

Understanding the concepts and principles behind the approach



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About this document

This document sets out some key concepts and principles underpinning the Flood Resilience Measurement for Communities (FRMC) approach. It includes discussion of important concepts and definitions, and answers frequently asked questions. It provides information on how the FRMC is used and why, and what it can and cannot do. This document refers to the second version of the FRMC, otherwise known as FRMC Next Gen, which became operational in 2018.

This document should be read with the **FRMC introductory document** (<https://floodresilience.net/resources/item/the-flood-resilience-measurement-for-communities-frmc>) and the **FRMC Glossary** (<https://floodresilience.net/resources/item/frmc-glossary>) for further information.



After the flood, Lima, Peru.
© Fidel Carrillo



What is the FRMC?

The Flood Resilience Measurement for Communities (FRMC) is a framework for measuring community flood resilience, with an associated process and tool for implementing the framework in practice. The framework consists of 44 indicators or 'sources of resilience' measured in normal/non-flood times and 29 post-flood variables measured after a flood occurs.

Developed by the Zurich Flood Resilience Alliance, the FRMC includes an approach for testing and

empirically validating the framework, and a technology-based data-gathering and evaluation tool for measurement and assessment of community flood resilience. The tool is a practical 'hybrid' software application comprising an online web-based platform for setting up the process and analysing results and a smartphone- or tablet-based app that can be used offline in the field for data collection.

Who designed the FRMC?

The first version of the FRMC was designed by the phase I (2013–2018) members of the Zurich Flood Resilience Alliance: Zurich Insurance Group, the International Federation of Red Cross and Red Crescent Societies (IFRC), the non-governmental organization (NGO) Practical Action, the International Institute for Applied Systems Analysis (IIASA), and the Wharton Business School's Risk Management and Decision Processes Center (Wharton) in the United States. Lessons learned in phase I informed the revision of the FRMC to FRMC Next Gen for phase II (2018–2023). Throughout the design, implementation, and redesign process the FRMC has been subject to numerous reviews from NGOs, multilateral organizations, and academic experts working in the sector.

The Zurich Flood Resilience Alliance is working on finding practical ways to help communities in developed and developing countries strengthen their resilience to flood risk. We focus on building ex ante flood resilience: flood prevention is cost-effective, but nearly 87 per cent of disaster-related aid spending goes into emergency response, reconstruction, and rehabilitation, and only 13 per cent towards reducing and managing risks before they become disasters.¹



ZFRA members participating in FRMC training © Practical Action

1 Kellett, J. and Caravani, A. (2013) Financing Disaster Risk Reduction: A 20-year Story of International Aid, Washington, DC: Global Facility for Disaster Reduction and Recovery (GFDRR) at the World Bank; London: Overseas Development Institute.

The need for resilience measurement

There has been both increased attention to resilience-strengthening in international humanitarian and development work, and an interest in its measurement and the overall accountability of 'resilience strengthening' initiatives. However, resilience measurement efforts to date have been limited in scope and context, particularly regarding flood risk. Currently there is no consistent way to measure resilience across different communities and over time.

Measurement provides the opportunity to learn which characteristics truly make the difference when it comes to resilience. Organizations want to develop a deeper understanding of resilience so that they are better able to orient investments and ultimately facilitate community development. Measurement is a critical part of this process. By measuring in multiple communities over time we can track how resilience is changing in response to programmes and policies.

The definition of community flood resilience

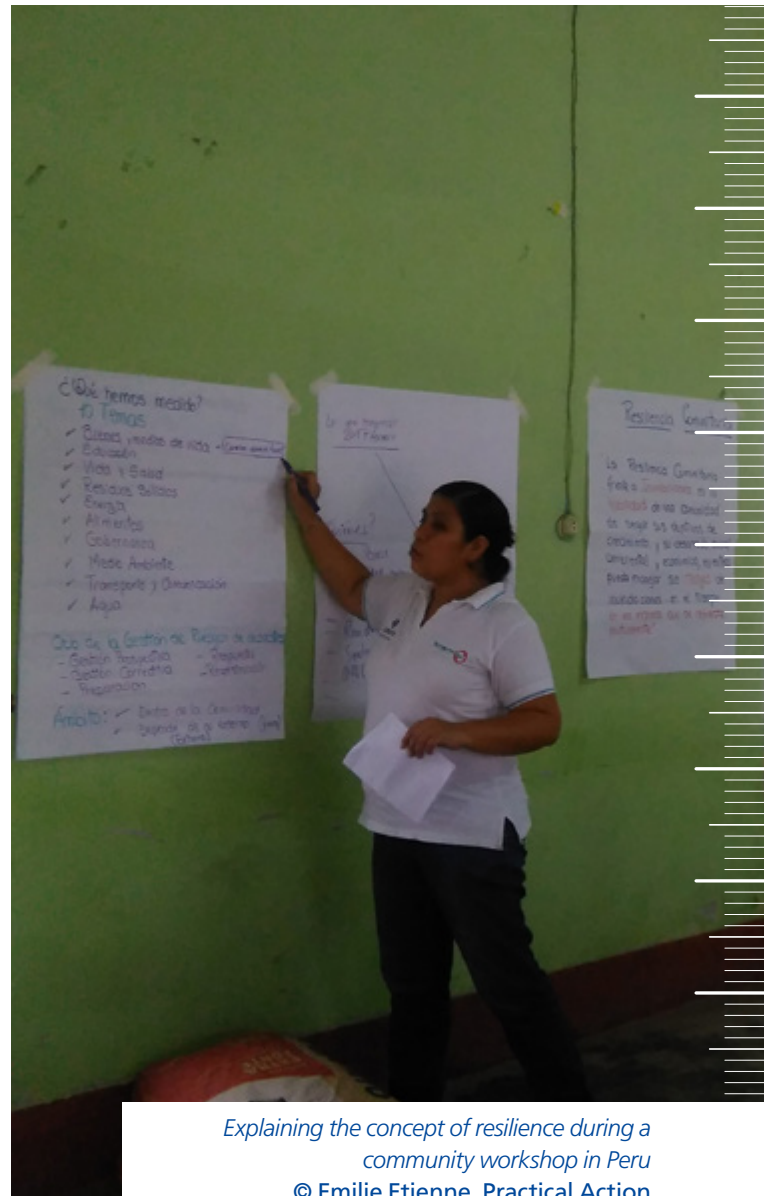
The Alliance defines **disaster resilience** as:

The ability of a system, community or society to pursue its social, ecological, and economic development and growth objectives, while managing its disaster risk over time in a mutually reinforcing way.²

Following and adapting from this, **community flood resilience** is defined as:

The ability of a community to pursue its development and growth objectives, while managing its flood risk over time in a mutually reinforcing way.

Thus 'resilience' is an outcome that ensures that a community can continue to thrive and develop in the face of flood risk. If a flood-prone community is resilient, its development will not be derailed by flooding.



Explaining the concept of resilience during a community workshop in Peru
© Emilie Etienne, Practical Action

² Keating, A., Campbell, K., Mechler, R., Magnuszewski, P., Mochizuki, J., Liu, W., Szoenyi, M., and McQuistan, C. (2017) 'Disaster resilience: what it is and how it can engender a meaningful change in development policy', *Development Policy Review* 35(1): 65–91 <<http://dx.doi.org/10.1111/dpr.12201>>.

Flood-focused

Resilience is context-specific and hence there is no one-size-fits-all solution to measuring resilience. Measurement needs to be specific and the FRMC specifically measures community level resilience to floods. Floods are one of the greatest perils globally and our Alliance members have extensive expertise in this arena.



Community members leaving village after early warning, Nepal. © Practical Action

Community-focused

We have chosen to focus on the community level because this is the level where flood impacts are felt most intensely, where much action on flood resilience needs to be taken, and the scale at which many NGOs and humanitarian organizations (including the Alliance members) primarily work.

For the purposes of the FRMC, a 'community' could be defined geographically (perhaps in rural contexts) or by administrative boundaries (which may work in more urban situations). However, no single

community will 'feel' like another and there may be cultural aspects to consider too. As a result, we have concluded that, in reality, a community largely defines itself.

It is important to note that measurement at the community level can support decision-making and advocacy at higher levels as well. Furthermore, community flood resilience measurement can also inform programming and initiatives for other threats faced by the community.

A systems-based approach

Understanding and building resilience requires 'systems thinking'. By this, we mean understanding all the different aspects of a particular issue and how those aspects are interdependent. Most work is not systems-based – it is sector specific. For example, roads are often built without thinking about how they will affect development in risk-prone areas, or considering how they will affect drainage and flooding. Systems thinking supports practitioners to see beyond the immediate issue and consider implications of interventions in light of other development objectives, disaster risk, and future trends. For example, a project to strengthen market access informed by systems thinking would strengthen market functioning and access for many decades to come.

Systems thinking considers interconnections. It is a powerful approach for understanding why situations are the way they are, and how to go about improving results. And it is critical in determining how systems function and reorganize when shocked or stressed.

The FRMC has been designed using a systems-based approach. The FRMC framework is holistic and integrated, and facilitates exploration of the interconnections between results. Users report that the process of implementing the FRMC builds staff capacity for systems thinking.

The framework and tool guide users to think deeply about the whole community system and the interdependencies within it (such as those shown in Figure 1). They also help users to visualize connections between systems at different scales (e.g. how the community links up to municipal and regional scales and down to household and individual scales). The FRMC helps users to identify connections to other aspects of resilience and the interdependencies which create those connections. Finally, it also helps users to think about how interventions and solutions can support more than just one element or source of resilience, and helps to identify intended and unintended consequences.



Figure 1 Hierarchy of systems in terms of their criticality for communities to survive and thrive
Source: ISET-International, www.i-s-e-t.org

How does the FRMC work?



FRMC capitals learning session,
Manuel Buelta y Rayón, Mexico
© Gustavo Sánchez, Red Cross Mexico

The FRMC consists of 44 indicators – so-called sources of resilience – that are measured in normal/non-flood times, and 29 post-flood variables measured after a flood event (discussed below). The framework underpinning the FRMC is the 5C-4R framework. The 44 sources can be grouped by the five complementary ‘capitals’ (5C) or by four properties derived from resilient system-thinking (4R). Both the capitals and resilience properties support thinking about the diversity of conditions needed to build capacity to avoid the creation of new risk, reduce existing risk, prepare for, withstand, and respond to shocks in a way that supports the community’s development objectives. Data is collected about each source of resilience, and trained graders use this data to assign a grade between A and D.

To use the FRMC, users log on to the web-based platform and set up a community study. They choose which data collection methods (household survey, focus group discussion, key informant interview, or secondary source data) they wish to use for each source of resilience, based on the community context. The system then sends surveys to field worker mobile devices for data collection. Once data is collected it is automatically uploaded to the web-platform where it is collated. Users who have been trained in assessment then use that data to grade the sources of resilience A–D. The system generates measurement results which users then use as inputs into flood resilience intervention decision-making. Results can be explored in multiple different ways via a ‘tagging’ system by which each source of resilience is coded to different lenses of analysis. Figure 2 summarizes the process of using the FRMC.

As a default, each capital group of sources is weighted equally (20 per cent of the final grade goes to each capital group). Within each capital group sources are also weighted equally. We have structured it this way because some capital groups have more sources than others. There is currently no empirical evidence to support a larger weight for any sources over others, although part of this programme is to explore this question. It is possible for users to define weights from 0 (effectively muting the source) to 1 for their own individual analysis later on.

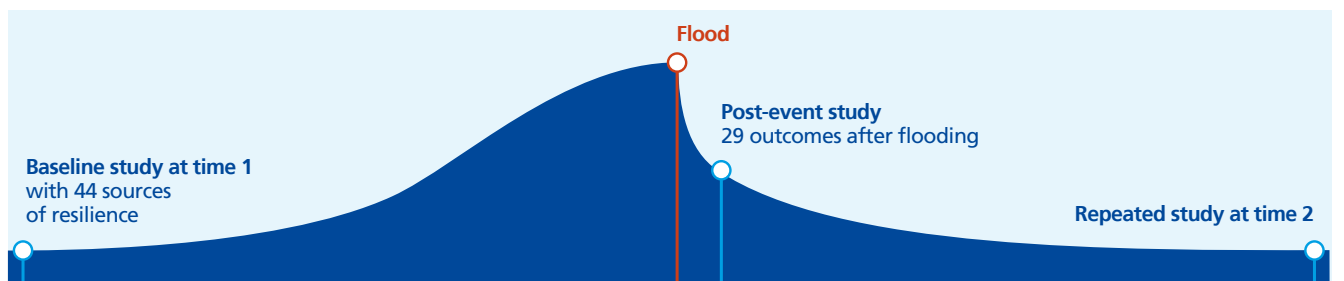
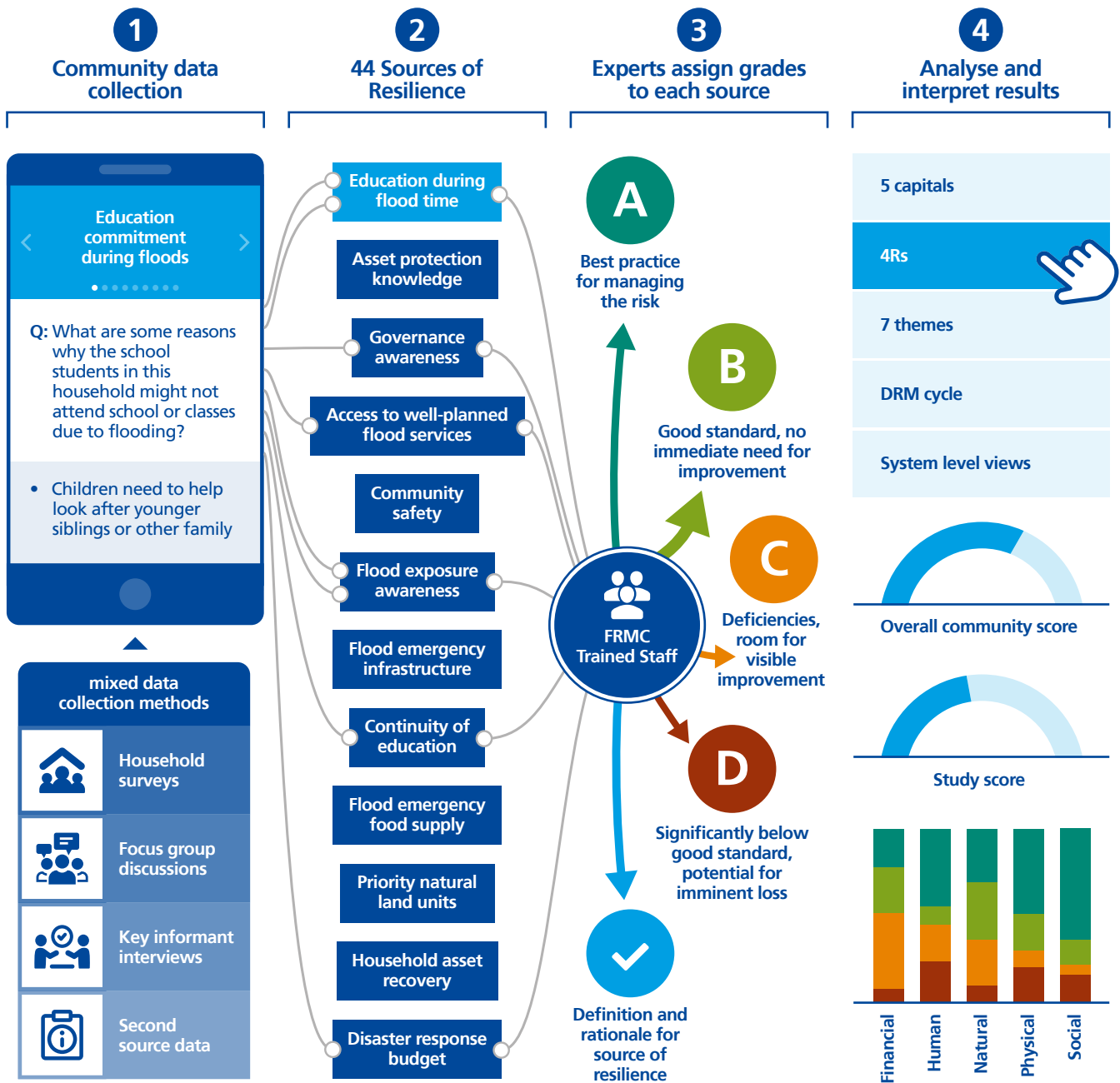


Figure 2 Schematic of the Flood Resilience Measurement for Communities (FRMC) process. Adapted from Laurien and Keating, 2019³

³ Laurien, F. & Keating, A. (2019). Evidence from Measuring Community Flood Resilience in Asia. ADB Economics Working Paper Series: no.595. <https://floodresilience.net/resources/item/evidence-from-measuring-community-flood-resilience-in-asia>

Post-flood studies

To understand which sources of resilience actually enable resilient outcomes we need to collect information on how the community fares in the event of a flood so that this can be compared with pre-event characteristics (the sources).

The post-event study is structured in the same way as the framework that assesses the 44 sources of resilience, except it has 29 measures of flood impact instead. The post-flood study is usually carried out between 3 and 6 months after the flood. The results

provide a comprehensive and structured flood impact assessment. The post-flood study can also help user organizations, communities, and key stakeholders to analyse how actions before, during, or after the flood affected damage and recovery, thereby giving them more confidence in future decision-making.

The post-event study is essential for the global effort on community flood resilience research (see 'Empirical validation' below).



View from Shkodra Castle on the Obot © Red Cross Albania

Who can use the FRMC?

The FRMC can be used by any organization concerned with community flood resilience. This includes NGOs, other civil and humanitarian organizations, and government authorities. Critically, the FRMC has been designed so that it is as broadly applicable as possible. It can be applied in both developed and

developing countries, in urban, peri-urban, and rural settings. It can be applied in communities facing all types of flood threats such as coastal, riverine, or flash flooding. Anyone can complete the expression of interest form found in the [FRMC introductory document](#).

Can sources be added or removed?

All 44 sources must be graded in the FRMC process, which means data must be collected to inform this grading. All data and grading information is saved in the central database. It is possible for users to define their own additional local questions to inform FRMC sources and/or collect additional information. While sources cannot be removed, they can be 'muted' for user-level analysis by weighting them as zero.

Using FRMC results

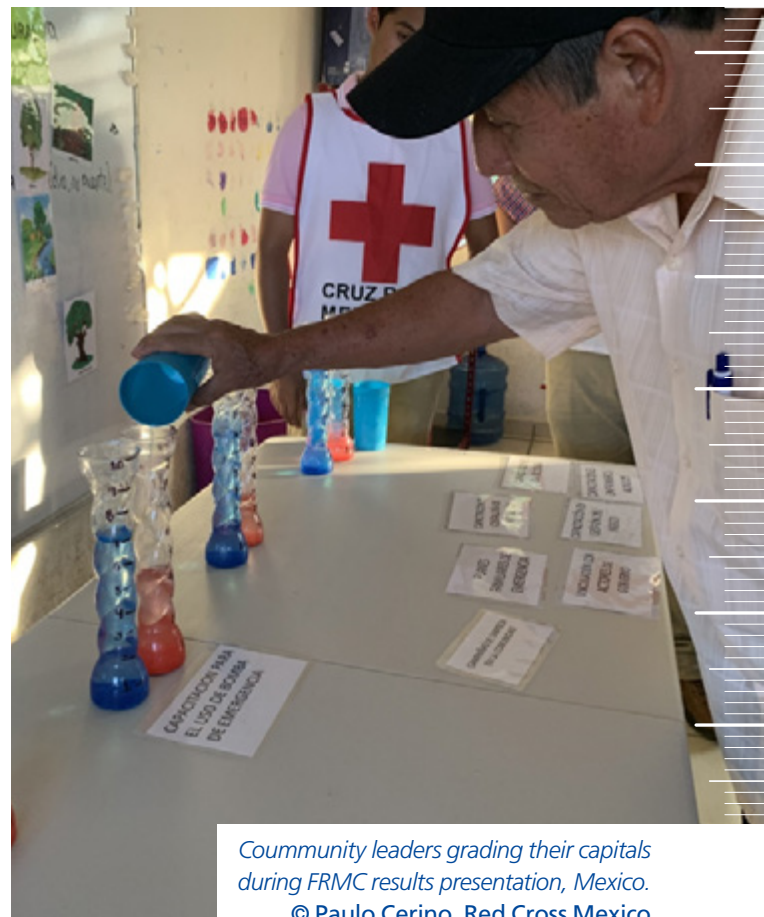
The FRMC is one input into a broader, participatory process of intervention design and implementation. It is designed to complement (not replace) existing processes such as vulnerability-capacity assessment (VCA) or participatory cost-benefit analysis. It is not designed to prescribe a methodology for community or stakeholder engagement, but does support a participatory approach. The data collection process has been designed so that it works alongside existing participatory processes.

Communities and key stakeholders play a central role in the FRMC process and must be engaged throughout the process. How a user organization engages with the community and key stakeholders will vary, but it is essential that they see a benefit in the process and are willing to take part. While some of the more technical details of the framework may not be accessible to all community members or stakeholders, it is the responsibility of the user organization to ensure they understand and can engage with the process and results.

FRMC results **do not** tell users which intervention to select. The measurement tool helps to identify potential areas of strength and weakness; however choosing an intervention is a much more complex process which must consider multiple factors and perspectives. FRMC results are discussed with the community and key stakeholders, and through this process, focus areas for strengthening resilience are identified. These are then worked through programme systems to develop interventions.

There may be a temptation to gravitate towards interventions which one believes will increase the resilience grade with the least amount of money, time, or effort. While one of the benefits of the

FRMC is that it might identify relatively cost-effective 'quick wins', it should never be the case that the objective of the intervention becomes to increase the resilience grade per se. Choosing interventions is a complex process which needs to consider a number of different factors and perspectives. It is up to the assessment team to work with the community and key stakeholders to understand the opportunities for building resilience highlighted by the results and to help them identify and prioritize actions for which resources and commitment are available.



Community leaders grading their capitals during FRMC results presentation, Mexico.
© Paulo Cerino, Red Cross Mexico

The FRMC is not a monitoring and evaluation tool

The FRMC is not intended to be a project or intervention evaluation framework that will be used by external assessors to evaluate a project's efficiency or effectiveness. Rather, it is intended as a fully integrated framework and tool that will be deployed at various stages of a long-term

(multi-year) community resilience-building programme to support decision-making and generate evidence of how resilience in a community changes over time. Some individual sources or raw data questions may be extracted to inform a broader M&E process.



Discussing FRMC results with the community. © Madhab Uprety, Practical Action

Making comparisons

The FRMC has not been designed to be a competitive tool to compare the performance of communities. Overall resilience scores should not be compared across communities, nor should individual sets of strengths and weaknesses of communities be used to demonstrate good/strong/resilient or bad/weak/not resilient communities. The FRMC simply provides information about change and the direction of the journey for the communities themselves, relative to where they started and where they want to get to. The numbers/grades and the quantitative aspects of the FRMC are a progress guide, not the outcome.

Numbers should not be used as absolutes, rather as relatives indicating a trajectory over time.

While communities should not be compared in a competitive sense, it is possible to aggregate and then analyse results across groups of communities. This type of aggregated analysis could be used to link the community level to higher administrative levels and hence understand the situation across a region. Alliance researchers are also using aggregate data to map community flood resilience, identifying averages, clusters, outliers, and trends or recurring aspects.

Managing measurement bias

‘When we try to measure what is important, we make important what it is that we measure’.⁴

A bias – sometimes called circular reasoning – occurs when we define what resilience is, measure it, make interventions based on that measurement, then measure again and say ‘resilience has increased’. Circular reasoning bias is a significant concern for any resilience measurement approach. We cannot escape it; instead we must recognize and manage it.

The FRMC does not claim to be a definitive measure of community flood resilience. It is an informed perspective on the factors that likely contribute to community flood resilience. The sources of resilience can be thought of as proxies for resilience capacities. Users are encouraged to consider results critically, and not assume that a source is important for flood resilience in a particular community simply because it is in the FRMC. Similarly, there are likely many other factors that are important for community flood resilience that are not measured in the FRMC, and users should not discount their importance simply because they are not measured.

Two time-frames

Before a flood, resilience is a latent characteristic of the community. The actual resilience is revealed in the community’s ability to withstand or quickly bounce back, learn, and grow stronger from the flood event. It is not until after the flood that we find out if the community was resilient, but it is before the flood that we want to know whether they are likely to be. This is the problem of two time-frames. The FRMC tackles this problem by measuring at both time frames: the 44 sources of resilience aim to measure the latent characteristics of resilience, while the post-flood study measures the outcomes of that resilience. Alliance researchers are linking ex ante and ex post results via the empirical validation process (see below).



Workshop for community members to prioritise interventions based on FRMC, Bangladesh.
© Md. Ohidul Islam, Concern

⁴ Levine, S. (2014) 'Assessing Resilience: Why Quantification Misses the Point', *Humanitarian Policy Group Working Paper*, London: ODI.

Empirical validation

By measuring at two time frames – both sources and outcomes – in many communities over time, Alliance researchers are finding empirical evidence for which sources of resilience best influence flood outcomes. These insights can then inform the ongoing improvement and refinement of the FRMC.

In addition to pre-event resilience grades and flood outcome data, when grading, users are asked to

comment on the relevance of each source of resilience for each community, and their confidence in the grade assigned. By utilizing raw data, grades, and relevance/confidence feedback, Alliance researchers hope to generate evidence that certain sources of resilience are critical across multiple contexts. The researchers are utilizing multiple statistical techniques to generate empirical evidence for the impact of the sources of resilience.

User feedback and validation

If the FRMC approach is to be robust and useful it must align with communities' and resilience practitioners' understanding of what constitutes community flood resilience; and it must be practical in the field. This is important for two key reasons. First, communities are the true experts on their own flood resilience and practitioners/users can capture

and amplify that expertise since they work directly with flood-prone communities. Practitioner endorsement of the FRMC contributes substantially to validity. Second, for the FRMC tool to be useful for users it should make sense to them. Researchers within the Alliance work with users to incorporate community and practitioner perspectives.



Community leaders participating in drill, Choisca, Peru © Giorgio Madueño. Practical Action

Data storage and ownership

The FRMC tool data is being collected in a central database. This is done for a number of reasons. First, the web-application and linked mobile application are structured such that they run through a central server. Second, a central database means the data is safely stored in one place. Third, a central repository allows the development team to review the full set of data available and use it to improve the FRMC in the future. Finally, the data collected in the central database is enabling extensive and innovative empirical analysis of the critical sources of community flood resilience.

Only authorized users of the system can access data, and then only at the level of their authority. At the highest level of supervision is a role we have labelled 'Trainer'. This is effectively the local organizational expert who has responsibility for allocating work to others. The next level down is 'Local Project Leader', who works with the communities assigned to them. Finally, there is the role of 'Field Worker'. Field Workers can only collect and upload data, using a mobile device, for the questionnaires they have been allocated.

One further role exists: the role we label 'Researcher'. This role is a specialist position that provides access to the entire database for all countries and users for analysis purposes.

All respondents are asked to provide informed consent before information is collected. Nonetheless, all data which goes into the system is anonymized. Because we do not collect identification data from community members, no individual can be identified from the data (either in its raw form or aggregated).

The issue of data ownership is a complicated one. Through access controls we can make sure that only authorized users have access to data and then only to the extent of their authority. This authority will be exercised to conduct and compare analyses at the level of the organization and for research associated with community flood resilience. None of these uses is detrimental to the ultimate owners of the data (the community). However, to use the data in this way there is a responsibility on all users to ensure informed consent has been obtained so the community is aware of the way the data will be used.

Data policy

- a. The Flood Resilience Measurement for Communities (FRMC) has been developed as a product of the Zurich Flood Resilience Alliance (the Alliance) and consists of: 1) the measurement framework and associated materials; 2) a hybrid online and mobile app-based software tool, and; 3) the data the measurement generates.
- b. **The FRMC framework and associated materials:** Were developed by organizations working through the Alliance. The framework and associated materials are the joint intellectual property of the Alliance. Materials pertaining to the FRMC may be used and reproduced freely for research and non-profit purposes only.
- c. **The software:** Zurich Insurance contracted and paid IBM to develop and maintain the FRMC software, and hence Zurich owns the IP that is the software and associated technical guidance. Use of the software may be provided for non-commercial purposes only.
- d. **The data:** All data are collected in accordance with ethical data collection practices and are anonymous at the individual and household levels. The data within the tool is controlled by the organizations that collected it. As a condition of using the framework, all organizations have agreed that data will be stored in a central database and be used for research purposes following the signing of an access agreement that Zurich is managing.
- e. **Use-rights:** The Alliance are keen for the FRMC to be used as widely as possible, within the time-frame of the current phase running until 2023. Existing partners are encouraged to expand use of the tool within the remit of the Alliance. The Alliance invites expressions of interest from new organizations wishing to use the FRMC.

For more information
write to info@floodresilience.net
visit www.floodresilience.net/FRMC
or follow [@floodalliance](https://twitter.com/floodalliance)
on social media.

Photo credits: Front page, *Boats serve as transport during floods, Jonuta, Tabasco* © Michael Szönyi, Zurich Insurance Group.

Intellectual Property note:

a) The Flood Resilience Measurement for Communities (FRMC) has been developed as a product of the Zurich Flood Resilience Alliance (the Alliance) and consists of 1) the measurement framework and associated materials, 2) a hybrid online and mobile app-based software tool, and 3) the data the measurement generates.

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