over the rooftops (bubong) of our neighbors. We walked from one rooftop to another" [MV9]*

Late evacuation also posed a significant challenge for emergency services, with multiple calls all coming in at the same time, at a point that is too late for effective response.

*"This is where the problem usually becomes complicated. Especially when calls come in unison requesting rescue of people and their properties when flashfloods and landslides occur. At that time, people had been advised to move and evacuate. During typhoon Ompong, landslides and flooding incidents were experienced in the afternoon, and often typhoons and flooding are experienced at night. These are the times people get to realize how risky their situation has become. That's the time when all of them wanted to evacuate which is already late" [KII4].*

*"Every time there's heavy rains, the barangay officials go around. I immediately followed and alerted my family". The officials already told us to move"*

*"In every disaster, loss of power or blackouts are unavoidable. What can we resort to, or can be operated without the use of electricity?"*

*"Here in the barangay, we wait for the officials. There is a siren, we live close to it. It sounds off when there's a typhoon. But the reminder comes from the kagawads. The siren sounds off but like us, we move when the kagawads tell us. And sometimes, it's hard to believe when the weather is ok, like when the rains are not that hard"* [MV13].

Source: Chitto Cancio

## 4.4    COMMUNICATION AND DISSEMINATION

Global literature emphasises a connection between inequality and access to early warning communication. There are many examples in different contexts where early warning messages have less effectively reached women[75] and other marginalised groups, directly impacting their chance of survival[76]. Gender inequality in education and literacy levels affects the capacity to receive, understand, and act upon early warning [77, 78, 79,80, 81.] Individuals vary in their access to formal and informal dissemination channels and their communication preferences, with these differences shaped by gender norms and areas of exclusion or inequality[82,83,84].

Access to warning information in the Philippines is affected by gender norms and inequalities. For example, rural poor women often lack devices such as mobiles or radios through which a warning message may be broadcast[85]. Whilst the number of internet users in the Philippines has more than tripled from 23 million in 2010 to 73 million in 2020, there still exists a digital divide due to the lack of digital infrastructure in the country[86]. Roberts and Hernandez[87] expand on this and provide a useful framework for understanding the multidimensional nature of internet and mobile phone access in the Philippines. It is not sufficient to only consider access, given that other factors such as affordability and levels of digital literacy affect whether someone can utilise the mobile phone or internet services available to them. The Philippines also has some of the most expensive internet coverage in South East Asia making it unaffordable for many who are on lower incomes[88].

Consistent with literature on vulnerability, Roberts and Hernandez[89] found that the most digitally marginalised were women, indigenous communities, and low-income families. Digitalization is an attempt to reach more people, but careful consideration should be given to how it could further increase vulnerability to disasters through exclusion and marginalisation based on gender, age, education level, location or socioeconomic status[90].

75      E. Enarson and L. Meyreles, "International perspectives on gender and disaster: differences and possibilities," International Journal of Sociology and Social Policy, vol. 24, no. 10, pp. 49-93, 2004.

76      Global Crisis Response Support Programme (GCRSP), "Good Practices for Gender in Early Warning Systems," [Online]. Available: <https://gcrsp.eu/assets/uploads/Good%20Practices%20in%20EWS.pdf. [Accessed 16 07 2021].

77      G. Kibria, "Why Are Women in Developing Countries More Vulnerable to Climate Change? Climate Change Implications on Women with Reference to Food, Water, Energy, Health, and Disaster Security," ResearchGate, 2016.

78      UNISDR, "Making Disaster Risk Reduction Gender-Sensitive: Policy and Practical Guidelines," UNISDR, UNDP and IUCN, Geneva, 2009.

79,82   S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.

80,83   S. Brown, M. Budimir, A. Sneddon, D. Lau, P. Shakya and S. Crawford, "Gender Transformative Early Warning Systems: Experiences from Nepal and Peru," Practical Action, Rugby, UK, 2019.

81      Gender and Disaster Network, "Women, Gender and Disaster Risk Communication," [Online]. Available: https://www.gdnonline.org/resources/GDN_Gender-Note5_RiskCommunication.pdf. [Accessed 16 07 2021].

84      G. E. S. (Genanet), "Mainstreaming gender into the climate change regime," in Tenth Session of Conference of Parties (COP 10), Buenos Aires, 2004.

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

86,90   Ramboll , "Gender Equality and Social Inclusion Strategy," ASEAN Australia Smart Cities Trust Fund, 2021.

87,88,89  T. Roberts and K. Hernandez, "Digital Access is not Binary: The 5'A's of Technology Access in the Philippines," The Electronic Journal of Information Systems in Developing Countries, vol. 85, no. 4, pp. 1-14, 2019.

According to recent research on the adequacy of EWS across Asia, communication and dissemination in the Philippines scored the lowest out of all EWS components[91]. This was exemplified during Typhoon Haiyan, where evidence suggests that whilst many knew of its imminent landfall, the warning information they received was not in an appropriate language nor was it clear enough to take action[92,93,94,95]. Many of the warnings contained the term "storm surge" which did not accurately convey the severity of the storm across different local languages; where simplified terminology was used (e.g., big waves) people took action and evacuated[96,97].

## 4.4.1   CHANNELS OF WARNING DISSEMINATION

Surveys explored how individuals currently receive early warning. 17% of respondents reported being unaware until the flood was happening, with no early warning.

Of those who do receive early warning, the most common current source of early warning messages for women and men were Community Leaders. For men, the three next most common sources were the media, followed by other members of their households and neighbours. For women, the next three most common current sources were neighbours, local government authorities and then the media.

There were limited gender differences in the current channel through which people receive early warnings. A majority of women and men reported receiving in-person early warning (67% women and 57% men). The next most common methods of currently receiving warning were through TV (47%), then radio, then text message, with only around 10% receiving warning through a loudspeaker or siren.

91    I. Aguirre-Ayerbe, M. Merino, S. Aye, R. Dissanayake, F. Shadiya and C. Lopez, "An evaluation of availability and adequacy of Multi-Hazard Early Warning Systems in Asian countries: A basline study," International Journal of Disaster Risk Reduction, vol. 49, no. 1, pp. 1-11, 2020.

92    Y. Tanaka and A. Nonoguchi, "Case Study on the Philippines and Sri Lanka: Transforming Gender Relations in Disaster Risk Reduction," Japan International Cooperation Agency and Georgetown Institute for Women, Peace and Security, 2016.

93,96   CENDEP with ActionAid Philippines, "Resilience and Recovery after Typhoon Haiyan," ActionAid, 2015.

94    D. Blanco, "Disaster Governance in the Philippines: Issues, Lessons Learned, and Future Directions in the Post-Yolanda Super Typhoon Aftermath," International Journal of Public Administration, vol. 38, no. 10, pp. 743-756, 2015.

95,97   A. Gonzalez Rojas, "Vulnerability Assessment Using Time Series Mapping: A Case Study of Typhoon Haiyan in Tacloban City, Philippines," 2019. [Online]. Available: https://dash.harvard.edu/handle/1/42004236. [Accessed 16 07 2021].
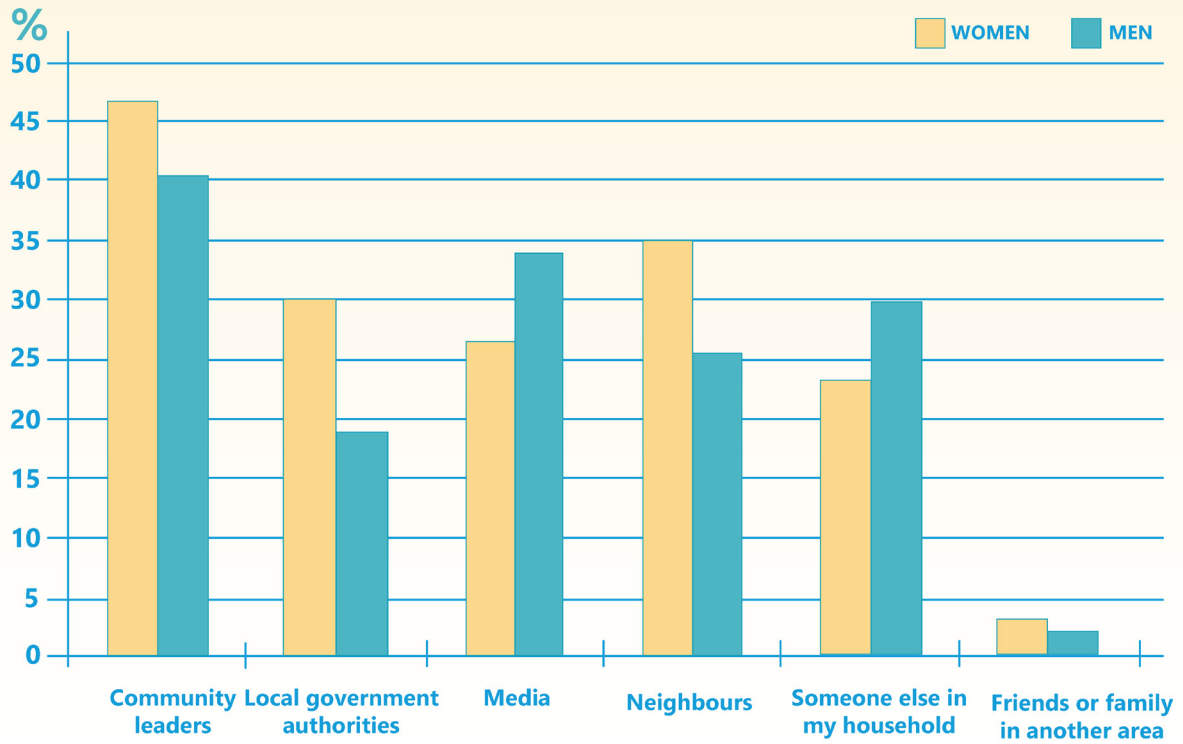
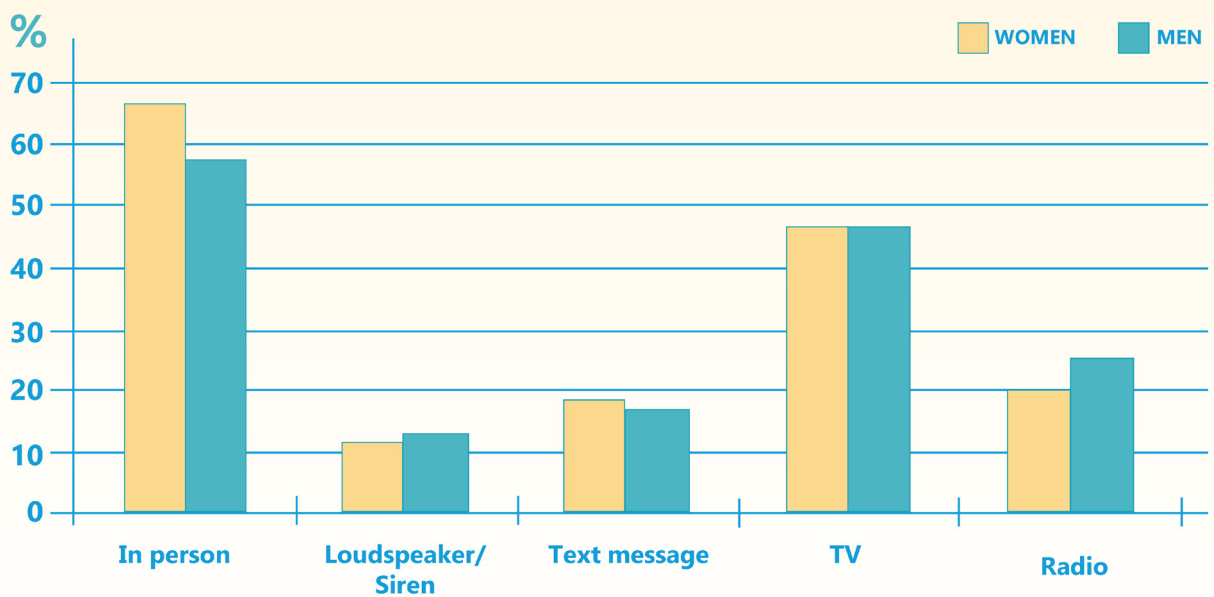**Figure 16: Sources of warning information by gender**



**Figure 17: Channels of early warning by gender**

Only 7 out of 107 people in the survey reported having no source of early warning (a number too small for further statistical analysis of the characteristics of this group).

Amongst the Missing Voices interviewees, people talked about receiving warnings in person from Barangay officials. These warnings seemed to occur at the point of needing to evacuate, and to be focused on simple instructions to evacuate, rather than providing earlier warning or risk education to enable risk-informed early action.

*"Every time there's heavy rains, the barangay officials go around. I immediately followed and alerted my family". The officials already told us to move" [MV12].*

*"There were people from the barangay going around our place the day before. These were the kapitan and the kagawads warning us to evacuate early" [MV13].*

*"The barangay officials have megaphone warning the barangay of the flooding street by street.  They also used siren to alert the barangay. In addition, we do watch TV for weather announcements" [MV10]*

### 4.4.2   PREFERRED AND TRUSTED SOURCES OF INFORMATION

Respondents were also asked what would be their preferred way of receiving early warning. Respondents reported a range of preferred sources of early warning information. Receiving warnings in person from family members or neighbours was the most frequently cited source, with 50% of women and 49% of men saying this is how they would prefer to receive warnings. The second most preferred source for men was also in person, via community organisations (40% compared with 30% of women), while an announcement on TV was more preferred by women (40% compared with 32% of men). SMS from local government and radio announcements were preferred by about a fifth of respondents, with few respondents preferring social media, voice messages, and siren warnings.

Survey respondents were asked which sources of early warning they most trust. Family members are the most trusted source of information for respondents, with 43% of women and 53% of men saying that they trust information received from their relatives. About a quarter of interviewees considered community leaders and local government authorities to be trusted sources of information, with very low reported trust in broadcast media (TV and radio). Around a tenth of respondents (12% of women, 11% of men) did not report any trusted sources of information.

Missing Voices interviewees similarly highlighted willingness to follow guidance from community leaders.

*"What is important is still to follow the barangay officials. Like in our case, we followed immediately so when we got to the evacuation, it was not yet full, we were able to find a place. The siren here is working but it is the officials that people follow"* [MV12].

*"Here in the barangay, we wait for the officials. There is a siren, we live close to it. It sounds off when there's a typhoon. But the reminder comes from the kagawads. The siren sounds off but like us, we move when the kagawads tell us. And sometimes, it's hard to believe when the weather is ok, like when the rains are not that hard"* [MV13].

Key Informants described in-person approaches to early warning communication.

*"As to communication, even in the afternoon before the flood came, the police were already checking the area together with the barangay officials. Megaphones were used to announce that a flood could happen. Aside from the weather bureau, the police were there, we were there, the CDRRMO were there to discuss to the people, the barangay council.  We went house-to-house, especially those living beside the creeks. The people were well-informed"* [KII2].

*"Megaphones were used and were aimed directly at people and houses where people refuse to move. So that all will be aware, and will feel a little ashamed, especially with the megaphones directed at them. That was the strategy used, perhaps in order for the neighbors to watch out or remind for each other. Like, 'hey, you are the only one not moving or preparing'. To the point that one would feel ashamed in not doing anything.  The household is made to feel that they have no choice but obey the authorities"* [KII2].

*"So far now, the early warning system in City Camp Lagoon is supplemented by the house-to-house reminders of the barangay council and the police using megaphones. If it's possible, one barangay should have at least 3 megaphones. We find this going house-to-house effective, especially in reaching all points of the purok. If there is only one used, the roaming around will take a lot of time. So that the house-to-house calls can be done simultaneously"* [KII2].

*"The barangay has public address system. House to house reminders especially in the low-lying areas of the barangay"* [KII6].

Key Informants also talked about alternative dissemination approaches:

*"Lately, unlike before, during the 1990s when the use of cellphones was not common, what we usually do is activate the volunteers from the marginalised sections of the barangay. The social workers conduct a regular monthly capability building. Particularly in potentially-affected barangays. When the use of cellphones became more popular, like texting and social media, giving flood information was tapped this way" [KII3].*

*"(It's important) to explore non-online ways of communicating. Not only the use of cellphone, but also other media platforms like the use of 'radyo' in the provinces (transistor radios)....where we live in the province, the telecoms signal is so weak that (people) still rely on radio as a source of communication. ... The radio is still the main source of communication" [KII5].*

*"The public also learned about the flooding from our official Facebook page where we receive messages, post announcements made by media sources, including government radio stations which give us air time to announce preparations for Ompong" [KII4].*

*"Social media should also be tapped since most people, like all genders, have access to it" [KII2].*

It is worth noting that KIIs mentioned social media much more than survey respondents of MVIs. In the open question on preferred channel of early warning communication, only 2 respondents out of 107 mentioned social media. The survey did not include under 20s, where social media may be more popular, but for the mainstream population, social media did not seem a preferred dissemination method from the quantitative survey.

Key Informants also spoke of the need for redundancies in the dissemination system, due to issues related to infrastructure supporting digital communication:

*"During Typhoon Ompong, there was power shortage. All telecommunications networks such as Smart, Globe and even PLDT was down. We were only able to communicate via radio"[KII1].*

*"In every disaster, loss of power or blackouts are unavoidable. What can we resort to, or can be operated without the use of electricity?" [KII2].*
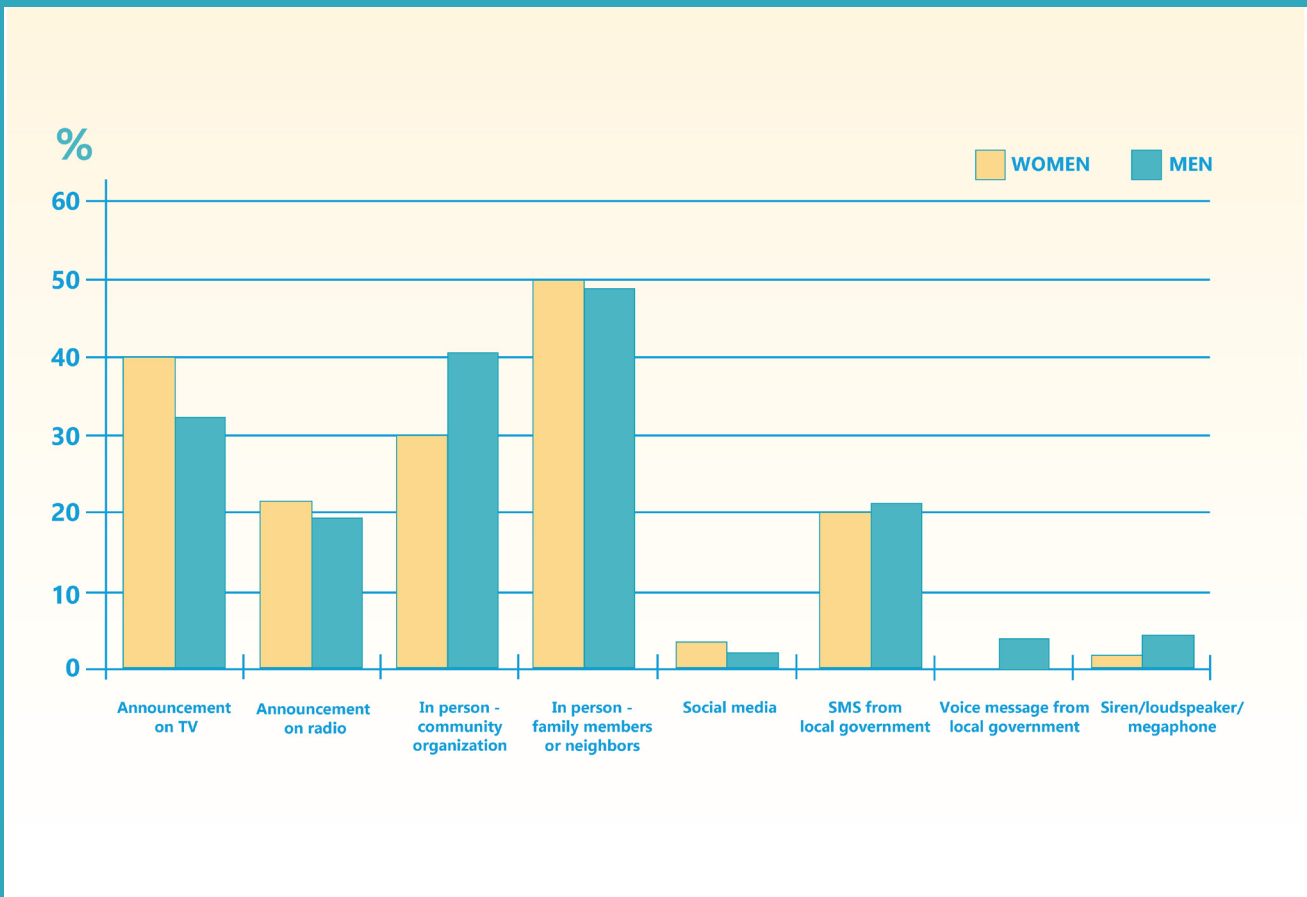
**Figure 18: Preferred sources of early warning information**
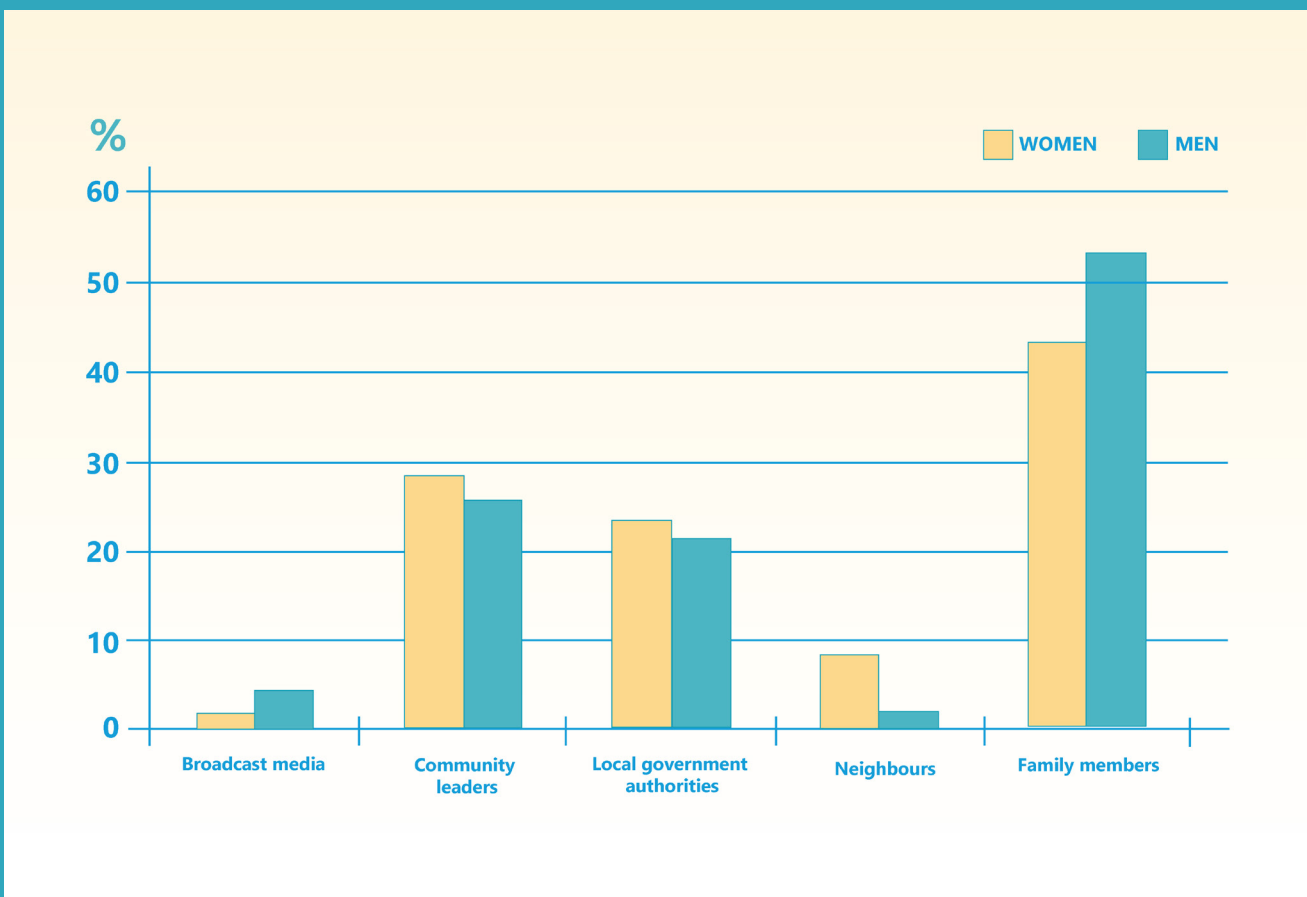


**Figure 19: Trusted sources of information by gender**

### 4.4.3   CONTENT OF WARNING INFORMATION

Survey respondents were asked about their key information needs to improve their ability to take risk-informed early action. The top three information needs respondents identified are: 1) how severe the flood will be; 2) when it will occur; and 3) where it will occur. Slightly more women specified needing to know about the severity of the flood (73% compared with 68% of men), whereas more men mentioned the timing of the flood (81% compared with 62% of women) and the location of the flood (66% of men compared with 48% of women). Knowing where the information is coming from was mentioned by 23% of women and 21% men. Knowing where to go was specified by 30% of men compared with 17% of women.

Key Informant Interviewees spoke about the need to tailor and target early warning messages:

*"There is also a need to 'localize' the language used. Advisories/ early warnings usually come in English or Filipino. It should be localized using the native dialect" [KII1].*

*"There were 2-3 languages used in communicating the information. Like for our indigenous peoples (IPs) like the Muslims, we have also the barangay disaster coordinating council and we are fortunate that there are barangay councillors who are Muslims. The leaders were tapped, also their imams. In the Lower Rock Quarry, there is a mosque for them. So, the leaders were also tapped to inform their fellow Muslims. These are the informal leaders in the community" [KII2].*

*"The use of technical terms makes it difficult for ordinary people to understand...People won't leave the area if they do not understand what storm surge means. More people could be at risk because of this" [KII5].*
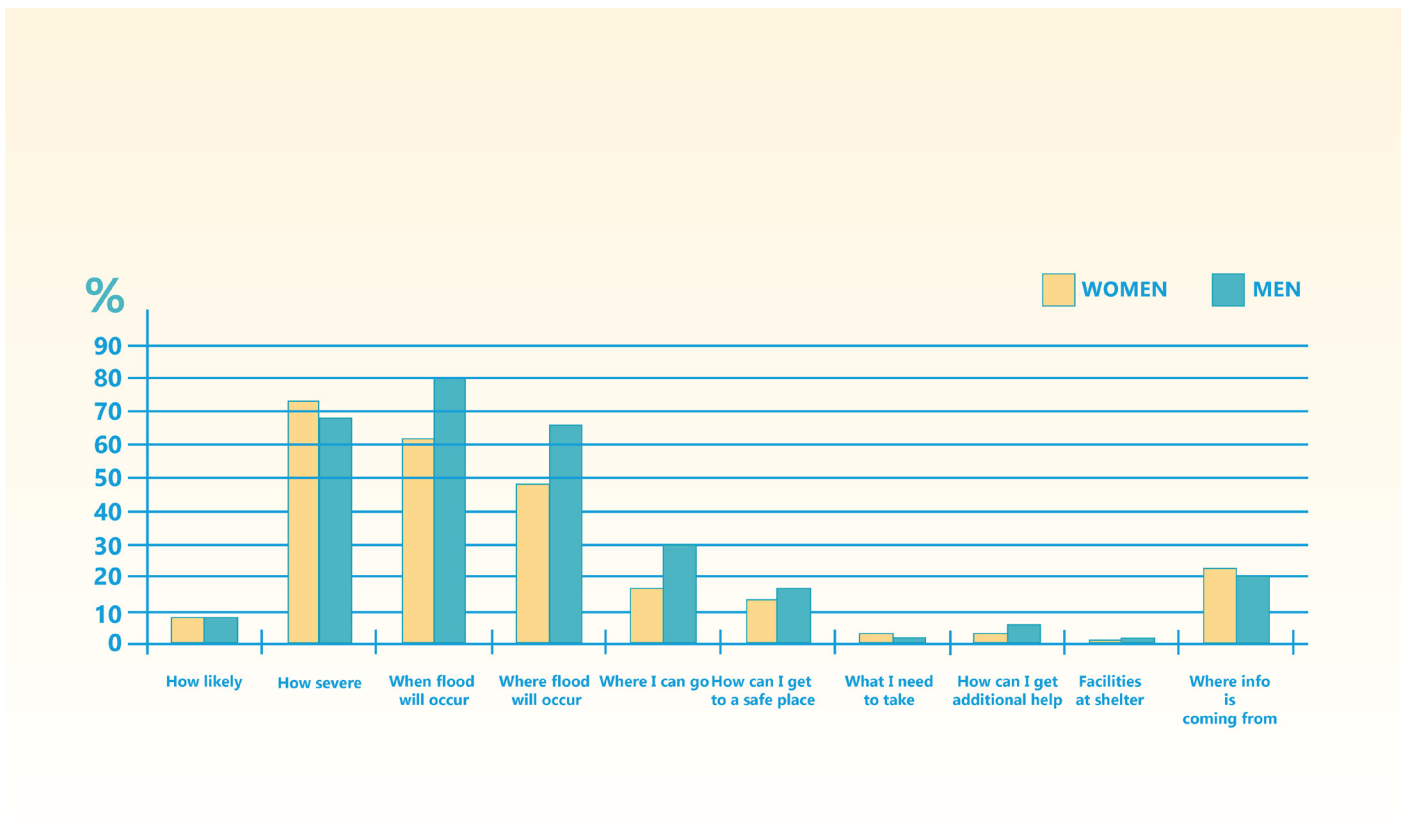
**Figure 20: Information needs by gender**

*"(I will) make sure that our stuff is packed, placed in plastic and we (will) secure these in our second floor. Then I (will) contact my brother-in-law to expect us anytime in case we need to move"*

*"We did not know what to do at first..."*

*"I forgot the flashlight, I forgot the food. Everything. Everything was left behind. All I brought were clothes"*

Source: Chitto Cancio

## 4.5    PREPAREDNESS

Research in countries where gender inequality is less pronounced show women are more likely to receive and act upon warnings, and more likely to be active during emergent community disasters[98,99]. The literature also highlights the under-valued capacities that women and gender minorities can bring, "their resources, skills, capacities, assets, experiences, and hard-won knowledge about how to make life safer and live with risk"[100]. While gendered roles may increase people's vulnerability to disasters, they may also have valuable, but different, knowledge, skills, experience, and coping methods that can be incorporated into disaster preparedness[101].

Global literature has shown that marginalised gender groups are likely to participate less in EWS initiatives due to the demands of domestic roles, lack of autonomy, social isolation and persecution, gendered assumptions, and perceptions that their contributions are not relevant or welcome[102,103]. Such barriers to minority participation in disaster preparedness will need to be considered, ensuring trainings meet the needs and are designed to suit the preferences and access requirements of marginalised populations.

The Philippines is exposed to numerous natural hazards[104], yet a nationwide household survey found that only approximately half of the population take preparedness measures, with previous experience of a disaster being the primary driver of this action[105]. Research suggests that there are significant differences in the roles that gender groups take on during the preparedness phase of a disaster, for example, men are more likely to remain at home to protect property[106].

98    M. Fordham, "Challenging Boundaries: A Gender Perspective on Early Warning in Disaster and Environment Management," 2001. [Online]. Available: https://www.unisdr.org/we/inform/publications/8264. [Accessed 16 07 2021].

99    UNISDR, "Making Disaster Risk Reduction Gender-Sensitive: Policy and Practical Guidelines," UNISDR, UNDP and IUCN, Geneva, 2009.

100    E. Enarson and L. Meyreles, "International perspectives on gender and disaster: differences and possibilities," International Journal of Sociology and Social Policy, vol. 24, no. 10, pp. 49-93, 2004.

101    S. Kratzer and V. Le Masson, "10 things to know: Gender equality and achieving climate goals," Climate and Development Knowledge Network (CDKN), 2016.

102    S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.

103    S. Brown, M. Budimir, A. Sneddon, D. Lau, P. Shakya and S. Crawford, "Gender Transformative Early Warning Systems: Experiences from Nepal and Peru," Practical Action, Rugby, UK, 2019.

104    A. Brucal, 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, 2020.105

105    V. Bollettino, T. Alcayna, K. Enriquez and P. Vinck, "Perceptions of disaster resilience and preparedness in the Philippines," Program on Resilient Cities and Harvard Humanitarian Initiative, 2018.

106    Y. Tanaka and A. Nonoguchi, "Case Study on the Philippines and Sri Lanka: Transforming Gender Relations in Disaster Risk Reduction," Japan International Cooperation Agency and Georgetown Institute for Women, Peace and Security, 2016.

Consistent with global literature, evidence from the Philippines shows that the participation of marginalised groups in disaster preparedness activities or training is limited[107,108,109]. This is particularly pronounced when people experience intersecting axes of marginalisation, such as women from religious minorities or indigenous groups[110]. Surveyed Disaster Risk Managers from poorer regions of the Philippines expressed the lowest preparedness levels[111].

In Baguio city, what is referred to as 'family and community disaster preparedness training' in flood-prone areas is provided yearly, according to disaster management and social welfare development staff. The training includes basic life support, elements of a disaster management plan and procedures such as how to execute rescue operations, and how to evacuate. Participation rates vary, suggesting that some groups in the community are not able to access this training, especially those constrained by work, domestic and care duties at home, and disability.

It should be noted that training conducted by the Philippines Red Cross were actually attended mainly by women and the elderly because the workshops took place during the day whilst men were at work and children at school[112]. This serves to demonstrate that disaster preparedness activities can be designed according to access, availability and needs of different marginalised groups to facilitate and support participation into preparedness and planning activities.

### 4.5.1  ACCESS TO TRAINING AND PREPAREDNESS INFORMATION

The survey examined the extent to which respondents had received training or guidance on flood preparedness. 62% of respondents (65% women and 57% men) reported having received some kind of advice about how to prepare for a flood, with gender not being statistically significant (QD6). A third of respondents reported community leaders as a key source of preparedness advice, with family members the second most common source (gender was not statistically significant (QD7)).

Respondents were asked about what types of preparedness advice they had been given. The examples shared slanted towards last minute actions to be taken just before or in the early stages of a flood, with limited considerations of earlier action to reduce risk or ensure effective timely response. 48% of respondents had not received any preparedness advice other than generic advice to evacuate if a flood

107    V. Bollettino, T. Alcayna, K. Enriquez and P. Vinck, "Perceptions of disaster resilience and preparedness in the Philippines," Program on Resilient Cities and Harvard Humanitarian Initiative, 2018.

108 ,110    I. Abarquez and N. Parreño, "Review of Gender Equality in Disaster Risk Reduction and Management," World Bank, Metro Manila, 2014.

109    Y. Tanaka and A. Nonoguchi, "Case Study on the Philippines and Sri Lanka: Transforming Gender Relations in Disaster Risk Reduction," Japan International Cooperation Agency and Georgetown Institute for Women, Peace and Security, 2016.

111    A. Brucal, 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.

112    International Federation of Red Cross and Red Crescent Societies (IFRC), "A practical guide to gender-sensitive approaches for disaster management," IFRC, 2012.

occurred (gender was not a statistically relevant factor).

Evacuation was the most common response to a flood event for women and men. More men than women said that they evacuated, monitored the news for updates, moved valuables to a safe place in the home, and shut of electricity to the home, whereas more women than men said they prepared an emergency bag. Notably, very few respondents said that they made efforts to keep important documents safe, in spite of this being mentioned as a significant piece of advice received. While no men reported being advised to protect the home from damage, almost as many men as women reported taking this action (chiming with Missing Voices insights that showed women and children were more likely to evacuate early, with men more likely to stay at home and evacuating later). The most commonly reported preparedness advice was to keep important documents safe and to prepare an emergency bag.

A number of Missing Voices interviewees referred to taking steps to secure key documents, although the majority described taking such actions last minute, immediately before the moment of evacuation. A few interviewees had learnt from past experience and were committed to proactive preparedness actions in advance of needing to evacuate:

*"(I will) make sure that our stuff is packed, placed in plastic and we (will) secure these in our second floor. Then I (will) contact my brother-in-law to expect us anytime in case we need to move" [MV7].*

Only a small number of Missing Voices interviewees referred to taking action in advance of an emergency situation:

*"We were also listening to the radio before that so we were preparing even before the officials came. What I usually do, especially during the rainy season, our bags are already packed. Our blankets, food that can be easily opened, water bottles, and medicines" [MVI16].*

*"Once it's rainy season, we ready some of our stuff by placing them in plastic bags – some clothes, documents. This is what we're used to now. We keep some clothes, goods, documents in plastic to be sure. Then once we're alerted with an incoming typhoon, we go to the supermarket to buy those big black garbage bags" (MV8).*

## 4.5.2   INADEQUATE PREPARATION DIRECTLY AFFECTS RESPONSE CAPABILITIES

Many of the challenges raised in MV interviews could be linked to inadequate or infrequent training to plan, prepare and practice what to do when they receive a warning. Multiple respondents spoke about panicked responses to warnings or to flood waters entering their home:

*"I forgot the flashlight, I forgot the food. Everything. Everything was left behind. All I brought were clothes" (MV9).*

*"We were still packing our clothes upstairs but the waters were reaching the bottom of the stairs" (MV7).*

*"We did not know what to do at first..." (MV11).*

Key informants mentioned individuals asking where to evacuate once flooding was already underway:

*"(When a) flood is coming. Sometimes they come directly to use to ask where to evacuate" [KII7].*

Key Informants spoke of some existing training, and MV interviewees highlighted keenness to receive further training:

*"The CDRRMO works in close coordination with other responding offices and the barangays and communication lines have been established. We have well-trained personnel who are being tapped to provide disaster preparedness training to requesting entities / sectors and even especially down to the vulnerable sectors at the barangay level" [KII1].*

*"The training is on basic life support, how to execute a disaster plan, how to evacuate. Every year we do that. Part of the training for volunteers, we have measures or protocols on the vulnerable groups to rescue first during disasters, how to handle them with sensitivity, how to dislodge elderly people, those in wheelchairs, and pregnant women. We have volunteers and informal leaders identified who undergo this training" [KII2].*

*"Yes, I know this training. I've attended it already. The CDRRMO gives it, together with the Red Cross. I like attending trainings like this. But it was a long time ago. Anything that will be good for us, I will attend". [MV9]*

Survey respondents were asked what they would do differently in a future flood. Significantly more men than women referred to evacuation when thinking about what they would do differently in a future flood event (53% compared with 40%). Other actions were highlighted fairly equally across genders, including preparing a bag in advance, securing the home and protecting possessions, and securing important documents.
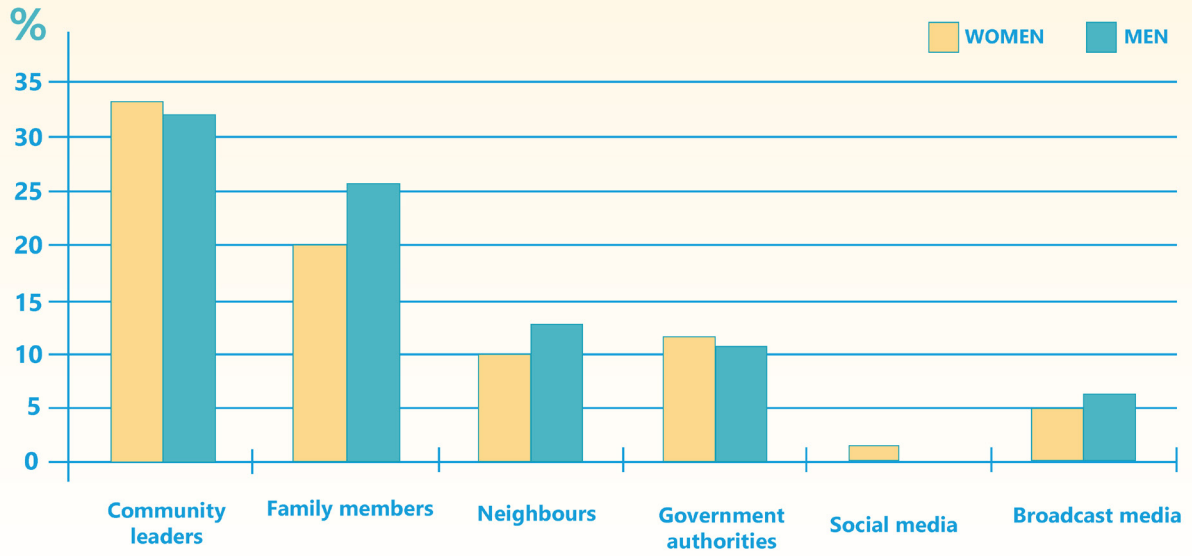
**Figure 21: Sources of preparedness advice**
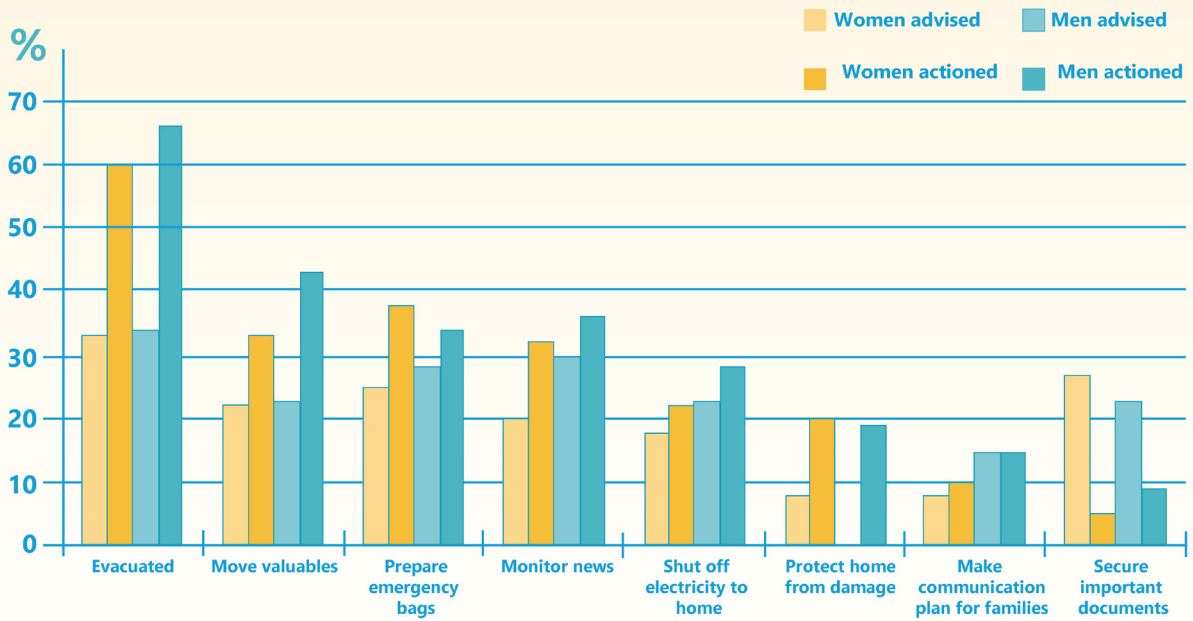


**Figure 22:  Actions advised and action taken in response to flood**

### 4.5.3  BARRIERS TO ACTIONS

Respondents reported a number of barriers which would make it difficult for them to take the actions they would want to in a future flood event. A lack of access to risk information was key for women and men, with 30% of women and 26% of men highlighting this barrier. Caring responsibilities was also significant, with 23% of men and 20% of women saying this would make it hard for them to take different actions. Fear of a lack of safety during evacuation or while in temporary shelters was only mentioned by seven respondents (6% of the total sample), making it difficult to draw any conclusions about this barrier.

Issues related to caring responsibilities and lack of access to understandable risk information were highlighted in a majority of Missing Voices interviews. Caring responsibilities affected the process of evacuation, what people could bring with them, what people could save and their experience in temporary shelter (see sections on evacuation and evacuation facilities). A lack of access to risk information, or a lack of understanding of the risk information that they did receive, cut across a number of Missing Voices interviews (see section on Risk Knowledge).

Key Informants also spoke about barriers to early action that related to Risk Information. Key informants spoke of frustration in people ignoring instructions to evacuate and perceived this as being linked to a lack of trust in those warnings. Analysis of the other results suggests the problem may be less linked to trust in who is delivering the message (community officials seemed well trusted), and more related to wider aspects of risk knowledge. The current emphasis seemed to be on communicating directives to evacuate, without people understanding the risks they were facing, without people understanding their window of opportunity for safe evacuation, and without understanding of decision making under uncertainty.

Preparedness plans need to proactively address the barriers that will prevent individuals from taking effective early action in response to an early warning.
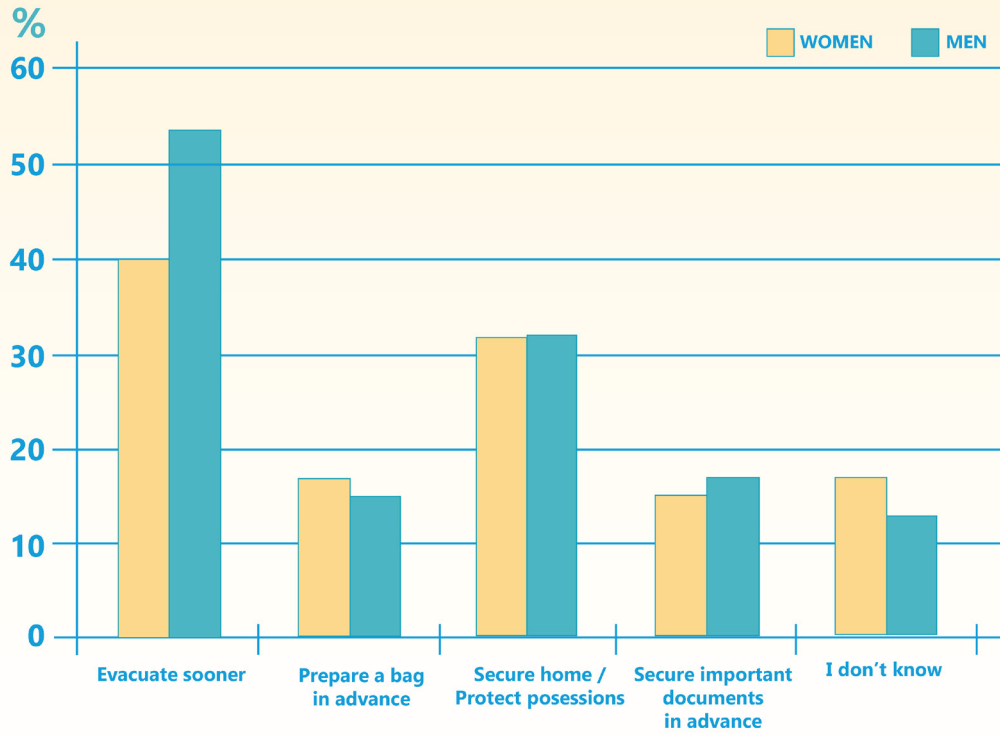
**Figure 23: Actions respondents would take in a future flood event**
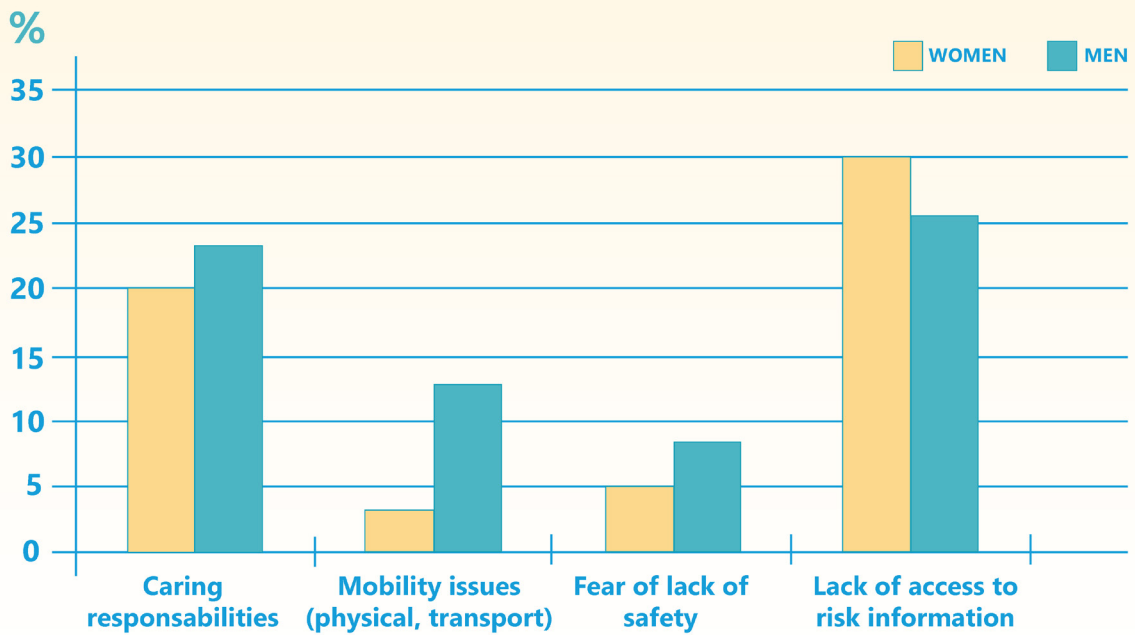


**Figure 24:  Barriers to taking preferred actions by gender**

"I still returned to the house to get our stock of rice. I did not mind that I was pregnant. I realized it's important to have rice to cook, even in the evacuation centre"

"It was a commotion. My children were crying. I handed them first to one of my nieces, then I had to rush back to the house to pack. I was scared for them, and they were also scared for me"

"The road that we were passing by was a bit frightening because it was so narrow. It's like a small alleyway. We had to feel through our feet and make sure that we are passing through its cemented section. Because there could be cracks or holes. The road was already flooded"

Source: Asian Development Bank

## 4.6   EVACUATION

Global literature highlights gendered dimensions of evacuation. In contexts where women fulfil a majority of domestic and caring roles women are more likely to be at home, taking a lead role in evacuating children or other vulnerable household members. Other gendered dimensions of evacuation can include traditional dress restricting movement; marginalised groups having lower levels of nourishment, which undermines physical ability to respond to emergency situations; gendered differences in ability to swim and climb trees; cultural or religious restrictions on women's mobility and gendered power dynamics over decision making [113,114]. Groups with higher vulnerability have different preferences and capacities to prepare and respond, including a preference for earlier evacuation[115,116]. Response plans may not be designed according to the needs, capabilities, and preferences of vulnerable groups. Women and men traditionally have distinct roles in response, though changing mobility patterns mean women increasingly need to cover a wider range of roles.

The gendering of roles in evacuation in the Philippines has been found to also impact when men and women evacuate[117]. These roles were location-specific – in the coastal areas the whole family prepared the home before evacuating together, in the inland areas the study found some women took on this perceived traditional role, whereas in other contexts, this was assigned as the man's role[118]. In the cases where women evacuated first, they took on the caring role of the children to get to the evacuation shelters; the reasons given for this varied between respondents – in some cases women reported this was personal choice to evacuate earlier due to preference to reduce risks to themselves and their children, in others cases it was reported it was the man's role to secure the home[119]. Whilst the patterns of behavior vary, this is consistent with findings from the global literature which highlight the need to understand the local context and take different preferences for timing of evacuation, and gendered roles in evacuating into account. Evidence from the Philippines suggests that during Typhoon Haiyan, many men and older boys from lower socioeconomic backgrounds decided not to evacuate so that they could safeguard their possessions and home, but this decision ultimately resulted in many unnecessary deaths[120].

113      R. MacDonald, "How women were affected by the tsunami: A perspective from Oxfam," PLoS Med, vol. 2, no. 6, pp. 474-475, 2005.

114      D. Guha-Sapir, L. Parry, O. Degomme, P. Joshi and J. Saulina Arnold, "Risk factors for mortality and injury: post-tsunami epidemiological findings from Tamil Nadu," CENTRE FOR RESEARCH ON THE EPIDEMIOLOGY OF DISASTERS (CRED), 2006.

115      S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.

116      S. Brown, M. Budimir, A. Sneddon, D. Lau, P. Shakya and S. Crawford, "Gender Transformative Early Warning Systems: Experiences from Nepal and Peru," Practical Action, Rugby, UK, 2019.

117,118,119  Y. Tanaka and A. Nonoguchi, "Case Study on the Philippines and Sri Lanka: Transforming Gender Relations in Disaster Risk Reduction," Japan International Cooperation Agency and Georgetown Institute for Women, Peace and Security, 2016.

120      P. Eadie, M. Atienza and M. Tan-Mullins, "Livelihood and vulnerability in the wake of Typhoon Yolanda: lessons of community and resilience," Natural Hazards, vol. 103, no. 1, pp. 211-230, 2020.

The national literature suggests that gender minorities may be reluctant to evacuate based on their everyday experience of marginalisation: "the general reluctance of (sexual and gender minorities) to stay in temporary shelters during evacuation for the fear of facing discrimination and sexual harassment tells us much about the current plight of sexual and other gender minorities in the Philippines"[121]. Discrimination and safety were listed as two of the main concerns for transsexual persons in public spaces in the Philippines, as well as the freedom and ability to express one's gender[122]. This goes some way in suggesting why people may not feel they are able to safely move to-, and stay in evacuation centres.

In terms of discrimination, harassment and gender-based violence, global literature shows that marginalised and vulnerable groups are at a higher risk during and after a disaster[123,124]. Gender-based violence is not a direct result of a disaster itself, rather it catalyzes a breakdown in social order and allows existing inequalities to become intensified[125]. From a DRR perspective, as well as the obvious violations of the rights of women, girls, and gender minorities, this can increase vulnerability by delaying evacuation, especially at night, and increasing fear, stress, and trauma during evacuation. Fears regarding safety can reduce the effectiveness of EWS for the most marginalised, dis-incentivizing evacuation.

Sexual and gender-based violence has been found to increase in the aftermath of a disaster in the Philippines[126]. This is influenced by a history of colonialism and a predominant culture of religious and social conservatism, reinforcing patriarchal dominance[127,128,129].

In the aftermath of Typhoon Haiyan, the incidence of gender-based violence rose and was exacerbated by overcrowding of evacuation centres, resulting in a lack privacy and security[130]. The Typhoon also increased the flow of displaced people to larger cities, placing an unaccounted-for burden on urban services and facilities[131].

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121    J. Gaillard, K. Sanz, B. Balgos, S. Dalisay, A. Gorman-Murray, F. Smith and V. Toelupe, "Beyond men and women: a critical perspective on gender and disaster," Disasters, vol. 41, no. 3, pp. 429-447, 2017.

122    N. Katjasunkana and S. Wieringa, "Women-loving-women in Africa and Asia," Riek Stienstra Fund, 2011.

123    S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.

124    S. Brown, M. Budimir, A. Sneddon, D. Lau, P. Shakya and S. Crawford, "Gender Transformative Early Warning Systems: Experiences from Nepal and Peru," Practical Action, Rugby, UK, 2019.

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

126,128    M. Tanyag, "Resilience, Female Altruism, and Bodily Autonomy: Disaster-Induced Displacement in Post-Haiyan Phillipines," Journal of Women in Culture and Society, vol. 43, no. 3, pp. 564-585, 2018.

127    H. Nguyen, "Gendered Vulnerabilities in Times of Natural Disasters: Male-to-Female Violence in the Philippines in the Aftermath of Super Typhoon Haiyan," Violence Against Women, vol. 25, no. 4, pp. 421-440, 2018.

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

130,131    Protection Cluster, UNFPA and UNICEF, "Preventing Gender-Based Violence After Typhoon Yolanda; Responding to Survivors' Needs," 2013. [Online]. Available: https://reliefweb.int/report/philippines/preventing-gender-based-violence-after-typhoon-yolanda-responding-survivors-needs. [Accessed 16 07 2021].

132,133    A. McSherry, E. Manalastas, J. Gaillard and S. M. Dalisay, "From Deviant to Bakla, Strong to Stronger: Mainstreaming Sexual and Gender Minorities into Disaster Risk Reduction in the Philippines," Forum for Development Studies, vol. 42, no. 1, pp. 27-40, 2015.

The experiences of gender minorities and marginalised groups during evacuation in the Philippines mirrors the findings from the global literature. For example, there is evidence that the LGBTIQ+ community experience discrimination and at times sexual harassment when evacuated to crowded facilities[132]. Additionally, having to present identification documents upon arrival at evacuation centres proved difficult for some gender minorities where they could not update their identification documents; this has resulted in ridicule as well as the fear that if they do not provide identification documents, that they will not be granted access to the centres of relief materials[133].

### 4.6.1  ASSISTANCE DURING EVACUATION

Key informants spoke about the ways in which marginalised groups, especially pregnant women, elderly people and people with disabilities are targeted for additional assistance during evacuation:

*"On the elderly and PWDs, we actually strategized, during with the CDRRMO and the barangay, to prioritize the senior citizens, those in wheelchairs. Just in case people will start to converge inside the evacuation centre, we made sure that the elderly and PWDs are also secured in their assigned locations, and are with their families. That their tents are already set-up. So far, there has not been any issues. One good thing that we did was, all police stations in Baguio, more than 10 stations, helped ferry people to the evacuation centre" [KII2].*

*"There were groups who found it difficult to respond. One of these are pregnant women. Even when you're evacuating them, they are thinking of other things like 'what if I give birth there in the evacuation centre?' Although none so far, from our profile of then pregnant women, gave birth during that day. There were women who were 7-8 months pregnant. This was really the vulnerable group that Social Welfare personnel monitored closely. They could give birth anytime due to stress" [KII2].*

*Survey respondents were asked about their experiences of evacuation. In total, 63% of respondents reported evacuating in response to flooding (60% of women and 66% of men).*

From those who evacuated, 35% of women and 26% of men received assistance from outside of their own household, with examples including help to pack emergency items, information about what to do or where to go, or transport or mobility support. Women were more likely to receive support from community organisations and neighbours or relatives, while more men received support from government authorities. This may indicate the importance of connections to formal and informal social support networks in supporting people to respond to floods.

### 4.6.2  CHALLENGES DURING EVACUATION

Participants were asked to rate the ease of evacuation on a scale of one to five, with one indicating that evacuation was very difficult, and five indicating that it was very easy. On average, respondents scored the ease of evacuation as being quite easy (3.66 out of 5), with women on average finding the evacuation slightly easier than men (QD8b).

Figure 26 illustrates the distribution of respondents along the scale. The distribution reflects the finding above that while more men than women found evacuation challenging, women who did experience problems reported more severe problems, as illustrated by the higher representation of women at the higher end (level 5) of the scale.

Within a survey question on flood related experiences, 6% of evacuees specifically mentioned the evacuation route being difficult, including 3% of men and 8% of women. A larger number of Missing Voices interviewees focused on their experiences of precarious evacuations.

*"The road that we were passing by was a bit frightening because it was so narrow. It's like a small alleyway. We had to feel through our feet and make sure that we are passing through its cemented section. Because there could be cracks or holes. The road was already flooded" [MV13].*

*"It was not just us who went from rooftop to rooftop. We were joined by many others. We had no choice. … (we) had no choice but tear this fence down without getting permission… just for us to cross over. Because if we will go around, it's no use. The flood was already high and it was all around. … So, we crossed over that fence. It's good that my children were okay during that ordeal. They were coming up to me, saying 'Mama, mama' with frightened voices. But I told them no, to not cry. I made sure they crossed over safely first. My neighbours helped us get over the fence. The men were holding us, helping us as we crossed over. One by one" [MV9].*

Women commented on the steep elevated path to the evacuation centre, how difficult it is it to carry food and clothes up that route to the evacuation centre. Some thought they would have help from soldiers on the way there, but would not have any help on the return journey, a consideration that deterred them from evacuating until flooding was certain, which in practice meant delaying evacuation until flooding was underway.

A number of women discussed evacuating first with their children, but being unable to carry any belongings, clothing or food when evacuating their children.
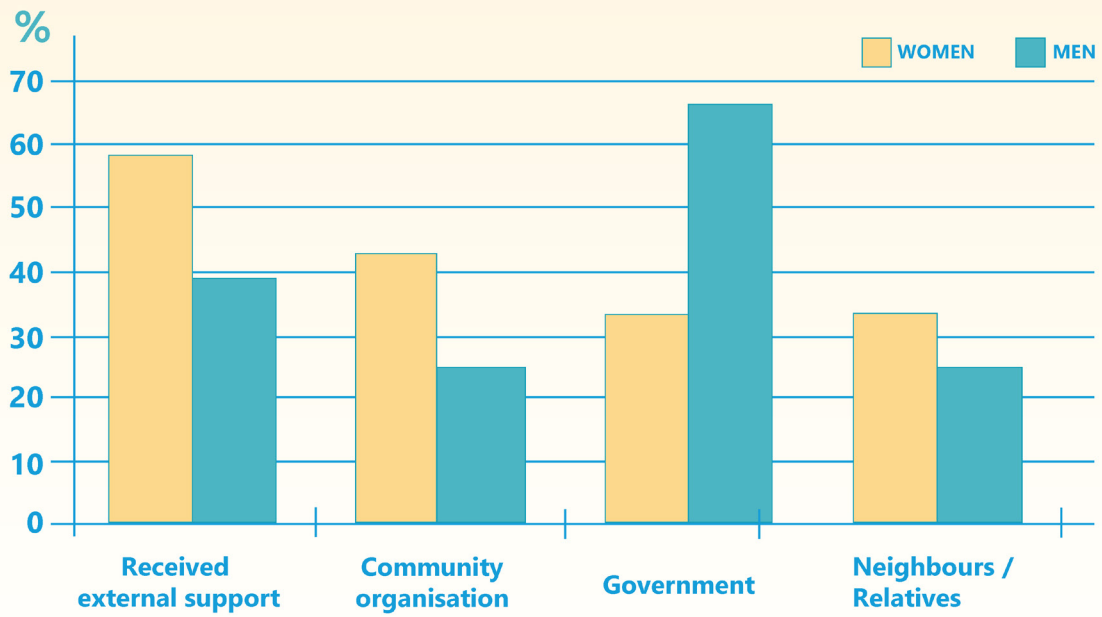
**Figure 25: Source of external support by gender**
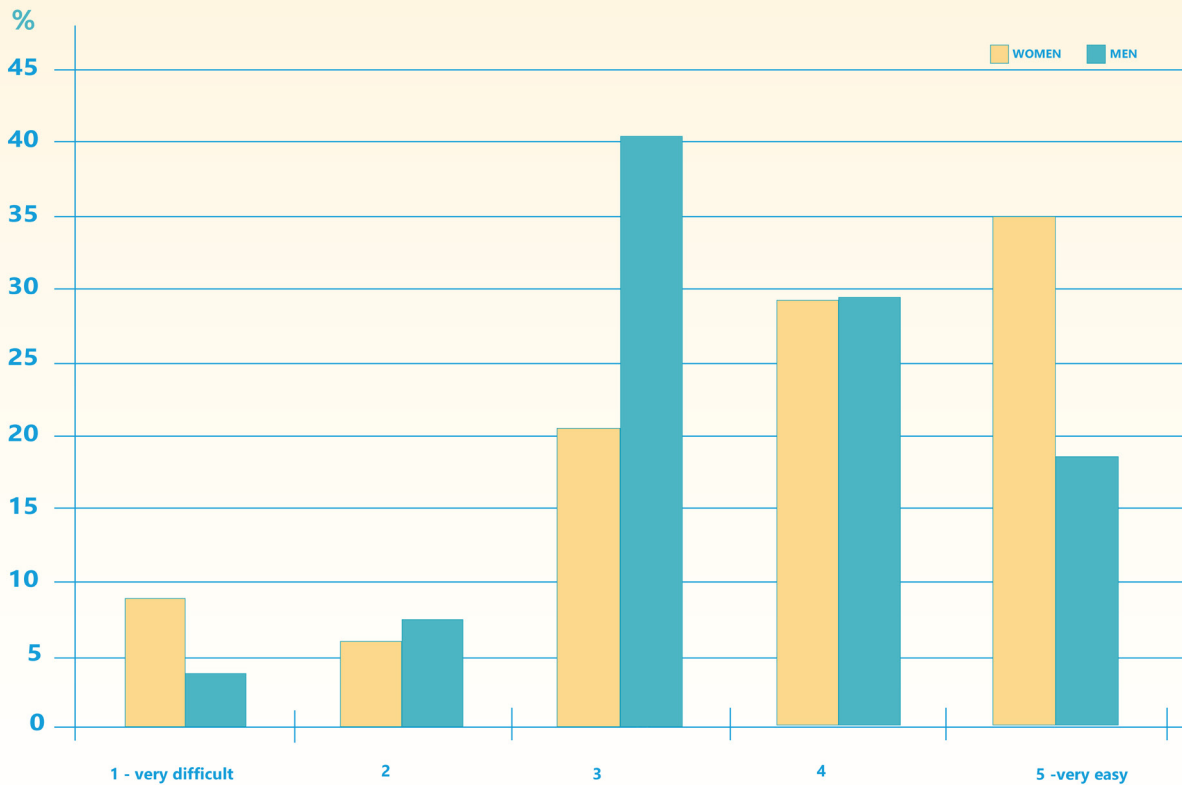


**Figure 26: Ease of evacuation by gender**

*"My eldest at that time was only 9, and my youngest was 6. I was only able to bring clothes and cooking utensils. It was not possible to bring other stuff because I was all alone, my husband was not here" [MV13].*

Women discussed returning to their house to collect essentials before evacuating a second time, with this second evacuation taking place under worse and higher risk conditions.

*"Initially, when I left with my children, the flood was only knee-high. But when I returned to get our belongings, it was no use. The flood already reached our house. It was impossible to get in" [MV6].*

*"It was a commotion. My children were crying. I handed them first to one of my nieces, then I had to rush back to the house to pack. I was scared for them, and they were also scared for me" [MV13]*

*"I returned to pack. When I returned, the floodwaters were already up to my waist while walking in the streets" [MV9].*

Food, clothing and critical supplies for cooking and sleeping were what women returned to their houses for, having been unable to evacuate with supplies whilst evacuating their children.

*"I still returned to the house to get our stock of rice. I did not mind that I was pregnant. I realized it's important to have rice to cook, even in the evacuation centre" [MV6].*

*"The waters rose very fast. We were still packing our clothes upstairs but the waters were reaching the bottom of the stairs" [MV7].*

It was not clear that current response plans took into consideration people making two evacuation trips.

Respondents were asked what they would want to do differently if another flood were to occur. The most common response from women and men was regarding evacuation: respondents who evacuated said that they would evacuate sooner (70%); a small number said that they would evacuate to a different place (9%), and some respondents who did not evacuate said that they would evacuate in the future (23%).

4.6.3    Barriers to deciding to evacuate

A number of barriers to prompt evacuation were noted, including fear of discrimination, inadequate facilities, closed facilities, and concerns over safety of belongings left behind.

This point was reinforced by Key Informants:

*"It is in evacuation when gender inequality and discrimination is experienced" [KII5].*

Past negative experiences in evacuation centres directly affected peoples' willingness to evacuate early.

*"I just felt that I was following my mother to feel safe....Hygiene was the most challenging... We do not follow our neighbors who leave early... we wait for the waters to come...My experience as a girl influenced me somehow. If my family can avoid staying in the evacuation center, then we avoid"* [MV2].

Other barriers to timely evacuation related to a mismatch between when individuals wanted to evacuate, and when evacuation facilities were prepared to receive them. Some interviewees had wanted to evacuate earlier, but found officials did not want to open evacuation centres until flooding was underway. This approach particularly did not suite single caregivers who were evacuating with children, especially those with additional vulnerabilities, including those who would need to take two or more trips.

*"But what happens here sometimes is that they do not allow us to evacuate in the barangay. Like, we have to get flooded first before they open the doors to the barangay. That's how it is here. Like, people should be in a state of panic before they allow us to evacuate. Like with what happened to us, we did not evacuate before the flood because we were told that the barangay hall has this event and it cannot be used by us to evacuate....we got flooded and we had nowhere else to go"* [MV7].

Other barriers related to people wanting to protect their house and their assets, fearing early evacuation would leave them vulnerable to looters. To protect their possessions, some families chose to split up, sending children ahead to the evacuation centre first, to be left under the care of other youths or extended family, whilst parents stayed in their home.

*"In earlier flood events, although warning has been communicated, people were hard to convince. They were hesitant to leave their properties...The barrier here is not only people refusing to leave their homes. There was also the fear of looting"* [KII4].

*"For others who are hard-headed, like the family heads. Of course, they cannot bring all their belongings to the evacuation centre, properties like appliances. We were really strict in informing them. We told them that even pets were not allowed in the evacuation centre. There were families who have pets left behind. This is also one of the reasons why family heads keep on coming back to their houses. Even for livestock animals like chickens. For these people, they know the risks of coming back and staying on. But then, they could not leave behind their properties, their pets and livestock"* [KII2].

*"There are cases where women's livelihood are located inside their homes. There is a hesitance also to leave the place because of what they have invested in these livelihoods"* [KII5].

*"Some of the marginalised families are focused on their economic undertaking. If they don't work, they don't eat. (They hear that a typhoon is coming), but they opted to give more importance to their economic undertaking. The marginalised group that often works in the market – they are the ones who react this way"* [KII3].

*"There were so many people (in the evacuation centre). But I am not used to so many people. ...he told me that there's a place there to stay in the church where the children could be safe. So, we went"*

*"I had two children who needed milk, but milk was in short supply. When the milk ran out, I had no choice but to feed my little ones with coffee, for them to have something warm"*

*"There are cases where women's livelihood are located inside their homes. There is a hesitance also to leave the place because of what they have invested in these livelihoods"*

## 4.7    EVACUATION FACILITIES

Global literature has shown across diverse contexts that marginalised and minority groups face harassment in evacuation shelters[134,135]. Discrimination and violence can leave stigmatised minorities at risk in camps and shelters, pushing individuals into more vulnerable coping strategies (e.g. LGBTIQ+ individuals, particularly youth, living homeless in cities rather than going to camps, or individuals with albinism being too unsafe to consider staying in a camp, as is the case in Malawi)][136,137].

Once in evacuation centres, national research in the Philippines suggests that women and gender minorities do not have their basic needs met, with relief materials often being distributed to men[138]. In particular, women's specific material needs (e.g. provision of menstrual products) and the needs of those directly under their care (e.g. food or milk for children) are not accounted for in traditional head of household approaches to relief distribution[139]. Similarly, the needs of other sexual and gender minorities are not adequately met in evacuation facilities with cases of exclusion from the distribution of relief materials, resulting in an inadequate supply of food[140]. Furthermore, transgender and gender diverse people have additional concerns over privacy and safety when using toilet facilities in evacuation centres due to fear of sexual harassment, and intimidation and discrimination[141].

### 4.7.1   TYPES OF FACILITIES

The vast majority of survey respondents who evacuated said that they knew where to go (91%). The majority of survey respondents who evacuated went to an official temporary shelter, with a gendered difference observed (70% of women who evacuated compared with 65% of men), while other respondents went to stay with friends or family.

Participants were asked to rate how far their needs were met in their temporary shelters, whether they evacuated to official shelters or to stay with friends or family, on a scale of one to five, with one indicating that their needs were not met at all, and five indicating that their needs were met fully. Overall, respondents reported that their needs were met quite well, with women reporting a slightly higher average score than men (QD9).

The analysis also found that respondents who evacuated to stay with family or friends were more satisfied that their needs were met than those who evacuated to an official temporary shelter, with an average score of 4.42 compared with 3.85.

134,136    S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.

135,137    S. Brown, M. Budimir, A. Sneddon, D. Lau, P. Shakya and S. Crawford, "Gender Transformative Early Warning Systems: Experiences from Nepal and Peru," Practical Action, Rugby, UK, 2019.

138,139    Asia-Pacific Economic Cooperation, "The study on "Women in Times of Disaster": The Integration of Gender Issues and Gender Perspectives in Disaster Management," APEC, 2009.

140,141    J. Gaillard, K. Sanz, B. Balgos, S. Dalisay, A. Gorman-Murray, F. Smith and V. Toelupe, "Beyond men and women: a critical perspective on gender and disaster," Disasters, vol. 41, no. 3, pp. 429-447, 2017.

## 4.7.2   EXPERIENCES IN EVACUATION SHELTERS

Around a third of evacuees experienced problems during evacuation or while in temporary shelter. A slightly higher proportion of men experienced problems (35% of men and 28% of women). From amongst those reporting problems, women reported double the number of problems (QD9).

Respondents reported a range of problems experienced at temporary shelter facilities, with significant gendered gaps. Notably, lack of toilet and washing facilities, insufficient provision of food or cooking facilities, and insufficient lighting were reported to a greater extent by women than men. Women also reported a lack of places to sleep more than men, while slightly more men reported a lack of privacy.

A number of Missing Voices interviewees mentioned difficulties sleeping on cold hard floors, with additional worries about relatives or children who were sick or with chronic health conditions. Several people returned through flood waters for mattresses or blankets to provide some basic level of comfort and ability to stay healthy and rested. People also returned for basic cooking implements, to enable cooking of rice, or to top up inadequate relief supplies:

*"I asked one of my daughters to collect cooking bowls from our house so that we can cook rice. We were given canned goods and we ate them on top of the rice. To get cooking stuff, we had no choice but to wade into the floodwaters" [MV7].*

Some interviewees reported avoiding the evacuation centre as it did not meet their needs, particularly their need for early evacuation or their need for a safe space for their children.

*"There were so many people (in the evacuation centre). But I am not used to so many people. ...he told me that there's a place there to stay in the church where the children could be safe. So, we went" [MV9].*

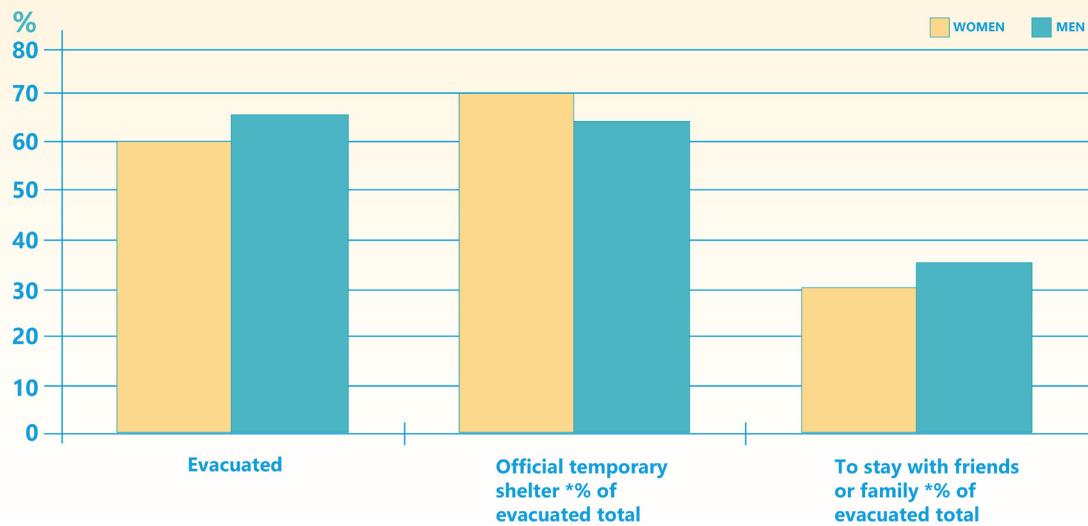**Figure 27:  Evacuation and destination of respondents by gender**
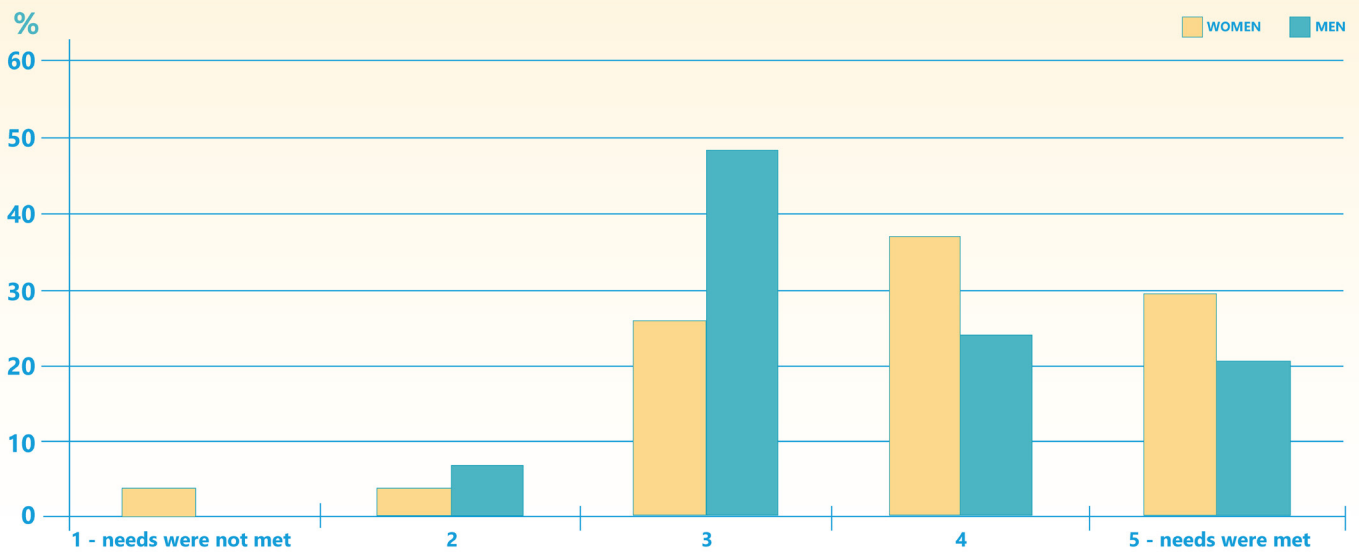


**Figure 28: Sufficiency of temporary shelter facilities by gender**
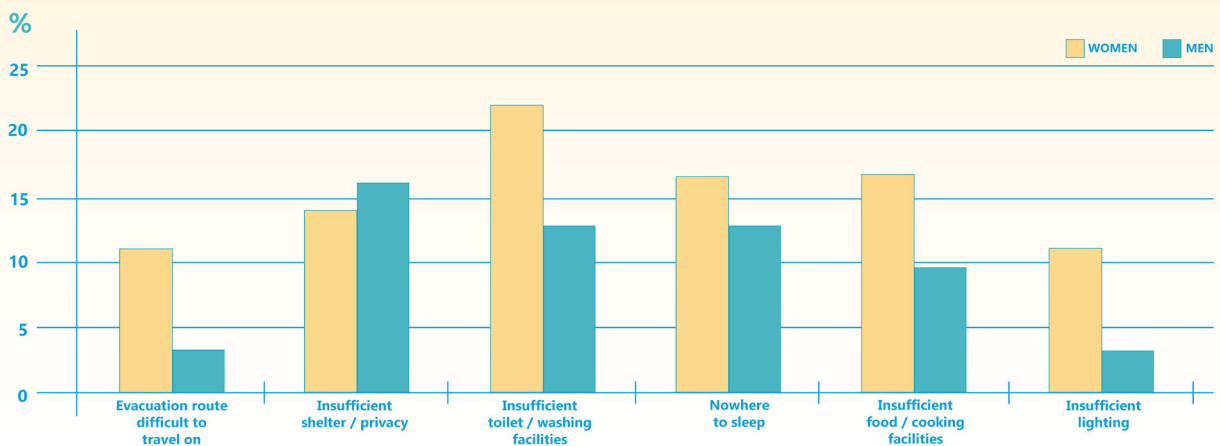


**Figure 29: Problems experienced by respondents who evacuated during evacuation and at temporary shelter**

*"The evacuation centre we stayed in was in Aguinaldo elementary school. We stayed for a long time, almost one month. At first, we stayed 2-3 weeks in Aguinaldo. After that, we were transferred to The Mansion…We could not return to our house because it took a long time for the waters to subside… It was difficult staying in the evacuation centre. We cannot eat anything normal because it's always lugaw, biscuits. It's hard to eat just like that. We do not have anything to cook food with. There were also no places for bathing. There was a comfort room but it was difficult. We had to line up and water was in either short supply or not good for bathing because it was dirty"* [MV14].

*"I had two children who needed milk, but milk was in short supply. When the milk ran out, I had no choice but to feed my little ones with coffee, for them to have something warm"* [MV7].

Key informants discussed the management of evacuation shelters:

*"Although Ompong came Sept 14-15, pre-emptive evacuation started Sept 13. As early as Sept 12, people were already coming to the evacuation centre to be listed as evacuees. We had to remind them that there is no listing, or reservation when it comes to evacuation. It does not mean that by enlisting, the households are assured of a space in the evacuation centre. This is not the case. We clarified that pre-emptive evacuation means moving out of their homes and heading straight to our evacuation centre"* [KII4].

*"As evacuation manager, I was in charge of pre-emptive evacuation, master listing, profiling of families – from children to senior citizen, from healthy to sickly. Then we arranged them according to families. The evacuation centre then was full packed. At that time, our evacuation centre was not yet fully finished, and all the rooms were occupied, even the lobby. We made safe all senior citizens, and then those who are experiencing influenza, we had to segregate and put in separate rooms. We called the medics, we had a small clinic to attend to all sick individuals…But we were projecting that if our place would overflow, we will use the multipurpose halls of the other barangays mentioned earlier. Especially for families that needed to be segregate because of sick members"* [KII2].

*"Once the individuals and families enter the evacuation centre, their information is readily collected. Like names, how many children they have, are there senior citizens in the household? PWDs? Pregnant women? There are teams assigned to consolidate the data, on a per hour basis.  That is why we are able to update*

*the evacuation board in each centre. With that, we are able to update, for instance, that there are 15 senior citizens in the centre, or that someone is even bedridden. With this info, we are able to arrange or alert the other barangays in case we need to transfer these people to give them enough space and not mix them with the many people coming into the evacuation centre. From the moment that we take in families, we get to identify which have special needs or could be sensitive to what's happening in the evacuation site"* [KII2].

*"But the needs of women, like sanitary napkins are not. That is a basic need of women. So that kind of gendered thinking should not be lost when it comes to disaster response. Also, women and LGBTQ are also vulnerable in evacuation centres. Like in the absence of partitions there could be cases of gender-based violence"* [KII5].

*"It will be noticed that even before the typhoon comes, the City already opened schools, evacuation centres where temporarily the people have to stay. In the pre-emptive evacuation, the priority are people who are ill"* [KII3].

*"We have recommended that these evacuation centres be gender-sensitive to the needs of the clientele. Like the establishment of breastfeeding rooms, conjugal rooms. Those facilities that follow the protocols to meet the needs of displaced families. In the establishment of these permanent evacuation centres, guidelines have been set around maintaining the privacy of families like one cubicle per family, so that there is no mixing up"* [KII3].

*"The mandatory requirements are there to instill privacy and sensitivity to the needs of affected families. For PWDs, there are guidelines to camp managers on how to deal with the concerns of PWDs"* [KII3].

Key informant interviews explained that even outside of a disaster setting, transgender people face difficulties and discrimination in access to basic facilities, a situation which is exacerbated by crisis and creates barriers and disincentives to evacuation:

*"Particularly, on issues around SOGIE (Sexual Orientation, Gender Identity and Expression), the most affected are transgender people. They carry the heaviest load of prejudice inside the LGBTQ community"* [KII8].

*"Later did I learn that the evacuees in the University were given food, blankets by some politicians. There were so many who gave food rations there"*

*"(We still had to pay rent) Of course. Nothing is free"*

*"I did not get any relief goods because we were not in the evacuation centre. But after some time, we were informed by the barangay that relief is available and could be collected from them. Our names were on the list of affected people"*

## 4.8 POST-EVENT RELIEF AND LONGER-TERM RECOVERY

Global literature notes discrimination and inequality in access to post-disaster relief[142]. Marginalised groups such as ethnic minorities, elderly people, disabled people, LGBTIQ+ people, single women, widows, and female heads of household often experience difficulty accessing aid, through direct or indirect discrimination, or due to services and approaches not being tailored to meet their needs[142]. Inequality and stigma can also affect the quality of disaster impact data, with minorities under-counted, overlooked or excluded[143]. In the aftermath of Typhoon Haiyan in the Philippines, the lower-income LGBTIQ+ community experienced noticeably more discrimination than that of their middle to higher-income equivalents[145].

Groups missing from the data and from the analysis are less likely to receive targeted support[146]. Issues of eligibility and definitions of a household may leave people vulnerable, and less traditional households may not be counted, e.g. families with LGBTIQ+ individuals[147].

There are also gender and age dimensions of reconstruction, with gender impacting on likelihood of owning assets, access to finance or insurance which in turn determines also disaster compensation[148]. Women, particularly elderly and/or widowed, are less likely to be able to rebuild their homes following a disaster. This is related to women's lower levels of access to resources such as insurance or loans, and difficulty accessing any government assistance for reconstruction, which may mean that women are more likely to remain in internally displaced person (IDP) camps for a longer period of time[149]. In addition, elderly and disabled people both need more support with reconstruction and often lack the financial resources to pay for such support[150].

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142,143,144,146,
147,148,149,150   S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.
145             A. Junio, "Sexual Minorities and Disasters in the Philippines: Where Are They?," [Online]. Available: http://www.kfaw.or.jp/correspondents/docs/27-
               2_Philippines_E.pdf. [Accessed 15 July 2021].

In the Philippines, women are responsible for a majority of caregiving activities, and this increased in the aftermath of a disaster where they are also expected to care for the sick or injured, whilst also rebuilding livelihoods that may have been lost[151,152]. This places a large physical and mental burden on women, resulting in longer term, negative impacts on their health and well-being[153]. Women are rarely financially compensated for the additional responsibilities they take on[154], and this, combined with the fact that most relief materials are distributed to heads of households, leads to a worsening of women and girls' experience of disasters. The unequal share of caring responsibilities has implications on women's ability to rebuild their livelihoods as they may have dropped out of education or paused employment or training to provide support during a disaster[55,156,157]. A study in Baguio city, from 2014, found that changes in weather worsened the existing difficulties women face in carrying out both caregiving responsibilities and income-earning activities[158]. This was not a challenge faced by men who traditionally only carry out income-earning activities[159].

In the Philippines, women lack access to participation in livelihood rebuilding activities[160]. This is in part due to the expectation that women will take on additional caregiving responsibilities post-disaster making their time availability less than that of their male counterparts[161].
Some studies showed that, to varying degrees, whilst Filipinos are familiar with disaster plans and have taken some preparedness measures such as stockpiling food, only 3% have home insurance and even less (1.4%) are insured against disasters[162,163].

Global literature highlights the ways in which inequalities in disaster impact can cascade into wider chains of inequality and impoverishment. Marginalised individuals and groups are often most vulnerable to environmental shocks and stresses[164], with disasters known to reinforce, perpetuate and increase gender inequality. Disasters are also known to exacerbate social discrimination[165,166], exacerbating existing power dynamics and leaving the most marginalised further "left behind"[167].

151      Oxfam, "DRR and CCA in the Philippines," Oxfam, Oxford, UK, 2017.

152      P. Eadie, M. Atienza and M. Tan-Mullins, "Livelihood and vulnerability in the wake of Typhoon Yolanda: lessons of community and resilience," Natural Hazards, vol. 103, no. 1, pp. 211-230, 2020.

153,154,157 M. Tanyag, "Resilience, Female Altruism, and Bodily Autonomy: Disaster-Induced Displacement in Post-Haiyan Phillipines," Journal of Women in Culture and Society, vol. 43, no. 3, pp. 564-585, 2018.

155      Asian Development Bank, "Gender-Inclusive Disaster Risk Management," ADB, 2014.

156      D. Reyes and J. Lu, "Gender Dimensions and Women's Vulnerability in Disaster Situations: A Case Study of Flood Prone Areas Impacting Women in MalaboCity, Metro Manila," Journal of International Women's Studies, vol. 18, no. 4, pp. 69-88, 2017.

158,159  L. Mason and T. Agan, "Weather variability in urban Philippines: a gender analysis of household impacts," Climatic Change, vol. 132, no. 4, pp. 589-599, 2015.

161      Asia-Pacific Economic Cooperation, "The study on "Women in Times of Disaster": The Integration of Gender Issues and Gender Perspectives in Disaster Management," APEC, 2009.

162      V. Bollettino, T. Alcayna, K. Enriquez and P. Vinck, "Perceptions of disaster resilience and preparedness in the Philippines," Program on Resilient Cities and Harvard Humanitarian Initiative, 2018.

163      R. Hoffman and R. Muttarak, "Learn from the Past, Prepare for the Future: Impacts of Education and Experience on Disaster Preparedness in the Philippines," World Development, vol. 96, no. 1, pp. 32-51, 2017.

164      A. Bahadur, K. Peters, E. Wilkinson, F. Pichon, K. Gray and T. Tanner, "The 3As: tracking resilience across BRACED," ODI, London, 2015.

165      UNISDR, "Revealing Risk, Redefining Development - Global Assessment Report on Disaster Risk Reduction," UNSIDR, 2011.

166      E. Dwyer and L. Woolf, "Down by the River: Addressing the Rights, Needs and Strengths of Fijian Sexual and Gender Minorities in Disaster Risk Reduction and Humanitarian Response," Oxfam Australia, 2018.

167      E. Lovell and V. le Masson, "Equity and inclusion in disaster risk reduction: building resilience for all," ODI and CDKN, London, 2014.

### 4.8.1   ACCESS TO RELIEF

In the MV interviews there was confusion over whether flood-impacted individuals who did not stay in the evacuation centre were eligible for relief:

*"We found out that the relief was only given for those who were in the evacuation centre. The government treated only those in the evacuation as the needy ones during that time. But like us, what choice did we have since the evacuation centre was already full, and (extended family) place was available? But we were also flooded. We lost a lot in this flood. The response of the city social welfare was that they only give relief goods to those in the list and are in the evacuation centre. I even went to the barangay. Even if they know we were flooded, they reasoning is we cannot get any relief goods because we were not in the evacuation centre. So, it seems like people were helped not because they are flood victims, but only because they are in the evacuation centre"* [MV8].

*"Later did I learn that the evacuees in the University were given food, blankets by some politicians. There were so many who gave food rations there"* [MV9].

*"I did not get any relief goods because we were not in the evacuation centre. But after some time, we were informed by the barangay that relief is available and could be collected from them. Our names were on the list of affected people"* [MV9].

*"One challenge in general was that understanding evacuation instructions, as some did not proceed to the evacuation centres as instructed. Some went back home/elsewhere (relatives) or went to the barangay hall instead of going or staying in the evacuation centre. Since relief goods are mainly given in the evacuation centre, these households who did not go to the evacuation centres did not receive relief goods"* [KII7].

Poorer families living in rental accommodation felt their circumstance was not considered, especially if the house they lived in was owned by a middle-income family:

*"I think the reason why we were not listed is that we were identified as 'may kaya' (wealthy) because we lived in a compound owned by a rich family. But we were only renting a room in their first floor. We sort of got identified that we are not that poor to need relief goods. Our landlords were the ones who are rich. They have jobs. They (the barangay officials) know that we are renters but we were still excluded from the list of households that deserve to be helped"* [MV8].

*"During flooding, an effective measure is the setting up of master lists of affected families or recipients of assistance. It helps us in targeting the vulnerable groups, who they are, like senior citizens and where they are located"* [KII1].

Key informants also shared questions around equality and targeting of relief:

*"At present, , and as practiced during the onset of the COVID-19 pandemic in 2020, food relief packs are designed for families and individuals who live alone" [KII1].*

*"In terms of receiving aid, we are not sure if the Department of Social Welfare and Development (DSWD) is already recognizing same-sex families in the concept of 'family'. The DSWD is the one giving out family packages, managing camps or evacuation centres. It is not sure whether DSWD is recognizing these kinds of families. In this manner, there could be discrimination in the access to services" [KII5].*

Respondents who were poor and elderly, spoke of the difficulties in buying medicine for chronic health conditions in the period after flooding, when there was limited funds needed to support post-flood recovery:

*"In the future, if it's possible to add assistance it would be good. Like, for instance, a little cash assistance will help, especially for someone like me who is already on maintenance medicines. So I could have some cash to buy medicines" [MV16].*

### 4.8.2   LONGER-TERM IMPACTS

Missing Voices interviewees also spoke of the contribution of flood to longer-term inequalities. One woman who was pregnant at the time of a flood, spoke about the exertion of evacuating twice (once managing other small children before returning home for critical supplies and evacuating a second time). She shared how this exertion, combined with the stress and trauma of the event, likely contributed to her going into premature labour. Longer-term impacts cascaded across that individual's family, as while she was hospitalized with a premature baby for many months, her young adolescent daughter dropped out of regular school attendance to look after younger siblings. The woman considered it lucky that her daughter was a strong student, was allowed to return to school after months of absence to take and pass a school exam, and was allowed to thereafter continue her education. Without these circumstances, the flood could have resulted in the abrupt end to this girl's education, with consequences for her future well-being and economic security.

Poorer individuals whose rented house was flood damaged highlighted the injustice of still having to pay rent to a landlord even while their house was in an un-livable condition for months, exacerbating their already difficult economic situation:

*"(We still had to pay rent) Of course. Nothing is free" [MV9].*

The literature provides evidence of flood impacts exacerbating inequality, prompting greater consideration of the vulnerability of communities facing economic and social inequality pre-flooding. A key informant highlighted the economic vulnerability of LGBTIQ+ individuals:

*"In poor communities, if you are LGBT or particularly transgender, there are lesser opportunities for you. What happens, many transgender people are boxed in. They are stereotyped in working in parlors (salons). Most of them who are not educated do end up as sex workers" [KII8].*

Key Informants noted the cascading impacts of disasters:

*"On the part of recovery, it is the marginalised women in our society who have no access to employment, as to health care, justice. They are the ones who experience gender-based violence, especially during disasters. So what happens is the gap widens in their ability to recover from the disasters they experience. The chances for them to get back to their normal lives becomes more limited" [KII5].*

*"There is a compounding effect on the psycho-social well-being of women, especially when the pandemic is combined with disasters. It's ok if you are not poor. If you're middle class. But the effect is worse even for the poor" [KII5].*

"We do not have a feedback monitoring system. This is something to be considered"

# "Sometimes the participation of women in decision-making is overlooked"

"With your project's goal of transforming Baguio into a smart city, people should also consider all gender identities and sexual orientation. For that to happen, there should be massive education and awareness on sexual orientation and gender identities."

Source: Asian Development Bank

## 4.9    GOVERNANCE AND PARTICIPATION

In this final section the research explored issues related to governance of the EWS, decision making, participation and accountability.

There is an ethical imperative to uphold the rights of all members of that community; 'every individual has the right to information about climate related hazards. Indeed, access to information is not simply a liberty right but a welfare right. Early warning is necessary for the enjoyment of basic human rights including the right to life'[168]. UNDRR[169] stipulate that "national governments are responsible for high-level policies and frameworks that facilitate early warning and for the technical systems that predict and issue national hazard warnings", and should work with EWS stakeholders to support and strengthen capacities to ensure warnings and actions are targeted to the most vulnerable.

In the Philippines, there are multiple agencies responsible for communication and dissemination of warnings and risk information: the Philippines Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), the Philippine Institute of Volcanology and Seismology, and the National Disaster Risk Reduction and management Council (NDRRMC)[170].

The Philippines has a number of national laws and policies relating to both disaster risk management and gender][171,172] but there is a lack of integration and complementarity between them, resulting in plans that do not take account of gender and social inclusion[173,174]. The implementation of national policies at the local level also remains a significant challenge[175]. At present, literature suggests that the Philippines' disaster management policies are becoming increasingly gender aware[176,177], but that a great deal remains to be done in order for policies to be gender transformative.

168    United Nations Environment Programme, "Early Warning as a Human Right;," 2015. [Online]. Available: https://wedocs.unep.org/bitstream/han-dle/20.500.11822/7429/Early_Warning_as_a_Human_Right_1.pdf?sequence=5&isAllowed=y. [Accessed 16 07 2021].

169    United Nations Office for Disaster Risk Reduction, "Developing Early Warning Systems: A Checklist," in Third International Conference on Early Warning , Bonn, Germany, 2006.

170    D. Blanco, "Disaster Governance in the Philippines: Issues, Lessons Learned, and Future Directions in the Post-Yolanda Super Typhoon Aftermath," International Journal of Public Administration, vol. 38, no. 10, pp. 743-756, 2015.

171    Ramboll , "Gender Equality and Social Inclusion Strategy," ASEAN Australia Smart Cities Trust Fund, 2021.

172    Asian Development Bank, "Gender Mainstreaming in the KALAHI-CIDSS National Community-Driven Development Program," ADB, Metro Manila, 2018.

173    ASEAN Intergovernmental Commission on Human Rights (AICHR), "Women in Natural Disasters: Indicative Findings in Unraveling Gender in Institutional Responses," AICHR, 2018.

174,176 Asia-Pacific Economic Cooperation, "The study on "Women in Times of Disaster": The Integration of Gender Issues and Gender Perspectives in Disaster Manage-ment," APEC, 2009.

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

177    S. Brown, M. Budimir, A. Sneddon, D. Lau, P. Shakya and S. Crawford, "Gender Transformative Early Warning Systems: Experiences from Nepal and Peru," Practical Action, Rugby, UK, 2019.

The literature suggests that there is poor trust in the Philippines government, stemming from a lack of transparency, accountability and a perception of corruption[78,179,180]. Importantly, in the context of this report, corruption relates to the spending of disaster risk management funds in the disaster response phase[181,182]. This lack of trust affects the confidence communities have in both the authorities and their plans, which could impact the success and effectiveness of an EWS.

It is important to pay special attention to the voices and stories of populations which are marginalised, hidden, and vulnerable[183,184] to be able to understand the specific needs, priorities, and perspectives of these groups, to ensure that the EWS is effective for them and that 'no one is left behind.

The global literature highlights a tendency for women and marginalised groups to be excluded from DRR policies, strategies, and decision-making, informed by inequalities in societal power relations, gender norms, alongside gendered socioeconomic inequality[185,186,187,188]. There are often social, cultural, and political barriers to women taking decisions, holding positions of authority, or having their voices heard in decision-making, particularly in contexts where gender inequality is high. There is often limited representation of women or gender minorities in technical roles, or at senior levels of the EWS (or wider governance)[189].

It is important to adopt proactive strategies to include women and gender minorities at every stage of the EWS, for example holding training courses at appropriate times to fit around work and home commitments[190]. This includes observation monitoring, data collection, and analysis to produce warnings. Marginalised gender groups demonstrate high levels of interest in participation in DRR and EWS initiatives but feel their voices do not matter or are not welcome.

Proactive efforts are needed to include the needs, priorities, and capabilities of marginalised gender groups, and magnify their voices at every stage of the EWS.

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178,181   I. Abarquez and N. Parreño, "Review of Gender Equality in Disaster Risk Reduction and Management," World Bank, Metro Manila, 2014.

179   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.

180,182   S. Domingo and A. Manejar, "Disaster Preparedness and Local Governance in the Philippines," Philippines Institute for Development Studies, Quezon City, 2018.

183,187   J. Gaillard, K. Sanz, B. Balgos, S. Dalisay, A. Gorman-Murray, F. Smith and V. Toelupe, "Beyond men and women: a critical perspective on gender and disaster," Disasters, vol. 41, no. 3, pp. 429-447, 2017.

184   B. Ramalingam and D. Sanderson, "Nepal Earthquake Response: Lessons for Operational Agencies," ALNAP/ODI, London, 2015.

185   A. Gorman-Murray, S. McKinnon, D. Dominey-Howes, C. Nash and R. Bolton, "Listening and learning: giving voice to trans experiences of disasters," Gender, Place & Culture, vol. 25, no. 2, pp. 166-187, 2017.

186   D. Dominey-Howes, A. Gorman-Murrary and S. McKinnon, "Queering disasters: on the need to account for LGBTI experiences in natural disaster contexts," Gender, Place & Culture: A Journal of Feminist Geography, vol. 21, no. 7, pp. 905-918, 2014.

188   UNISDR, "Making Disaster Risk Reduction Gender-Sensitive: Policy and Practical Guidelines," UNISDR, UNDP and IUCN, Geneva, 2009.

189   S. Brown, M. Budimir, A. Sneddon, D. Lau, P. Shakya and S. Crawford, "Gender Transformative Early Warning Systems: Experiences from Nepal and Peru," Practical Action, Rugby, UK, 2019.

190   J. Twigg, "Good Practice Review 9: Disaster Risk Reduction," 2015. [Online]. Available: https://goodpracticereview.org/9/. [Accessed 16 07 2021].

As of January 2021, 56% of Baguio city's government departments were led by women[191], and whilst this may allude to increasing gender equality, it is important to consider that this does not necessarily translate into increased power or influence. Whilst this is a step in the right direction, we should further examine how the voices of those experiencing multiple axes of marginalisation are accounted for in bureaucratic, institutional processes[192]. Domingo and Manejar[193] states: "Disaster preparedness, including its pre-requisite processes and institutional machinations, have to be addressed through stable inclusion in longer-term planning…", highlighting that inclusion of gender minorities in positions of power is not satisfied simply by female to male ratios in government positions, but rather, requires long-term commitment and work to truly embed gender throughout policy.

It should be noted that participation in EWS initiatives does not equate to influence or power over decision-making, with multiple examples in the literature where social norms prioritize male leadership [194]. The gendered needs, priorities and capabilities of marginalised gender groups are rarely identified or prioritized in EWS. Lack of power and influence over decision-making increases gendered vulnerability to disasters.

Underlying stereotypes or cultural biases can also affect perceptions of willingness and ability to participate [195]. Where these perceived barriers or challenges to participate in EWS align with embedded gender stereotypes, it is important to understand whether the issue is a genuine gendered issue, where one gender group is differently affected, or whether perception is itself shaped by gender norms [196]. Without this analysis and understanding, people will be excluded from participation in decisions and planning that can directly affect their lives.

191        Ramboll , "Gender Equality and Social Inclusion Strategy," ASEAN Australia Smart Cities Trust Fund, 2021.
192        R. Macalandag, "Examining the (In)Visibility of Gender in Disaster Risk Reduction and Management Plans: Reclaiming a Sidelined Agenda," Holy Name University, Bohol, Philippines, 2016.
193        S. Domingo and A. Manejar, "Disaster Preparedness and Local Governance in the Philippines," Philippines Institute for Development Studies, Quezon City, 2018.
194,195,196  S. Brown, M. Budimir, A. Sneddon, D. Lau, P. Shakya and S. Crawford, "Gender Transformative Early Warning Systems: Experiences from Nepal and Peru," Practical Action, Rugby, UK, 2019.

There are also examples where these underlying stereotypes or cultural biases have not only failed to challenge harmful gender norms, but have actively reinforced or institutionalized gender inequality[197]. Gender unaware approaches have a likelihood of perpetuating and compounding gender inequality, for example by formalizing men as decision-makers and recipients of warning information, and assuming or actively delegating women as secondary recipients of warnings and/or disempowering their active contributions to planning and decisions.

There is a perception that the LGBTIQ+ community are accepted and tolerated in the Philippines, however, research that has spoken to the members of the LGBTIQ+ community demonstrates that this is in fact not the case, with LGBTIQ+ Filipinos facing regular mockery, violence (physical and mental) and exclusion[198]. Global literature highlights the important roles that marginalised gender groups can and do play in DRR and EWS when included and supported to participate effectively. Active participation of marginalised individuals can support transformative empowerment with vulnerable groups reclaiming space for political engagement by 'defining their own (DRR) needs and determining potential solutions'[199]. Twigg[200] recommends using 'separate or safe spaces where (marginalised individuals or groups) are more confident to speak out'.

Marginalised gender groups are an under-valued resource, capable of improving EWS, DRR, and resilience. For example, women are more likely than men to prioritize risk reduction, and marginalised groups are eager to learn and participate. This under-used potential can be harnessed through a gender transformative approach to EWS, acknowledging gender as an integral facet of our households, communities, and institutions, and taking proactive steps to reform the way EWS work, to achieve gender equality and to build EWS that are effective for all. Representation in DRR and EWS initiatives matters: there is a need for transformational change and empowerment of marginalised gender groups in all elements of EWS [201,202].

197,202   S. Brown, M. Budimir, A. Sneddon, D. Lau, P. Shakya and S. Crawford, "Gender Transformative Early Warning Systems: Experiences from Nepal and Peru," Practical Action, Rugby, UK, 2019.

178   B. Cardozo, "A "Coming Out" Party in Congress?: LGBT Advocacy and Party-List Politics in the Philippines," 2014. [Online]. Available: https://escholarship.org/uc/item/49v8j2wx. [Accessed 16 07 2021].

199   J. Gaillard, M. Fordham and K. Sanz, "Culture, gender and disaster: from vulnerability to capacities," in Cultures and Disasters: Understanding Cultural Framings in Disaster Risk Reduction, Abingdon, UK and New York, NY, Routledge, 2016.

200   J. Twigg, "Good Practice Review 9: Disaster Risk Reduction," 2015. [Online]. Available: https://goodpracticereview.org/9/. [Accessed 16 07 2021].

201   S. Brown, M. Budimir, S. Crawford, R. Clements and A. Sneddon, "Gender and Age Inequality of Disaster Risk," UN Women and UNICEF, 2019.

### 4.9.1  KNOWLEDGE AND CONFIDENCE IN AUTHORITIES

Respondents were asked if they knew who was responsible for flood risk management in their area. 75% of women and 76% of men correctly identified the City Disaster Risk Reduction and Management Office as the responsible authority, with remaining respondents identifying the City Engineering Office as being responsible for flood risk management (and 3% not responding, excluded from the below).

Respondents were overall quite confident that the authorities responsible for managing local flood risk understood their needs. Women were slightly more confident than men, with an average score of 3.91 compared with 3.85 for men.

Key Informants commented on the challenge of meeting stakeholder expectations, given existing capacity limitations, as well as highlighting the need for feedback loops for system accountability and effectiveness.

*"For the FEWS to be effectively implemented, there is a need to upgrade the CDRRMO especially that early warnings will be integrated into the Smart City Command Centre once it becomes operational. Many of the staff are job orders, not regular employees - they can just resign when they find permanent employment outside the office and so we cannot keep them.  The CDRRMO coordinates all hazards". [KII1]*

*"We do not have a feedback monitoring system. This is something to be considered". [KII1]*

Survey respondents rated the ease of contacting relevant authorities quite highly overall (average 4 out of 5), with women ranking their ability to contact authorities slightly higher than men (QD10).
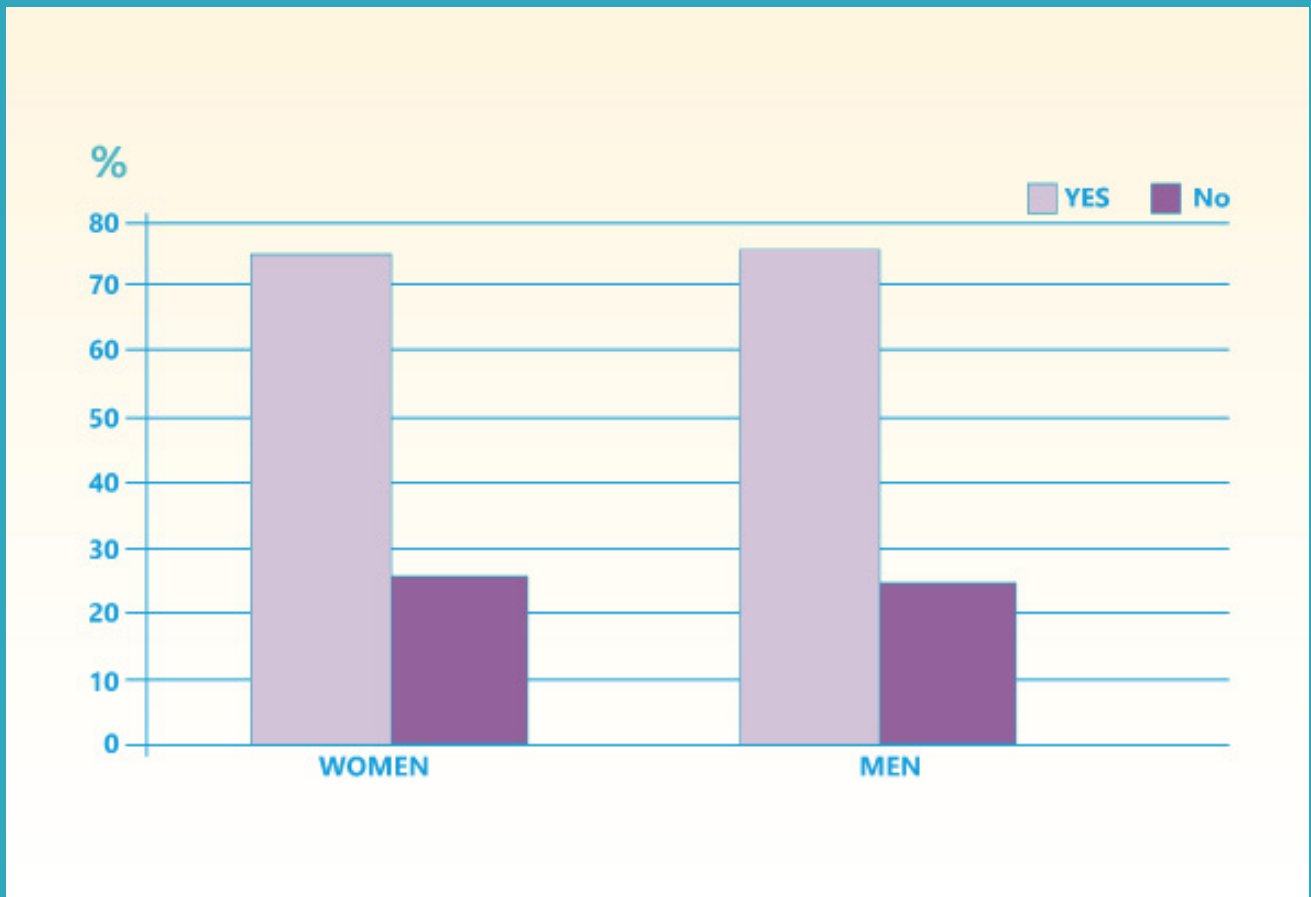
**Figure 30: Knowledge of responsible authorities by gender**
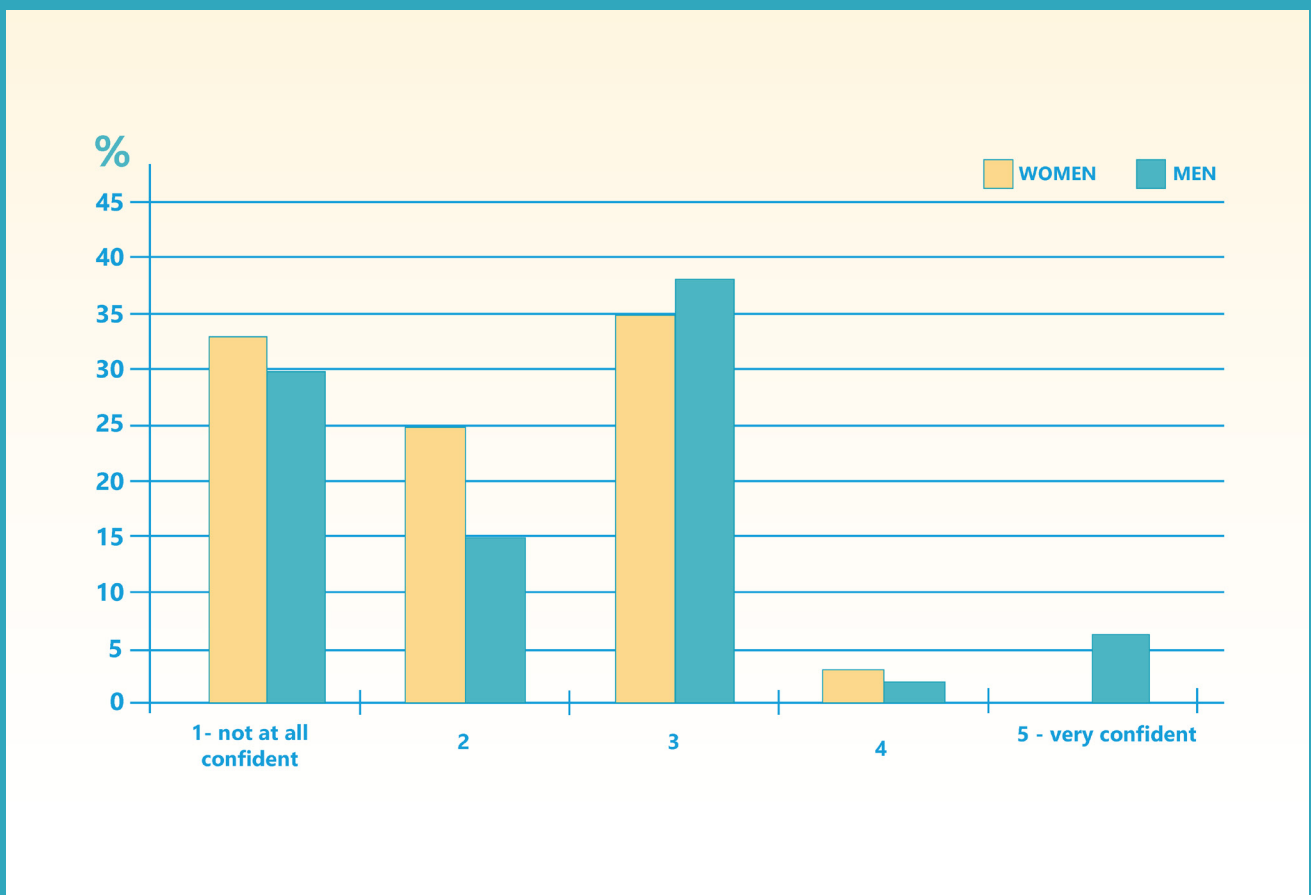


**Figure 31: Average confidence in authorities' understanding of needs by gender**
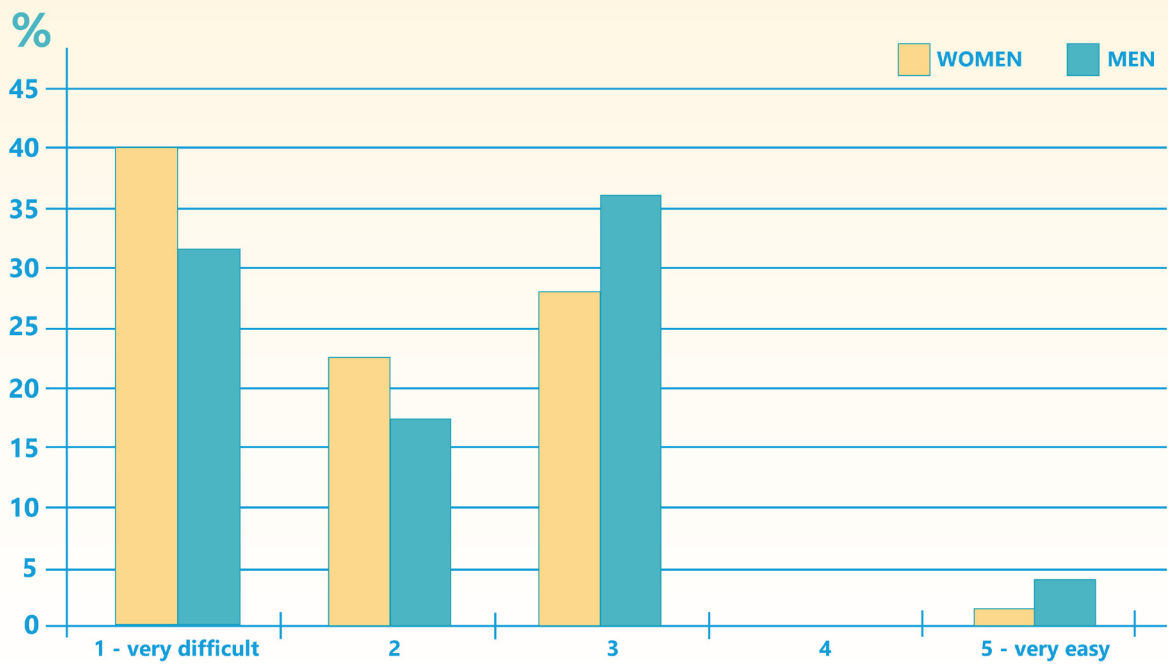
**Figure 32: Average score for ease of contacting authorities by gender**
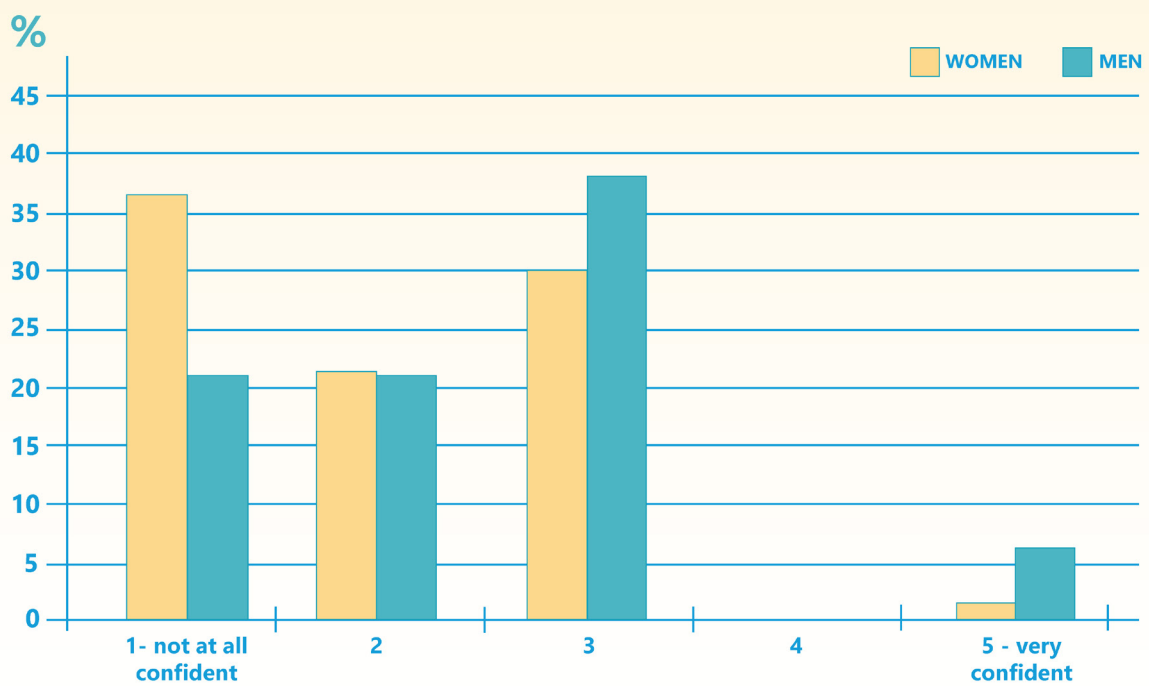


**Figure 33: Average score for confidence in being listened by gender**

Respondents were confident in being listened to (average response 3.8 out of 5) with women slightly more confident than men that they would be listened to by authorities if they contacted them with a question or concern (QD11).

Overall, women reported having slightly higher levels of knowledge about who the responsible authorities are, being confident in their understanding of needs, being able to contact them, and being confident that they would listen to their concerns. This may be a reflection of the previous finding that more women than men received warning information from, and trusted information from, formal sources such as local government authorities; on the other hand, more men than women received external support from government authorities in response to a flood, and reported that they needed support which they did not receive, so their lower confidence may be a result of negative experiences.

Respondents were asked what the most important improvements the relevant authorities could make to flood risk management were to them. A range of priorities were specified by respondents, including actions to be taken before, during, and after flooding. The most important change for women and men was the issuing of timely warnings, with 40% of women and 38% of men specifying this improvement. The provision of preparedness advice was the second most important action for women and men, mentioned by 22% of women and 28% of men, followed by the provision of transport and equipment to support rescue and evacuation (18% of women and 21% of men) (QD12).
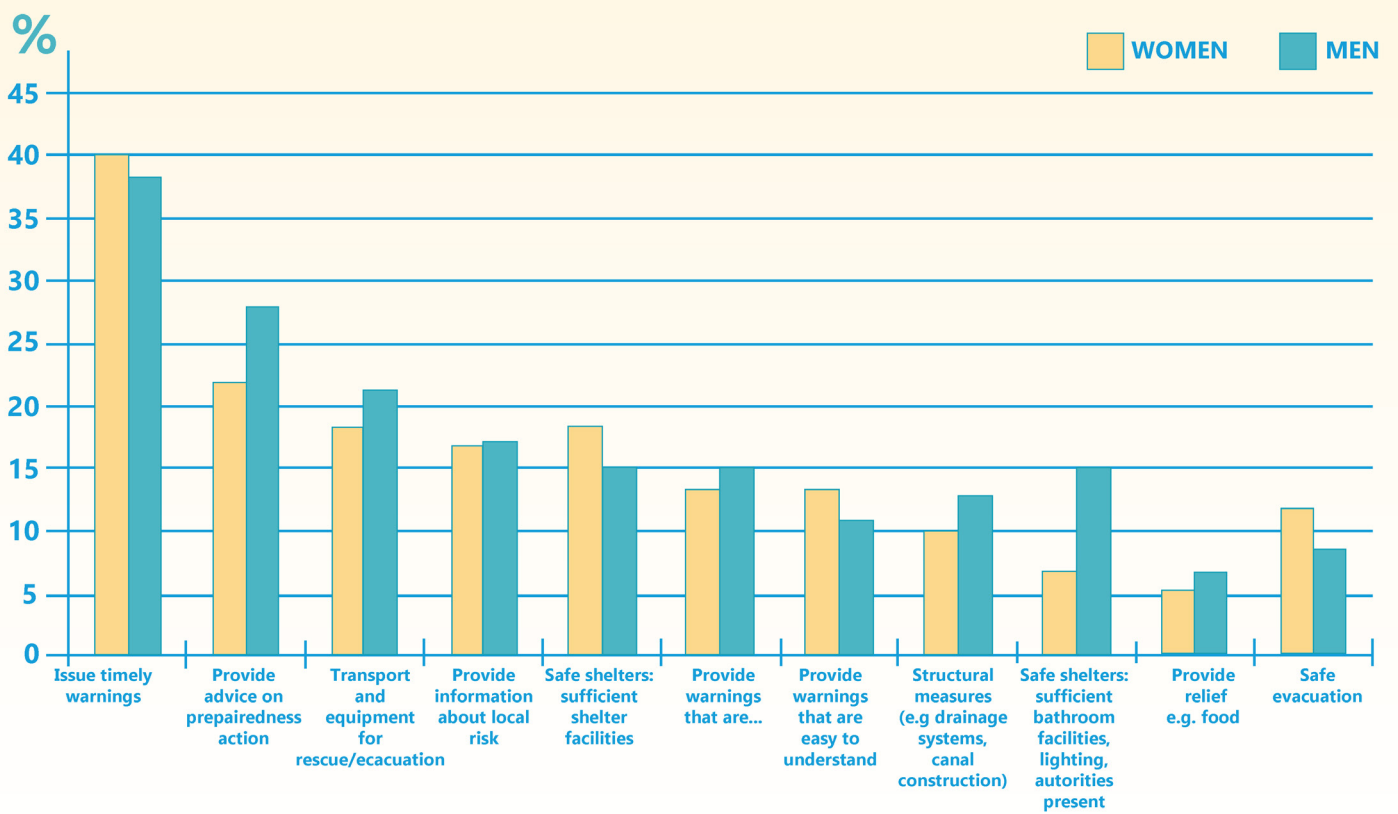
**Figure 34: Priority improvements for effective early warning**

## 4.9.2  BARRIERS TO PARTICIPATION

The Key Informant Interviews highlighted some existing practices, attitudes and potential biases held by those in positions of power within the governing stakeholder bodies of the EWS, and the wider DRR community in Baguio city that could reinforce exclusion of women and marginalised people. The prevailing perception within many KIIs that 'women and marginalised gender groups do not face any particular or specific challenges in accessing or responding to risk information' stand in contrast with the findings of the Missing Voices interviews and the survey which find examples of gendered challenges across the multiple areas, but particularly in responding to information. The (mis) perception that the needs of all are already well understood, also seems to give rise to a perception that diverse participation in decision-making is not a priority:

*"Women have roles to play in DRRM [Disaster Risk Reduction and Management]. They are the ones in-charge of our community kitchens. They are the ones cooking in our evacuation centres. Tasks are also assigned to women in terms of cleaning, keeping the evacuation camps clean" [KII4].*

*"Sometimes the participation of women in decision-making is overlooked" [KII5].*

*[Interviewer question: Do you think there are any challenges or barriers to receiving that information that would particularly affect women or marginalised gender groups?] "None.  The women or marginalised gender groups are quite aware of the flooding" [KII6].*

*"[Interviewer question: Do you think there are any challenges or barriers to being able to understand that information that would particularly affect women or marginalised gender groups?]  "No such barriers" [KII6].*

*[Interviewer question: Do you think that gender diversity is represented in flood preparedness planning and decision-making, e.g., are there women and marginalised gender groups participating in community/ municipal DRR decision making forums?] "Not aware of that.  They are not involved in decision-making but they are the priority. In our barangay we have one PWD councilperson as part of the decision making. They (women and marginalised gender groups) are not invited to decision-making meetings" [KII6].*

*"There are no challenges for women or marginalised gender groups faced in responding to the flood" [KII7].*

In contrast, one Key Informant provided contextual insight into the prevailing cultural gender norms and their impacts on women and gender minority groups:

*"Particularly in Baguio, we cannot deny that Baguio's indigenous culture remains to be highly patriarchal and macho. There are efforts and successes on the part of women's organizations to continue the struggle for women's emancipation. In the LGBT community, however, we still have a lot of work yet to be done ...I think our society has been exposed to the gender binary concepts and norms. And re-educating the LGBT community and the society as a whole would not be an easy task for SOGIE advocates" [KII8].*

They provided some insight regarding this gap between the perception of tolerance and inclusion and the lived realities of discrimination, highlighting the differences between various ethnic groups and the different experiences of LGBTIQ+ people:

*"In the particularity of Cordillera, being a macho, warrior tribe, it comes as a surprise that there are cases in the Cordillera where LGBT people are actually well-accepted. They are actually flourishing in these places... The case is different in Ifugao, in Kalinga Apayao, where the societies are conservative...LGBTs still have to prove themselves to the community, to be accepted, in the midst of a disaster, unlike straight people who do not have to prove anything" [KII8].*

They also highlighted the importance of including gender diversity the city's development and transformation strategies, and the need for education about different identities and experiences:

*"With your project's goal of transforming Baguio into a smart city, people should also consider all gender identities and sexual orientation. For that to happen, there should be massive education and awareness on sexual orientation and gender identities. ...There needs to be a massive education campaign and we can help the City in that respect. In talks and forums about SOGIE, we are willing to be part of making Baguio a smart city" [KII8].*

# 5 GENDER AND NATURE-BASED SOLUTIONS



**Image caption: Woman working in a nurseries of mangrove, Philippines**
Source: Asian Development Bank

As part of the adjacent "Baguio City Smart Flood Warning, Information and Mitigation System" project, a high-level flood mitigation action plan will be developed later in 2021, with focus on identification of potential Nature-based Solutions (NbS) targeting reduction of risks at city 'hotspots' (high-risk areas). The selection and conceptual sketching of the NbS intervention will include cost-benefit analyses (CBA), with special focus on identification of co-benefits.

A separate Task Order (AASCTF supported project) is planned to design and advise on the implementation of the NbS intervention. The location for the implementation of the NbS interventions is not yet fully defined and will be part of the scope in the Task Order. The site is expected to be a public space that will include multi-functional purposes, and it can be renovated for recreation and public use, fostering tourism, at the same time helping to manage flooding issues, and so triggering a number of co-benefits within the urban landscape in Baguio.

The NbS project is expected to be small-scale and very site specific. Key themes for the NbS is that it is contributes towards "smart and sustainable communities", has "multiple benefits", has potential "replicability in other cities", strengthens "resilience" of local communities, assists with "flood mitigation" and "climate adaptation," and incorporates "smart digital components" embedded within the the city's smart networks and infrastructure.

It is considered that this Mixed Methods Gender and Inclusion Study has an opportunity to examine key gendered issues relating to NbS in terms of the types of vulnerabilities, risk, and resilience they are targeted towards, and the needs and priorities of marginalised gender groups.

As noted in Section 2.1, consultation with the NbS task team took place to understand early thinking on the NbS solution and identify where the current project may augment this from a gender and inclusion perspective based on the data gathered as part of this study.

## 5.1   KEY NBS CONCEPT AND VISION

The NbS team presented an initial vision and concept to Baguio city stakeholders in May 2021. Here, it was identified that the key challenges (at a high level) in Baguio are considered to be:
- Solid waste / Garbage issues;
- Landslides;
- Flooding issues;
- Traffic congestion and pollution.

The drivers for the implementation of a NbS are to assist with flood mitigation, promote tourism, provide recreational space, and be educational.

The vision endorsed is "connecting the well-known destinations in Baguio through a network of Green Walks that creates a new way of experiencing the city for tourists and citizens at the same time that it mitigates flooding through blue-green infrastructure". The concept currently being developed for the "Baguio Green Walks" seeks to provides multiple features along the way, as identified in Figure 35.

## 5.2   GENDER AND INCLUSION ISSUES RELATING TO NBS

### 5.2.1   VULNERABILITIES, RISK AND RESILIENCE

People of different genders use and interact with ecosystems in different ways, with gendered differences in livelihoods, norms around mobility, access to public space, and patterns of socio-economic activity. Degradation of ecosystems presents gendered challenges as women and marginalised gender groups are less likely to have the resources or social capital needed to access alternative livelihood opportunities or key services provided by a given ecosystem; at the same time, women in particular play key roles in natural resource management around the world due to gendered roles and responsibilities relating to agricultural production and domestic labour[203].

Gender gaps in access to physical and social capital, including land ownership, financial services, information and information technology][204], and decision-making power in domestic and public life[205] mean that women and other marginalised gender groups are, on the one hand more involved in- and

203   IUCN, "Gender-responsive restoration guidelines: A closer look at gender in the Restoration Opportunities Assessment Methodology.," IUCN, Gland, Switzerland, 2017.

204   E. Simelton and M. Ostwald, Multifunctional Land Uses in Africa: Sustainable Food Security Solutions, London: Routledge, 2019.

205   FAO and CARE, "Good Practices for Integrating Gender Equality and Women's Empowerment in Climate-Smart Agriculture Programmes," FAO and CARE, Atlanta, 2019.

# Along the Green Walk



Stops along
the way

Digitalized
experience

Active program

View towards
the city

Landscape

Blue-green
infrastructure

Creative program

Wayfinding

**Figure 35: Features along the Green Walk**

dependent on the management of natural resources, while on the other hand having less control over these resources[206]. In terms of effective practices, gender analysis is highlighted as a crucial component to avoid sustaining or accentuating inequalities[207].

NbS programming should consider at the outset the context of gender dynamics and inequality and whether gender stereotypes or inequalities are reinforced in the design; the extent to which planned activities are accessible to women and marginalised gender groups, logistically and socially; and how to monitor, adapt, and evaluate the effectiveness and success of the NbS for people of all genders[208].

## 5.2.2   NEEDS AND PRIORITIES OF MARGINALISED GENDER GROUPS

This study found a number of gendered needs and priorities for early warning which can be usefully applied to the development of NbS.

Firstly, marginalised gender groups are found to be affected by gaps in risk knowledge, with issues around a lack of understanding or miscalculation of risk leading to greater vulnerability and exacerbated impacts for marginalised people. This indicates an opportunity for the NbS work to support the development of risk knowledge and understanding among marginalised gender groups, linking information about the solutions themselves to the risks they are designed to address, and to create opportunities for marginalised groups to actively participate in the identification and mapping of local flood risk, and of the factors which may drive changes to the location and severity of risk.

At the same time, the NbS work should consider the gendered differences in the types of risk information that individuals hold. Differences in patterns of socio-economic behaviours may mean that different gender groups hold different types of knowledge about the ecosystems in which the solutions will be developed and implemented; risk knowledge should therefore be considered as a potential capacity of women and marginalised gender groups as well as an area of gendered vulnerability.

This links closely with another key finding of the study which is the importance of diversity in communication. As with the communication and dissemination of early warning information, the NbS work should include a range of communication and dissemination strategies to ensure that marginalised gender groups are not excluded through the reliance on one channel or type of communication.

206    A. Jerneck, "Taking gender seriously in climate change adaptation and sustainability science research: views from feminist debates and sub-Saharan small-scale agriculture," Sustainability Science, vol. 13, no. 2, pp. 403-416, 2018.

207    CARE, "Gender-Transformative Adaptation: From Good Practice to Better Policy," 2019. [Online]. Available: https://careclimatechange.org/wp-content/uploads/2019/06/Gender-Transformative-Adaptation_Publication_FINAL.pdf. [Accessed 20 07 2021].

208    K. Sudmeirer-Rieux, U. Nehren, S. Sandholz and N. Doswald, Disasters and Ecosystems: Resilience in a Changing Climate - Source Book, Geneva: United Nations Environment Programme, 2019.

Mobile phone and internet access levels are high, indicating a strong potential to use these platforms for communication and dissemination, education and awareness. There is an opportunity for the FEWS and NbS programmes to support and reinforce each other, developing risk knowledge and awareness through the incorporation of freely accessible and digitally interactive education, information, and awareness tools. However, this should be approached with an understanding of the sources of information that people trust, and be seen potentially as a tool to facilitate the in-person communication that emerged as being of key importance in the study.

It is also clear that in spite of the high levels of mobile phone ownership and access to the internet as well as broadcast media, warnings are not currently reaching everyone, indicating gaps in current communication strategies which put marginalised people at greater risk.

Understanding not only what sources of information are accessible to women and marginalised gender groups, but which of these sources are trusted, is central to the effectiveness of communicating with the partner community about the NbS – for example, the study did not find TV or radio to be sources of information that were well trusted. This indicates the importance of building relationships with the partner communities as a vital and first step in communicating information as issuing information via any channel in isolation is likely to be ineffective.

Related to this are the findings in the study about the differences in how flood risk management officials and people living with flood risk perceive the governance of the system, with officials generally reporting that the system currently works well for everyone, while marginalised and vulnerable people did not feel that the system met their needs well. This is also reflected in the gap between the types of information that respondents in the study said that they need, which was varied and detailed, and types of information currently provided, which is very limited.

This highlights the importance for the NbS work to create opportunities for direct engagement with marginalised gender groups within partner communities, and to create feedback loops for that engagement to be continual. Meaningful dialogue and uptake of feedback are vital to facilitate ongoing development and improvement of the design, implementation, and adaptation of both the FEWS and NbS that will be relevant to the different needs within these communities, to the social context and dynamics of vulnerability and marginalisation in Baguio city, and effective in addressing them. Feedback loops are important to gauge the extent to which the NbS are successful in this, and in supporting the scaling-up and replication of effective and impactful practices.

# 6 CONCLUSIONS



**Image caption: Boy carrying belongings in the flood, Philippines**
Source: Asian Development Bank

The global and national literature highlights the relationship between gender, inequality and marginalisation, and differential experiences of flood risk, including of flood early warning. Primary quantitative and qualitative data analysis from Baguio emphasised the differential experiences and risks faced in managing and responding to flood risk across the city. Key spheres for gender and inequality informed analysis include: in consideration of vulnerability and impact; in risk knowledge; in monitoring and warning; in communication and dissemination; in preparedness; in evacuation; in evacuation facilities; in post-event relief and longer-term recovery, and in governance and participation. Key conclusions from each of these areas will be summarised below.

## 6.1 VULNERABILITY AND IMPACT

Gender alone does not seem to be a key driver of vulnerability and impact. A key area of vulnerability emphasised in the dataset is the vulnerability of people with caring responsibilities, especially lone parents with multiple children, elderly carers, and carers with multiple axes of vulnerability, for example disabled grandparents looking after grandchildren. Several interviewees felt that people with chronic disabilities were prioritised in current planning, though the research highlighted the vulnerability of those with temporarily impaired capacity, where a co-parent is away, or a family member ill, where a family's requirements for assistance are higher than was foreseen.

When considering vulnerability, we also need to reflect upon the gaps in our data. The research identified groups who were hard to reach, and the difficulties our research team encountered in either reaching these groups or in finding intermediaries who closely work with these groups, underscores their marginalisation and vulnerability. Groups who our researchers were unable to engage with include homeless people, and people with learning disabilities who are isolated from governmental or community support networks.

The importance of social capital or social connectedness in the existing EWS came across very clearly throughout the research, highlighting the likely vulnerability of those who cannot pull upon such social connections. This is likely to include those who are vulnerable to discrimination or ostracisation, minorities who may fear harassment and judgement and cannot confidently call upon social connections.

We also need to consider the lower social connectedness of people who are immigrants to Baguio, including migrant workers and students. The research highlighted the role of in-person communication in providing early warning, and the role of connections and extended family in providing options in temporary shelter – aspects that will not be immediately accessible to new-comers to Baguio. Where new-comers also fall into some of the categories outlined above (single parents, elderly carers, groups who are marginalised or at risk of discrimination) we would expect additional vulnerability. This group was also unable to be reflected in our research (see section 3.6 for details).

Baguio's EWS needs to ensure plans and approaches work effectively for those who are more vulnerable. Some consideration has been made of groups like chronically disabled or pregnant people, but additional consideration needs to be made of carers, single parents, and those whose circumstances have recently or temporarily changed. In terms of social connectedness, building on existing community connections is likely to be positive for a majority who value in-person engagement from community leaders. However, additional parallel pathways need to be prioritised, to ensure the system works effectively for those with less social connectedness, whether that is through group identity (some minorities are likely to have less trust in and access to community leaders) or whether that is through circumstance (migrant workers and newly arrived students will not be able to draw upon social connectedness).

## 6.2   RISK KNOWLEDGE

At a city-wide and system level, given the mobility and fluidity of the population, efforts will be needed to ensure city and Barangay level information on population exposure and vulnerability is updated. Where population location and characteristics are dynamic, past knowledge on flood impact will not guide future flood risk, and this dynamism needs to be built into the system.

At an individual level, there are a wide number of gaps in risk knowledge. Individuals had a poor understanding of the relationship between weather forecasts, current rainfall and flood risk, resulting in miscalculation of risk. Individuals underestimated the speed at which situations became unsafe, or the risks of waiting to see flood water before taking action. This highlights both a need to improve education on flood risk, as well as a need to ensure communication is understandable and utilises simple concepts that people are already familiar with that relate to people's experience of hazards i.e. floods, rather than more abstract weather phenomenon or technical terms like storm surges.

The issue of experience-informed knowledge is relevant in Baguio. Those individuals who had personal experience of flooding used such experience to inform future action. In parts of Baguio that are not regularly flooded, or amongst immigrant (to the city) populations, the likelihood of drawing upon experience-informed risk knowledge is lower. Consideration could be given to different ways of sharing stories of people's experiences of floods, enabling more people to benefit from experience-informed action.

In terms of knowledge of flood risk mapping, there were gendered differences in how much women had participated in flood risk mapping, and also in how useful they had found it, highlighting the importance of ensuring trainings and risk mapping are targeted to meet people's information needs. Given the dynamism

of population within Baguio, there is also a need to ensure risk information sharing, training or education is frequent enough to upskill all in the city, including temporary residents. The research also highlighted people's willingness to receive additional flood risk and preparedness education, a positive that will facilitate uptake.

The research highlighted clear links between a lack of risk knowledge, and poorer decision making, preparedness and flood response, so efforts to enhance risk knowledge should be a priority within the Baguio FEWS.

## 6.3    MONITORING AND WARNING

The research highlighted a potential gap between key informants, a majority of whom felt the current period of early warning was sufficient, and respondents who highlighted a range of preferences for early warning lead time. There was also a conflation of early warning at a preparedness stage, and of instructions to evacuate, with limited prioritisation of the former. Combined with low levels of risk knowledge (as discussed above) the current early warning lead time was not leading to effective preparedness and early action.

Baguio's city FEWS needs to consider clear preparedness communications to be triggered in advance of the point of evacuation, and also needs to consider allowing different evacuation lead times for individuals with different evacuation preferences. The current system appears to default towards a one-size fits all approach to the timing of flood warnings and instructions to evacuate. Informed by different response activities, especially for those who intend to make two evacuation journeys (for example one with young children and another for retrieving key supplies), EWS would do well to enable multiple rounds of early warning. Ideally these rounds of early warning would communicate how long people have to complete safe evacuation, and the point at which evacuation is likely to become more dangerous. This more sophisticated approach to early warning lead time also needs to link to both risk knowledge and preparedness planning, people need to be supported to think through in advance what steps they will need to take, how long each step would require, and the necessary point in the early warning to commence those steps.

There is also a need to distinguish more clearly between generic weather forecasts (that provide likely rainfall information but are not tailored into potential impacts), to preparedness warnings, where people are informed of the need to take preparedness actions but not to evacuate, and evacuation prompts, where people are warned to evacuate, with the latter divided according to people's different evacuation journeys.

The early warning lead times, and thresholds and triggers within the Baguio FEWS need to be co-designed between those who understand the physical and meteorological hazard, and those who understand social aspects including the actions to be taken. This co-production needs to occur at the design stage, and there also need to be feedback loops and consultations at regular intervals, ensuring the FEWS triggers and thresholds meet user needs.

Early warning triggers also need to take account of non-physical phenomenon, for example time of day or time of year. For example, a flood event expected to start at 4am would need different lead times to enable effective and safe early action in the daylight, than a flood event expected to start at 8pm. Likewise, an event likely to occur during a period of mass population movement (e.g. a festival) or at a time of shifting population dynamics (e.g. the week new students arrive in Baguio) would need greater lead time to enable effective early response. This highlights the importance of having well-informed people involved in the monitoring of thresholds and the triggering of early warning, not relying purely on physical and static thresholds and triggers.

## 6.4    DISSEMINATION AND COMMUNICATION

The research highlights that warnings are not reaching everyone, with many individuals first being aware of flooding when the water entered their home. It also highlighted the mismatch between weather forecasts and flood early warning; a number of individuals had been aware of a generic weather forecast communicated through media channels, but had not translated this into appreciation of flood risk.

The Baguio dissemination and communication system needs to be clear what is being communicated, when and by whom. At present the emphasis seems to be on one-size fits all instructions to evacuate delivered in-person by community leaders. This system has strengths and is positively received. However, it applies a standardised evacuation timing, which may be too late for vulnerable individuals, particularly those planning two evacuations, and may be too early for individuals who perceive themselves to need less early warning. Key informants tended to interpret those refusing to evacuate at the default designated time as stubborn or uncooperative and to incline towards a stick approach to compliance (intimidating people through police run loudspeakers). A more effective and nuanced approach could acknowledge that people have different preferences for evacuation timing, and focus on making sure people are aware of the likely safe window of completing evacuation that they have available, are enabled to take as many non-committal preparedness actions as they can in advance of starting evacuation, are clear and practised on where they will go and when they would leave, and are aware of the risks and dangers of late response.

The strengths of the current in-person and house-to-house dissemination approach are clear, in aligning with majority preferences on receiving in-person warning. At the same time, the in-person house-to-house approach may not align with the above description of the need for multiple rounds of warnings enabling individualised early response. As the system evolves, the emphasis on in-person communication needs to not become a blockage to the evolution of a more nuanced people-centred dissemination system. Multiple-channels of early warning can be valuable, rather than putting all investment into one approach.

From a media perspective, a number of respondents received weather information from TV and radio, but this was not translated into flood preparedness or flood early warning messaging. Collaboration between the FEWS and media outlets can enhance the utility of media dissemination, working with media outlets to disseminate flood early warning guidance as well as weather information.

A number of key informants highlighted the value of social media, including references to a FEWS Facebook page. Community respondents did not similarly value social media driven communication, so social media alone should not be seen as a panacea. However, the sample in this research did not significantly capture views from young people, or from the student population, so additional outreach with these groups can verify the utility of social media for reaching younger groups.

Mobile phones were accessible to the vast majority of respondents, highlighting this as a channel that could be useful in addition to in-person dissemination. Co-development and piloting of dissemination channels and messaging would be critical to ensure messages are understood and can be acted upon. Again, the importance of multiple co-existing communication channels is important, noting that some groups are unable to access particular channels, for example in this research, there were a number of people over the age of 55 who did not have access to a mobile phone.

The current system of in-person dissemination relies on strong social networks, and strong trust with community leaders. This assumption seems to hold for the majority. However, there will be groups within Baguio who have lower connections with community leaders, who are less known and understood by community leaders, or who have distrust of these authorities. Especially for minority groups who are hidden, who are disenfranchised or at risk of discrimination, communication channels faced on in-person delivery are likely to be less appropriate. The system can design a multi-track approach that embraces the benefits of in-person communication by community leaders, whilst also recognising that that approach will not work effectively for all people.

In terms of information needs, priorities included knowledge on how severe a flood might be, where a flood would occur and when a flood would occur. This information is more detailed than a simplistic 'evacuate' or 'don't evacuate' instruction. Those designing early warning messaging can consider how to effectively communicate these three pieces of information, enabling people to make risk-informed decisions. Those designing the early warning communication need to work closely with those responsible for flood monitoring and warning, co-developing an approach that enables the delivery of those three crucial pieces of information. Aligned with the request for earlier lead times, the system will need to consider the aspects of decision making under uncertainty. The greater the lead time, and the more sophisticated the communication, the more people will need to understand and gain comfort with the concept of taking decisions in advance of certainty, an issue that can be considered in components on communication and dissemination, as well as in preparedness and in public education.

As dissemination and communication systems evolve from very simple 'evacuate now' or don't messaging into something more nuanced, it is important to pre-design the communications, rather than leaving it to an individual during a crisis. Standard Operating Procedures for Flood Early Warning dissemination and communication can pre-design a series of communications to accompany different timings, severities or scenarios. These can be tailored to update information on the specific timing, location and severity of an event, but draw upon some standardised pre-tested wording to ensure the communications are understandable and actionable.

Language of communication was not significantly emphasised by respondents in this research, however, consideration of the language requirements of all residents (including temporary residents) of Baguio will be critical. If the FEWS prepares a series of communication statements in advance, this presents the opportunity to test out the understandability of different wordings, as well as getting input into any language barriers or minorities within the city. Any effective dissemination and communication component has a variety of feedback mechanisms built-in, enabling people to feedback during preparatory phases – this could include having periodic city-wide communication practice drills, sharing example communications and seeking feedback on the clarity and usefulness of the messaging. Additionally, after action reviews after any significant weather event can seek feedback on the utility of early warning communications, including any challenges with the understanding. A city can also invest in ongoing outreach, periodically taking draft communication messages to particular minority groups who are anticipated to have different communication needs, and checking their understanding of that messaging.

## 6.5    PREPAREDNESS

Community leaders were reported as a key source of preparedness advice, presenting an opportunity to enhance the quality and specificity of preparedness advice shared through this route. Aside from generic advice to evacuate, a low proportion (about a fifth) had received additional pieces of preparedness advice, highlighting the need for a greater focus on preparedness. Individuals need to know the activities they can take ahead of time, to reduce their risk and ensure a safer evacuation. Key informants reported individuals asking about evacuation routes and evacuation facilities at the point of evacuation, highlighting the ineffectiveness of preparedness planning or practice. Several respondents found evacuation routes unsafe or precarious, or encountered physical obstacles along their chosen evacuation route.

Preparedness drills can ensure individuals know and have walked their safest evacuation route. Preparedness training also prompts consideration of how their preferred route could be compromised in different flood and rainfall scenarios, consideration of how they would navigate that route at night-time or whilst assisting dependents, family members or neighbours with assistance needs. Preparedness also needs to emphasise alternative plans in scenarios where their response capability is different, due to the absence, injury or sickness of key individuals.

An emphasis on timing is also important. Many respondents appeared to be taking preparedness actions immediately before evacuating, missing an opportunity for earlier action. Preparedness planning can help individuals plan their key actions, the sequence and timing of preparedness actions, as well as planning in advance how they will get themselves, their critical supplies and their dependents safely to a temporary shelter. Where mass late evacuation places impossible strain on emergency services and first responders, clearer public communication can articulate this strain, communicating the consequences of overwhelming emergency services and the reasons why timely evacuation is vital to the effective functioning of the city during a flood.

It is also important to bring decision-making under uncertainty into preparedness planning. If individuals only take action at the point that flooding is certain, that will reduce their options for safe response. People can take better decisions under uncertainty if they understand the chances of different scenarios, the likely window for safe evacuation, the risk of late evacuation and options for taking low-regret early action, such as packing evacuation supplies, safely storing away important documentation or pre-positioning blankets or cooking materials in a temporary shelter.

## 6.6 EVACUATION

A number of issues contributed towards challenges in evacuation. People were taking a decision to evacuate too late, related to poor understanding of risk, resulting in dangerous evacuations. People, and especially single parents, were evacuating twice, with the second evacuation occurring under unsafe circumstances, due to the challenges of evacuating with children and with critical supplies. Some interviewees had wanted to evacuate earlier, but found officials did not want to open evacuation centres until flooding was underway. The one-size fits all approach to evacuation timing left some with insufficient time to evacuate, and left others, who wanted to evacuate later, to dismiss evacuation warnings entirely until flooding commenced.

Previous research from across the Philippines highlights the particular barriers to evacuation faced by individuals at risk of discrimination or harassment, and so particular care is needed in ensuring safe spaces for minorities facing social ostracisation. Respondents to this research did not share experiences or fears of discrimination during evacuation, but this issue should nevertheless be considered, especially given the limitations in this dataset (as described in section 3.6). Likewise, concerns over safety and security will need to remain a priority, given existing evidence of higher rates of gender-based violence during disasters, with marginalised minorities including adolescent girls and disabled women likely to have additional barriers to speaking up.

Poverty was also mentioned as a barrier to evacuation, especially for individuals without enough savings to forego a day's work. For individuals living in poverty, the consequences of early evacuation in terms of lost income may outweigh the benefits, a consideration that needs to be built into the design of evacuation strategies. The design of the evacuation strategy should also consider the incentives and fears of people whose homes also are the location of their home-based livelihood. Home-based livelihoods can be gendered, and are a consideration that needs to be included in the design of an evacuation strategy, understanding the reasons why some individuals may have more to lose and more disinclination to early evacuation.

Not wanting to leave pets or livestock was another barrier to timely evacuation for some interviewees. Whilst pets likely could not be hosted in communal shelters, a fit for purpose system needs to understand people's motivations, and seek to minimise barriers to effective timely evacuation. Engagement with communities on challenges like how to ensure the safety of pets may give rise to solutions that are not currently apparent. Public engagement can ask people what are their barriers to timely evacuation, and work with communities to come up with solutions, whether that is advice on the safest ways of leaving pets in a house, or helping families identify host households who could temporarily take on pets during a flood.

Other individuals highlighted the problems faced when the capacities they had expected to have, were not present at the time of an evacuation. There are many reasons why expected capacity is not available, for example other family members being temporarily away from home, family members being sick or injured at the time of an evacuation. Existing prioritization of evacuation assistance appeared to centre on those who are deemed chronically vulnerable, such as people with long-standing mobility related disabilities, and there appeared to be few mechanisms for communicating unexpectedly lower capacity or flagging the need for additional assistance. Evacuation plans, including the allocation of evacuation assistance, needs to be dynamic enough to respond to needs at the time of the flood warning. Individuals need to be aware of what assistance could be available, and there need to be clear channels and ways to flag requests for assistance. This method of requesting assistance needs to be understood by and accessible by all, without relying purely on personal connections and existing social capital.

## 6.7   EVACUATION FACILITIES

Respondents noted a number of challenges to existing evacuation facilities, mentioning inadequate WASH facilities, and challenges related to overcrowding, privacy and safety. For some respondents' negative past experiences discouraged evacuation to communal shelters, and such individuals preferred to find alternative arrangements, including looking for host families or staying with extended family. These alternative arrangements were particularly valued by marginalised families, including single parents and disabled parents, with concerns about keeping their children safe and supervised at communal evacuation facilities. Interviewees drew on existing social connections to find alternative arrangements – an adaptation that enabled them to avoid communal shelters. This raises a question about the coping mechanisms of parents who are in a similar situation, but without the social connections or extended family to draw upon. In many interviews the reliance on informal and social connections was emphasised, suggesting a need for additional outreach and support to individuals who are in any way excluded from social connections, including individuals at risk of stigma, and new migrants to the city.

A number of evacuees experienced discomfort during extended stays in evacuation shelters, sleeping on cold hard floors. This discomfort was bearable for most, but some interviewees worried about those who are sick or weak, or people with chronic health conditions. The lack of comfort and warmth in evacuation centres incentivised people to return to their houses to fetch blankets or mattresses during high risk flood periods. People also returned to houses to collect cooking utensils and basic bowls for eating. Preparedness plans could better anticipate people's needs whilst at evacuation shelters and work with communities to co-

design alternative solutions. Potential solutions could include providing designated transport for carrying essential supplies to evacuation shelters; enabling families to securely pre-position critical supplies at a shelter before evacuating people, or providing centralized supplies of food, cooking implements, blankets or spare clothes at shelters; or a combination of strategies. Co-development of solutions that suit the needs of vulnerable groups like single-parents with children are critical.

A number of families undertook two evacuations, one to take their children or any family members with additional needs, and a second to secure essential supplies. To avoid the risk of such individuals taking the second evacuation too late, evacuation shelters could open to evacuees earlier, in advance of the start of flooding. This could perhaps include the provision of short-term child-care options, to enable people to undertake a second evacuation with supplies at an earlier and safer time whilst leaving their children safe in the evacuation shelter.

## 6.8    POST-EVENT RELIEF AND LONGER-TERM RECOVERY

A number of concerns were raised about the current process for identifying needs or for allocating relief supplies. Within evacuation shelters, lists are commonly drawn up of vulnerable people. Questions were raised about how such lists were drawn up, who lists were shared with, and whether public lists could undermine vulnerable people's right to privacy, and potentially dis-incentivise vulnerable or marginalised people from speaking up. Questions were raised about the eligibility criteria for relief, and whether the criteria were truly inclusive, including to people who are not living in traditional family units for example LGBTIQ+ individuals. Questions were also raised about equity in relief allocations. A number of interviewees were concerned that eligibility for relief was being allocated only to those staying in evacuation shelters, potentially discriminating against people who felt unable to stay in shelters, whether out of safety concerns or because the shelters did not meet their specific needs, especially for people with children or disabled people.

In terms of longer-term impacts, there were a number of indications that those who are already marginalised going into a flood scenario, can be impacted more deeply, with impacts carrying forward into longer-term consequences. In some cases, these consequences can be multi-generational, where adolescents end up dropping out of education early. A concern for longer-term recovery, as well as a concern for equality and justice, prompt a focus not just on the average experience of being impacted by floods, but on the experiences of those who were marginalised, poor or vulnerable before being flood-impacted.

## 6.9   GOVERNANCE AND PARTICIPATION

There were generally high levels of confidence in community leaders and authorities, though gaps in governance were highlighted, particularly in terms of the capacity of authorities to fulfil the roles expected of them, and in terms of the investment to ensure that capacity. There were also governance gaps in terms of feedback loops, accountability processes and opportunities for community engagement into the system. Across the above components there are a number of areas where enhancements to the FEWS need to be co-designed, with conversations between city authorities and varied residents, yet the process or mandate for such co-development may not yet be in place. Roles and responsibilities across the EWS could also be clearer, especially in terms of public education on preparedness, on practicing for response, and on risk knowledge. After action reviews after a flood event can also be an important opportunity to take stock of how well the system met the needs of all residents. Within an EWS that aspires to leave no one behind, there needs to be proactive mechanisms for listening to the experiences of those at the margins, rather than just aiming to understand the average level of satisfaction in the current system.

The understanding and attitude of some individuals within positions of authority in the system could be a barrier to action. A number of key informants felt that authorities already understood the needs of everyone and suggested that therefore diverse participation in design and decision making was simply not necessary. It is important to acknowledge that individuals have diverse vulnerabilities, needs, levels of education, levels of access to social connections, levels of trust in authorities, levels of risk tolerance, and many other areas of diversity that affect their decision making and ability to respond effectively to an early warning. Whilst authorities may feel there is common understanding of the average experience, this does not mean that there is understanding of every experience, and the inclusion of more diverse perspectives in design and decision making can be a critical part of ensuring the system works for everyone.

A number of key informants did not see the need to consider gender or marginalisation, despite the research highlighting a number of areas where gender and marginalisation significantly affected people's experiences. In some cases, traditional or patriarchal attitudes towards gender roles were highlighted, attitudes that can limit opportunities for women or gender minorities being welcomed into leadership or less traditional roles within the EWS. Within a gender transformative EWS every individual should have opportunity to contribute their skills, knowledge and abilities, without being held back by gendered norms or expectations.

A number of key informants had confidence that the current system was already working well for all, a confidence that was not borne out in the research. This highlights a number of likely governance challenges. This mismatch in perception may be a result of the lack of feedback mechanisms, of a lack of evaluation of how the current system works for those with additional needs or additional areas of marginalisation. This mismatch may also be a feature of the more marginalised being less likely to have trust or confidence in providing in-person feedback on the failings in the current system. Building trust cannot happen overnight, but it is important to start by communicating that the system aspires to protect all, followed by communication that authorities in the system genuinely want to receive feedback, alongside safe channels to do so.

Closer community engagement across diverse areas of the system is likely to have multiple benefits, raising understanding of flood risk, raising awareness of how flood warnings are developed and what they mean, and raising trust in responding to early warnings. Greater co-development and co-design of what to monitor, what to communicate, how to support safe timely evacuation, how to minimise barriers to early action, will have dual benefits. From a community perspective it is likely to improve the usefulness of the EWS, and from a city government perspective, it is likely to improve the effectiveness of the flood response. Co-design is an important aspect of a people-centred EWS, that can be considered as an important ongoing component of the system, not just a consideration in the early stages of setting up or improving an EWS. A more effective people-centred EWS will directly translate into more people being able to take effective early action, reducing risk, saving lives and resources, and reducing flood related impacts.

## 6.10  NATURE-BASED SOLUTIONS

This study found a number of gendered needs and priorities for early warning which can be usefully applied to the development of NbS in Baguio city.

Firstly, marginalised gender groups are found to be affected by gaps in risk knowledge. There is an opportunity for the NbS to support the development of risk knowledge and understanding among marginalised gender groups, linking information about the solutions themselves to the risks they are designed to address, and to create opportunities for marginalised groups to actively participate in the identification and mapping of local flood risk, and of the factors which may drive changes to the location and severity of risk.

At the same time, the NbS work should consider the gendered differences in the types of risk information that individuals hold. Different gender groups hold different types of knowledge about the ecosystems in which the solutions will be developed and implemented; risk knowledge should therefore be considered as a potential capacity of women and marginalised gender groups as well as an area of gendered vulnerability.

Another key finding of the study is the importance of diversity in communication. The NbS should include a range of communication and dissemination strategies to ensure that marginalised gender groups are not excluded through the reliance on one channel or type of communication. Understanding not only what sources of information are accessible to women and marginalised gender groups, but which of these sources are trusted, is central to the effectiveness of communicating with the partner community about the NbS. Mobile phone and internet access levels are high, indicating a strong potential to use these platforms as a tool to facilitate the in-person communication that emerged as being of key importance in the study. The study did not find TV or radio to be sources of information that were well trusted, indicating the importance of building relationships with the partner communities as a vital and first step in communicating information, as issuing information via any channel in isolation is likely to be ineffective.

Related to this are the findings in the study about the differences in how flood risk management officials and people living with flood risk perceive the governance of the system, with officials generally reporting that the system currently works well for everyone, while marginalised and vulnerable people did not feel that the system met their needs well. This is also reflected in the gap between the types of information that respondents in the study said that they need, which was varied and detailed, and types of information currently provided, which is very limited. This highlights the importance for the NbS work to create opportunities for direct engagement with marginalised gender groups within partner communities, and to create feedback loops for that engagement to be continual and facilitate ongoing development and improvement of the design and implementation of NbS that will be relevant to the different needs within these communities and effective in addressing them. Feedback loops are important to gauge the extent to which the NbS are successful in this, and in supporting the scaling up and replication of effective and impactful practices.

# 7 APPENDICES



**Image caption: Boys sorting through belongings**
Source: Asian Development Bank

# APPENDIX A: KEY INFORMANTS AND MISSING VOICES INTEVIEWEES

Missing voices interviewees included people experiencing a wide range of axes of marginalisation, including individuals marginalised in multiple intersecting ways. Interviewees including those who experienced flooding as adolescents girls, those who experienced flooding as a child when separated from parents, a lesbian grandmother, a gay youth, a disabled grandmother, members of ethnic minorities, people living in informal settlements, low income families in rental accommodation, a person living with HIV/AIDS, religious minorities, elderly widows, single parents, those with young children at the time of flooding, a woman who was pregnant during evacuation and went into labour during the period of flooding, carers for disabled children, More precise details of each missing voice interviewee are not shared, to maintain our duty of care and commitment to anonymity.

## KEY INFORMANTS

Key informants included perspectives from people working in Baguio's Disaster Risk Management Office, those working at the City Social Welfare and Development Office, at the Philippine Commission on Women, Local government officials (Barangay Captains) and members of a local Church and Mosque.

# APPENDIX B: QUANTATITIVE ANALYSIS

## UNDERSTANDING IMPACTS
QD Tables 6 – 9

**(QD6) Quantitative data analysis results table 6: Significant demographic factors relating to housing impacts of flooding**

| Housing damaged or destroyed | Odds Ratio | Standard Error | t-statistic | p-value |
|---|---|---|---|---|
| Gender | 0.6623568 | 0.40291 | -0.68 | 0.498 |
| Age | 1.11521 | 0.129373 | 0.94 | 0.347 |
| Ethnicity | 0.6960342 | 0.166642 | -1.51 | 0.13 |
| | | | | |
| Language | | | | |
| Aplai | 1 | (empty) | | |
| Ifugao | 1 | (empty) | | |
| Ilocano | 0.2721674 | 0.23762 | -1.49 | 0.136 |
| Kankana-ey | 0.3251968 | 0.426697 | -0.86 | 0.392 |
| Tagalog | 0.6646648 | 0.656314 | -0.41 | 0.679 |
| Dual fluency | 1 | (omitted) | | |
| | | | | |
| Number of cohabitants | 1.750778 | 0.889323 | 1.1 | 0.27 |
| Number of generations in household | 0.3634353 | 0.243318 | -1.51 | 0.131 |
| | | | | |
| Employment status | | | | |
| Employed (informal economy) | 0.1621868 | 0.159474 | -1.85 | 0.064* |
| Unemployed | 0.2805267 | 0.309478 | -1.15 | 0.249 |
| Retired | 0.0570997 | 0.065691 | -2.49 | 0.013** |
| Other | 0.0082867 | 0.018188 | -2.18 | 0.029** |
| | | | | |
| Housing ownership type | 0.8057041 | 0.596851 | -0.29 | 0.771 |
| | | | | |
| Housing construction type | | | | |
| Light materials/wood | 12.86105 | 10.52841 | 3.12 | 0.002*** |
| | | | | |
| Highest level of education | | | | |
| Secondary | 0.2450727 | 0.323564 | -1.07 | 0.287 |
| Tertiary | 0.1218311 | 0.16041 | -1.6 | 0.11 |
| | | | | |
| Marital status | 1.432421 | 0.463969 | 1.11 | 0.267 |
| Disability status | 3.854853 | 4.298467 | 1.21 | 0.226 |
| Mobile phone access | 2.903059 | 5.252881 | 0.59 | 0.556 |
| Internet access | 1.49485 | 0.759566 | 0.79 | 0.429 |
| | | | | |
| Constant | 15.75396 | 54.38847 | 0.8 | 0.425 |

N=107, R2=0.2935

*,**,and *** denote the statistical significance at 10%, 5%, and 1% respectively

**(QD7) Quantitative data analysis results table 7: Significant demographic factors relating to relocation impacts of flooding**

| Had to relocate | Odds Ratio | Standard Error | t-statistic | p-value |
|---|---|---|---|---|
| Gender | 0.6575981 | 0.335078 | -0.82 | 0.411 |
| Age | 0.9189743 | 0.083349 | -0.93 | 0.352 |
| Ethnicity | 0.9415189 | 0.14236 | -0.4 | 0.69 |
| Language | 1.274157 | 0.236514 | 1.31 | 0.192 |
| Number of cohabitants | 0.6787002 | 0.263529 | -1 | 0.318 |
| Number of generations in household | 2.050241 | 0.89992 | 1.64 | 0.102 |
| Employment status | 0.7409722 | 0.203141 | -1.09 | 0.274 |
| Housing ownership status | 1.042822 | 0.683294 | 0.06 | 0.949 |
| Housing construction type | 1.699916 | 0.937471 | 0.96 | 0.336 |
| Highest level of education | 1.631753 | 0.644084 | 1.24 | 0.215 |
| Marital status | 1.00963 | 0.241803 | 0.04 | 0.968 |
| Disability status | 1.73099 | 1.64558 | 0.58 | 0.564 |
| Mobile phone access | 1 | (omitted) | | |
| Internet access | 1.31596 | 0.5154 | 0.7 | 0.483 |
| | | | | |
| Constant | 0.0617461 | 0.146247 | -1.18 | 0.24 |
| N=107, R2=0.1014 | | | | |

**(QD8) Quantitative data analysis results table 8: Significant demographic factors relating to education or livelihood impacts of flooding**

| Education or livelihood affected | Odds Ratio | Standard Error | t-statistic | p-value |
|---|---|---|---|---|
| Gender | 1.09798 | 0.6350596 | 0.16 | 0.872 |
| Age | 0.9960407 | 0.1056096 | -0.04 | 0.97 |
| Ethnicity | 0.9229761 | 0.1635665 | -0.45 | 0.651 |
| Language | 1.110505 | 0.2395303 | 0.49 | 0.627 |
| Number of cohabitants | 0.7629806 | 0.3322941 | -0.62 | 0.535 |
| Number of generations in household | 1.180082 | 0.6214216 | 0.31 | 0.753 |
| Employment status | 0.832332 | 0.2646569 | -0.58 | 0.564 |
| Housing ownership status | 2.322966 | 1.535456 | 1.28 | 0.202 |
| Housing construction type | 0.7830397 | 0.5082515 | -0.38 | 0.706 |
| Highest level of education | 1.18855 | 0.554333 | 0.37 | 0.711 |
| Marital status | 0.7761819 | 0.2142286 | -0.92 | 0.359 |
| Disability status | 2.290007 | 2.112175 | 0.9 | 0.369 |
| Mobile phone access | 0.2149048 | 0.2810809 | -1.18 | 0.24 |
| Internet access | 0.9768091 | 0.4532449 | -0.05 | 0.96 |
| | | | | |
| Constant | 1.864195 | 6.089167 | 0.19 | 0.849 |
| N=107, R2=0.0804 | | | | |

**(QD9) Quantitative data analysis results table 9: Significant demographic factors relating to relocation impacts of flooding**

| Received preparedness advice | Coefficient | Standard error | t-statistic | p-value |
|---|---|---|---|---|
| Gender | -0.10453 | 0.120944 | -0.86 | 0.392 |
| | | | | |
| Number of generations in household | | | | |
| 2 | 0.771455 | 0.342176 | 2.25 | 0.029** |
| 3 | 0.611027 | 0.402257 | 1.52 | 0.135 |
| 4 | 0.823438 | 0.412539 | 2 | 0.052* |
| | | | | |
| Internet access | | | | |
| 2 sources of access | 0.6335 | 0.294246 | 2.15 | 0.036** |
| 1 source of access | 0.774167 | 0.283926 | 2.73 | 0.009*** |
| No access | 1.381021 | 0.380245 | 3.63 | 0.001*** |
| | | | | |
| Constant | -2.82554 | 1.104634 | -2.56 | 0.014 |
| Internet access | 1.31596 | 0.5154 | 0.7 | 0.483 |
| | | | | |
| Constant | 0.0617461 | 0.146247 | -1.18 | 0.24 |
| N=107, R2=0.1014 | | | | |

## RESPONSE CAPABILITIES

QD Tables 10 – 14

**(QD10) Quantitative data analysis results table 10: Significant demographic factors relating to receiving preparedness advice**

| Total sources of advice | Coefficient | Standard error (robust) | t-statistic | p-value |
|---|---|---|---|---|
| Gender | -0.03648 | 0.184477 | -0.2 | 0.844 |
|  |  |  |  |  |
| No. of generations in household |  |  |  |  |
| 2 | 1.326387 | 0.73218 | 1.81 | 0.076* |
| 3 | 1.414441 | 0.836849 | 1.69 | 0.097* |
| 4 | 1.82668 | 0.766127 | 2.38 | 0.021** |
|  |  |  |  |  |
| Employment status |  |  |  |  |
| Employed (informal economy) | -0.20703 | 0.255443 | -0.81 | 0.422 |
| Unemployed | -0.51552 | 0.251353 | -2.05 | 0.046** |
| Retired | -0.95373 | 0.528196 | -1.81 | 0.077* |
|  |  |  |  |  |
| Constant | -2.09528 | 1.847067 | -1.13 | 0.262 |
| N=107, R2=0.0804T |  |  |  |  |

*,**,and *** denote the statistical significance at 10%, 5%, and 1% respectively

Robust standard errors are used under conditions of heteroskedasticity of the data

**(QD12) Quantitative data analysis results table 12: Average number of problems reported by respondents during evacuation and at temporary shelter facilities**

| | Women | Men | Total |
|---|---|---|---|
| Average number of problems experienced | 3.2 | 1.64 | 2.38 |

**(QD13) Quantitative data analysis results table 13:  Ease of evacuation**

| | Women | Men | Total |
|---|---|---|---|
| Average score out of 5: Ease of evacuation | 3.85 | 3.54 | 3.71 |

**(QD14) Quantitative data analysis results table 14:  Sufficiency of provisions at temporary shelter facilities**

| | Women | Men | Total |
|---|---|---|---|
| Average score out of 5: Needs met at shelter facilities | 3.77 | 3.65 | 3.71 |

## GOVERNANCE

QD Tables 15 – 17

**(QD15) Quantitative data analysis results table 15: Average score for ease of contacting relevant authorities**

| Average score out of 5: Ease of contact | Women | Men | Total |
|---|---|---|---|
| | | 3.81 | 3.96 |

**(QD16) Quantitative data analysis results table 16: Average score for confidence in being listened to**

| Average score out of 5: Confidence in being listened to | Women | Men | Total |
|---|---|---|---|
| | 4.02 | 3.58 | 3.83 |

**(QD17) Quantitative data analysis results table 17: Priority actions for authorities to implement**

| Priority actions for effective early warning system | Women (%) | Men (%) | Total (%) |
|---|---|---|---|
| Preparedness actions | | | |
| Structural measures (e.g. drainage systems, canal construction) | 10 | 13 | 22 |
| Provide advice on preparedness actions | 22 | 28 | 24 |
| Provide information about local risk | 17 | 17 | 17 |
| Communicating early warnings | | | |
| Issue timely warnings | 40 | 38 | 39 |
| Provide warnings that are easier to access | 13 | 11 | 12 |
| Provide warnings that are easier to understand | 13 | 15 | 14 |
| Evacuation | | | |
| Transport and equipment for rescue/evacuation | 18 | 21 | 20 |
| Safe evacuation | 12 | 9 | 1 |
| Temporary shelter facilities | | | |
| Safe shelters: sufficient shelter facilities | 18 | 15 | 17 |
| Safe shelters: sufficient bathroom facilities, lighting, authorities present | 7 | 15 | 10 |
| Provide relief, e.g. food | 5 | 6 | 6 |

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**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.

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