



Flood
Resilience
Alliance

Flood Resilience
Measurement for
Communities (FRMC)

Step by step guide to the process and software



 @floodalliance

 floodresilience.net

About this document

This document explains the process of using the FRMC tool and the various roles and responsibilities involved. For more details on the conceptual application of the FRMC and how the FRMC can be used by civil society organizations, please see [floodresilience.net/frmc](https://www.floodresilience.net/frmc) and download the FRMC overview document.¹

¹ <https://www.floodresilience.net/resources/item/the-flood-resilience-measurement-for-communities-frmc>

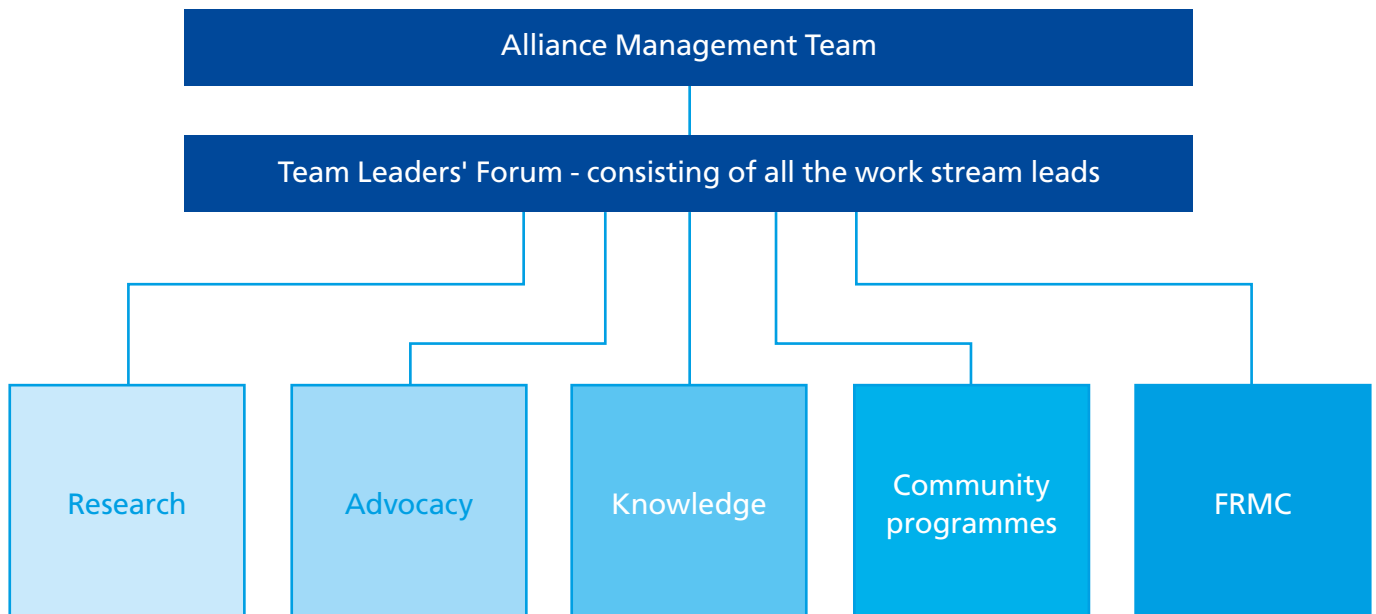
The Zurich Flood Resilience Alliance

Zurich Insurance Group (Zurich) launched a global flood resilience programme in 2013. The programme aimed to advance knowledge, develop expertise, and design strategies to help communities improve their ability to deal with the impact of floods, or build resilience to floods.

To achieve the programme's goals, Zurich formed a multi-year, interdisciplinary alliance (the Zurich Flood Resilience Alliance) to bring in complementary skills and expertise from different organizations. This enabled us to link academic insights, humanitarian sector capabilities, and risk management expertise to improve community resilience to floods.

Zurich works with the humanitarian and civil society organizations Concern Worldwide, the International Federation of Red Cross and Red Crescent Societies (IFRC), Mercy Corps, Plan International, and Practical Action, as well as research partners the International Institute for Applied Systems and Analysis (IIASA), the London School of Economics, and the Institute for Social and Environmental Transition-International (ISET). Please visit www.zurich.com/flood-resilience and www.floodresilience.net for more details.

The Alliance works in the following areas, with a multi-organizational work stream for each:



Why floods?

Floods affect more people globally than any other type of natural hazard.

And the position is getting worse, with:

- Increasing population, urbanization, and economic development in hazard-prone areas.
- Increasing loss of life and economic and insured losses due to floods.
- Increasingly interconnected and interdependent flood risks.

Why resilience?

We find: Every US\$1 invested in prevention saves \$5 in future losses.²

But: Only 13 per cent of aid spending goes into pre-event resilience and risk reduction; 87 per cent goes to post-event relief.³

We define 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.⁴

Why measure?

Measurement enables us to assess and demonstrate the real impact of improvements. Since there was no global framework available to do this, we needed to develop a consistent Flood Resilience Measurement Framework and the tools to implement this framework.

If we have a measurement framework and data, we can contribute to the evidence on how to define resilience. In turn, this will help to increase social, political, and financial investment in building flood resilience.

Why focus on communities?

While acknowledging that national and global drivers play a significant (and essential) part in building flood resilience, we have chosen to focus on the community level. This is the level where flood impacts are felt most immediately and where much action on flood resilience can be taken. It is also the level where we can demonstrate a tangible impact on people's lives, creating best practices in the field that can help us shape and influence policy at a higher level.



2 Mechler, R., Czajkowski, J., Kunreuther, H., Michel-Kerjan, E., Botzen, W., Keating, A., McQuistan, C., Cooper, N., and O'Donnell, I. (2014) *Making Communities More Flood Resilient: The Role of Cost-Benefit Analysis and Other Decision-Support Tools in Disaster Risk Reduction*, White Paper, Zurich Flood Resilience Alliance.

3 Kellett, J. and Caravani, A. (2013) *Financing Disaster Risk Reduction: A 20-Year Story of International Aid*, London: ODI; Washington, DC: Global Facility for Disaster Reduction and Recovery at the World Bank.

4 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>>.

The Flood Resilience Measurement for Communities

The Flood Resilience Measurement for Communities (FRMC) comprises two parts: the Alliance’s conceptual **framework**⁵ for measuring community flood resilience, and an associated **tool** for implementing the framework in practice.

The second component of the FRMC – the tool – is a practical hybrid software application comprising an online web-based platform for setting up and analyzing the process and a smartphone- or tablet-based app that can be used offline in the field for data collection.

In this publication we take you through the **process** which links the framework and the tool together to implement the FRMC in practice at community level.

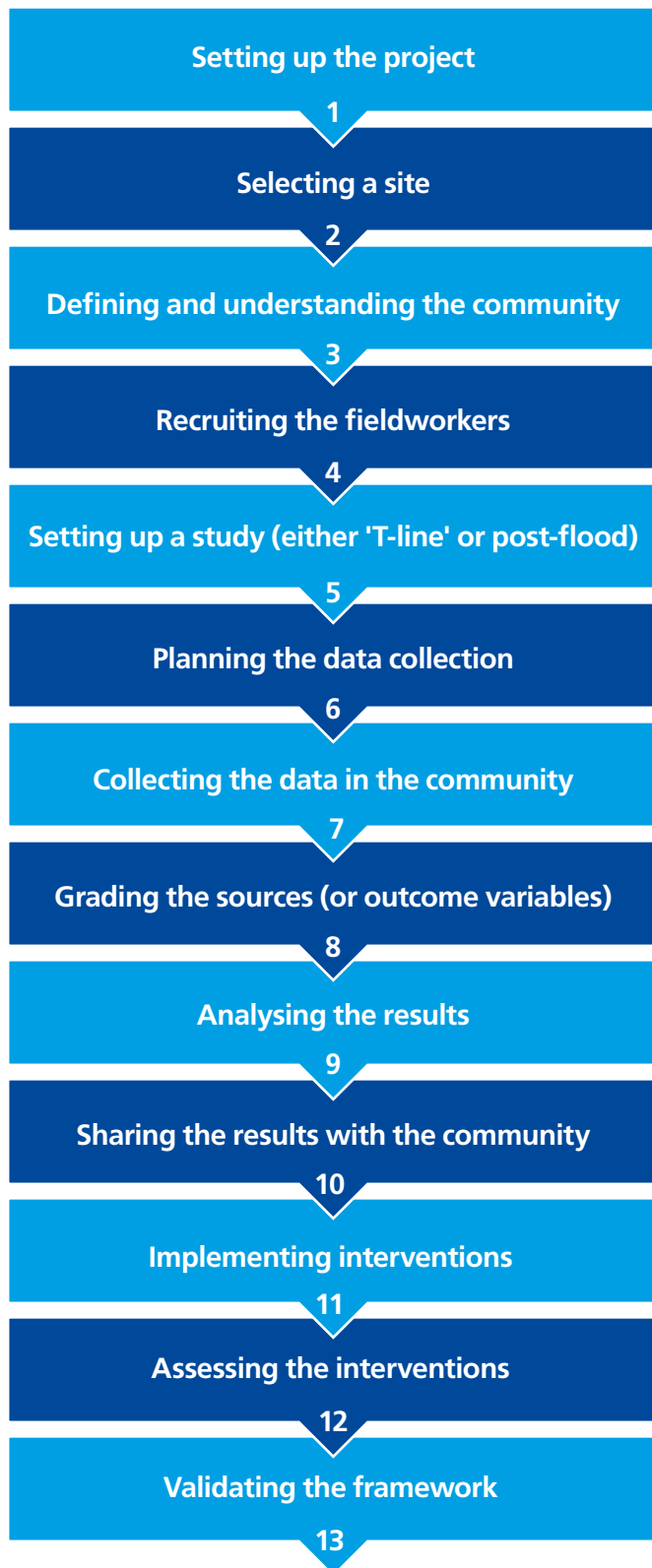
The FRMC process is often part of a wider community disaster risk reduction program and does not stand alone. Certain parts of the process such as project set-up and community engagement etc. are meant in the wider sense of the community project, and are not just about implementing the measurement using the tool.



After the flood, Lima, Peru. © Fidel Carrillo

⁵ For more information on the conceptual framework, please see the FRMC overview: <https://www.floodresilience.net/resources/item/the-flood-resilience-measurement-for-communities-frmc>

The FRMC process



The FRMC tool



- Set up measurement activities.
- Select data collection methods.
- Assign them to fieldworkers' smartphones.



- Collect data based on assigned methods.
- Store the data offline.
- Send the data to the web application when the job is completed.



- Consolidate all data for the assessment.
- Assign grades using the assessment methodology.



- Visualize and analyse the measurement results.
- Access guidance on how to interpret the results.



- Store the resilience measurement results for comprehensive analysis and validation.



Roles and responsibilities

Fieldworker



Responsibility: Interact with the community to collect data and conduct interviews and discussions with key community members.

Tool tasks: Use the mobile app to enter data from the field data collection surveys.

Local project lead



Responsibility: Coordinate the process and efforts to connect to a community; facilitate the grading process and the analysis of the results to support decision-making as part of the wider project.

Tool tasks:

- Can view community details.
- Create, modify, grade, and score studies for assigned communities.
- Assign fieldworkers (from the same organization and country) to a study.

Trainer



Responsibility: Coordinate and monitor the progress of the programme at the country level.

Tool tasks:

- View, create, and modify communities (within their organization).
- Assign local project leads to communities.
- Create and manage local project lead and fieldworker user profiles.

Administrator



Responsibility: Support the effective functioning and use of the tool.

Tool tasks:

- Create and modify other administrator and trainer user profiles.
- Perform support tasks including deleting studies or users and changing the status of studies if required.
- Can view and perform all functions available to all other roles.

Research expert



Responsibility: Support the validation process.

Tool tasks: Access the data cockpit and view or download data in the system.

User management tasks

Responsibility: **Trainers**



- **User creation:** Create and set up a new user.
- **Set credentials:** Change the email address and password of an existing user.
- **Delete user:** Delete an existing user in a new page (administrators only).
- **Role maintenance:** Change the roles or access rights of an existing user.
- **Find or sort users:** Use the search and filter functionalities for existing users.

Community management

Site and community selection criteria

- Gather the information required for the selection process (hazard maps, vulnerability assessment; initial engagement with the community to gauge their openness to the work). Review and verify that this information is correct and complete.
- Select communities based on the following micro- and macro-level criteria:
 1. All communities for one project are located in the same watershed (i.e. physical proximity, located on the same river, etc.) or peril scenario (coastal flooding, etc.).
 2. Located in an area of high flood hazard (based on hazard mapping and event history).
 3. High social and physical vulnerability to the hazard.
 4. Community willingness and means to participate.
 5. Buy-in from key external stakeholders (e.g. government).

More information on site and community selection is available in the FRMC methodology manual.

How do you define a community?

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, whether by physical, administrative, social, or other bonds that make it form a unit. When applying our resilience measurement approach we will be measuring at the level of this self-defined community.

Community management tasks

Applicability: **Trainers and project leads**



Find or sort communities: Use the filter functionalities for inputted communities.

View community details: Go through the details entered for specific communities.

Applicability: **Trainers**



Create a new community: Set up a new community with the requisite details.

Allocate a project lead: Allocate a project lead from the user list for the new community.

Edit details: Edit community name, geocodes, and number or average size of households for existing communities.



Harvesting pumpkins, Bangladesh. © Practical Action

Planning data collection

How can we collect data?

Household surveys: Household data collection takes the form of a structured interview between the local field team and individual households, usually held in the interviewee's home.

Focus group discussions: A focus group session consists of a number of invited respondents (ideally no more than 20) participating in a structured conversation. The discussion is moderated by the local fieldworker.

Key informant interviews: In-depth interviews with people who have specialist knowledge about the community and the subject.

Secondary sources: Secondary source data has already been collected or is readily available. This may include:

- Information from prior projects or other organizations.
- Census data.
- National or international data including online or offline government data.
- Data from hazard/vulnerability assessments and risk maps.



Eva from a local partner organization interviewing community member in San Mateo, Peru as part of data collection. © Giorgio Madueño, Practical Action



Abel from Practical Action interviewing Consuelo who lives in San Mateo, Peru as part of data collection. © Giorgio Madueño, Practical Action

Setting up the study

Responsibility: **Project leads**



Prerequisites:

- Community has been set up by the trainer.
- Project lead has been allocated to the community by the trainer.
- Any previous studies are complete.

Create a study: Create a new T-line study to collect data on and measure the 44 sources of resilience (at time 't'). For more information on the 44 sources of resilience, please refer to the FRMC overview⁶.

Name of study: The first T-line study you create for each community will be automatically called T0, the second will be T1, and so on. T-line studies do not need to be named manually.

Number of household interviews: Enter the number of household interviews to be conducted. The suggested number of households for 95 per cent confidence level will be displayed.

Planning the data collection

Responsibility: **Project leads**



1. Select the data collection method(s) for each source of resilience.
2. Allocate fieldworkers to the data collection methods and the corresponding buckets of key informants and focus groups chosen in the study set-up that will need to be interviewed.
3. Decide whether you need to have any local questions added to the study.
4. Preview the questionnaires as they will appear on fieldworkers' smart devices.
5. Decide if you need to save the study as a template.
6. Click the **Activate** button to set the study to active.

Post-flood study:

A post-event study is conducted following a flood event in the community to learn about the flood impact, to assess if any measures were effective, and to compare flood outcomes with sources of resilience. The process works very similarly to T-line studies.

⁶ <https://www.floodresilience.net/resources/item/the-flood-resilience-measurement-for-communities-frmc>

Fieldwork

How do we conduct the fieldwork activities?

1. Questionnaires are created for each data collection method based on the project lead's selections.
2. The project lead allocates data collection tasks to fieldworkers for that community.
3. The fieldworkers receive the allocated work on the mobile app.
4. The project lead meets with the assigned fieldworkers to plan the execution of the tasks.
5. The fieldworkers conduct the interviews and input the data in the mobile app.
6. The fieldworkers submit the data once the tasks are completed, and the data is uploaded to the online tool.
7. The project lead completes the secondary source data and community context question sections in the online tool.
8. Once all the work steps are complete, the status of the study will move from **Active** to **Grading**.

Data collection in the app

Fieldworkers have received work on their mobile device and need to complete the questionnaire.

1. Enter username and password, and select the preferred language. Log into the app. (Data connection required for first login.)
2. Synchronize the app to check for new work. (Data connection required.)
3. Go through the work allocated to you and understand who you need to meet to get the data.
4. Choose a data collection method, and start collecting the information and answering the questions. Once you are done with all the questions, that method will display a tick mark.
5. Continue until all the data collection methods are completed and all the boxes are ticked.
6. Return to the community study screen, which also should be ticked. Synchronize the app to upload the data.

Tracking progress in the online tool

The overall study status will move from **Active** to **Grading** once all the work steps have been completed. The project lead can review the status of the work products using the **Status Overview** button.

Questionnaires:

When a fieldworker completes a questionnaire on the app and uploads it to the server, it is set to a **Completed** status and remains in this status indefinitely.

Community questions:

The community questions need to be completed by the project lead online.

Secondary source data:

The secondary source data needs to be entered in the online tool by the project lead.



Maria Luisa, Silvia, and Eva, members of Carosio community brigade, participating in a national mock drill. © Giorgio Madueño, Practical Action

Grading

How do we measure the sources of resilience?

We grade each source of resilience based on the quantitative and qualitative data points and the benchmarks for best practice.

The grading scale:



How do we grade the post-event study?

The post-event study outcome variables are graded exactly the same as the sources of resilience, except for the first three which measure the flood itself – for detailed instructions see the guide for post-event studies on www.floodresilience.net/FRMC.

The grading process

1. Representatives of the field team attend a group meeting to discuss the findings.
2. The group works together to arrive at grades for each source of resilience:
 - a. Review the data from the various questionnaires to get a 'gut feel' for where it stands.
 - b. Compare with the definitions of A, B, C, and D for that source of resilience to see where the data stands in terms of the scale.
 - c. Consider the generic scale of A, B, C, and D, if required.
 - d. Select a grade.
3. The project lead inputs the grade choice into the tool.
4. The project lead explains why that grade was chosen.

Grading tasks

Responsibility:
Project leads (in collaboration with the team)



- **Grade each source of resilience:** Pick the correct A, B, C, or D grade based on the definition provided.
- **Explain rationale:** Provide a short explanation as to why that grade was selected.
- **Indicate confidence and relevance:** Tick 'Yes/No' to input your estimation.
- **Explain differentials:** Tick reasons for updated grades (after the T0 study).

Interpreting the study results

Viewing the results analysis in the tool

Applicability: **Project leads, trainers, researchers**



- Use the **Results** button from the context menu in the community details screen to view the overall score and category-based scores for a study.
- Use the **Data Cockpit** to select and view the results from completed studies graphically and numerically.
- Use the **Model Management** option to create a customized measurement framework for local contexts.

The scoring method

Each source of resilience is scored based on the assigned grade:

A	B	C	D
100	66	33	0

The linear average of scores from all sources in each capital (see below) forms the capital score.

The linear average of the five capitals together form the total score.

FRMC uses a number of different lenses through which to look at flood resilience. These are outlined in the following sections.

To find out more about the sources of resilience and how they relate to the other lenses, read the FRMC overview⁷.

⁷ <https://www.floodresilience.net/resources/item/the-flood-resilience-measurement-for-communities-frmc>



Parvati, Flood Gauge Reader, at Karnali Chisapani Station, Nepal. © Michael Szönyi, Zurich Insurance Group



Flood gauge in Germany.
© Michael Szönyi, Zurich Insurance Group

The five capitals lens

The five capitals (5Cs) from the 'Sustainable Livelihoods Framework' characterize what resources, assets, and capacities – known as 'capital' – a community has. Each of the 44 sources of resilience relates to one of the 5Cs, and together they build up a complete picture of all the factors that influence flood resilience.



Human: knowledge, education, skills, health



Social: social relationships and networks, bonds that promote cooperation, links facilitating exchange of and access to ideas and resources



Physical: things produced by economic activity from other capital, such as infrastructure, equipment, improvements in crops and livestock



Natural: the natural resource base, including land productivity and actions to sustain it, as well as water and other resources that sustain livelihoods



Financial: level, variability, and diversity of income sources and access to other financial resources that contribute to wealth

The seven themes lens



Assets: physical assets in the community, such as buildings and their contents, productive assets, land, and infrastructure



Livelihoods: the means through which community members make a living, including people's capabilities, income, and activities required to secure the necessities of life via income or subsistence



Natural environment: the living and non-living components that occur naturally (are not made by humans), including natural features such as rivers, ecosystems, and the ecosystem services they provide



Life and health: the protection of human life and supporting human physical health



Lifelines: essential systems or critical infrastructure that provide the necessities for meeting the community's needs



Governance: formal/official and informal/unofficial organizations and institutions, and their operations, that govern life in the community



Social norms: informal agreements that govern people's behaviour



Flooding along the Elbe river in Germany.
© Michael Szönyi, Zurich Insurance Group

The four properties of a resilient system (4Rs) lens



Robustness

The ability to withstand a shock



Resourcefulness

The ability to mobilize when threatened



Redundancy

Functional diversity



Rapidity

The ability to contain losses and recover in a timely manner

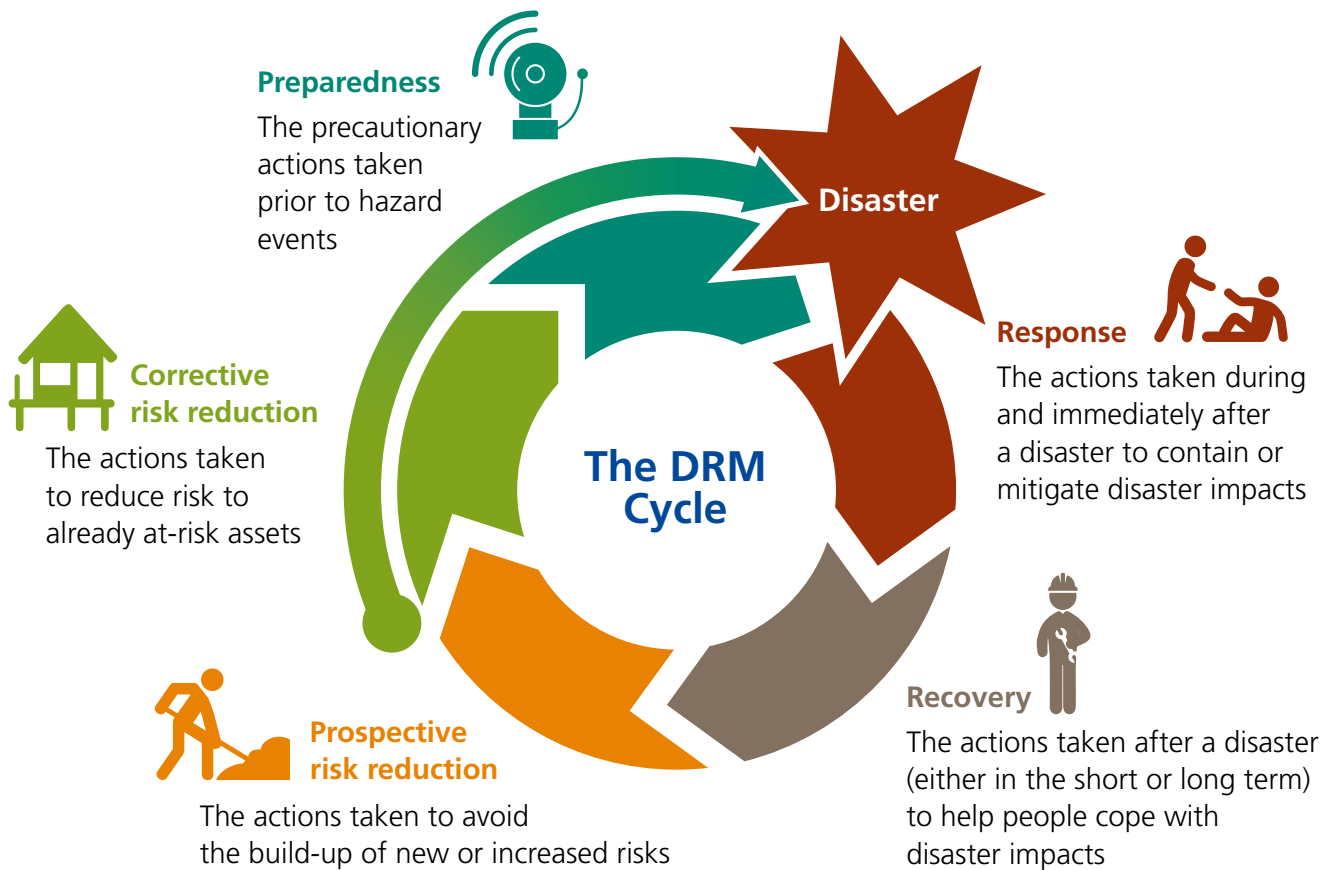
Post-event study variable types:

- **Hazard trait:** The size and type of flood (not graded).
- **Direct impact:** A direct impact is one that is caused by contact with flood waters.
- **Indirect impact:** An indirect impact is one that is caused as a consequence of a direct impact.
- **Action:** Things that people did during and following the flood.

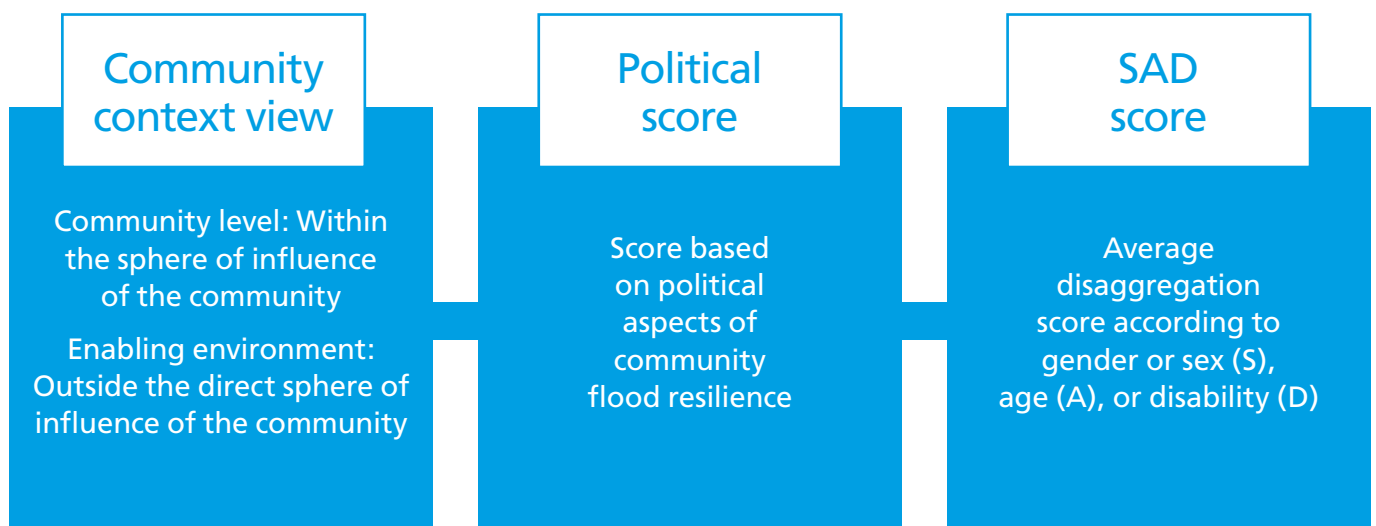


Maria Arisa working with her community to improve evacuation route in Chaclacayo, Peru. © Marco Antonio Arango

The disaster risk management cycle lens



Binary views



Designing, implementing, and assessing interventions

1. Assess the grading results as a team

- Use all lenses to assess FRMC results and identify community needs and opportunities.
- Use source level to better understand results.
- Define criteria for designing interventions and assess their feasibility.

2. Present results

- Present and discuss results in an appropriate format with the community.
- Invite or separately meet with other relevant stakeholders.

3. Brainstorm potential interventions

- Explore best practice 'solutions' and typical learning from previous interventions that build community flood resilience, including on the Flood Resilience Portal www.floodresilience.net/solutions

4. Select interventions

- Use the criteria that you defined previously to prioritize options.
- Define whether the interventions can be implemented by the organization directly or need support from a wider network of practitioners, the community itself, local governments, etc.

5. Develop an action plan

- Define the activities needed to implement the selected interventions, their timeframe, responsibilities, and necessary resources.
- Find more information in the guide *From FRMC results to intervention planning* on www.floodresilience.net/FRMC



Flood safe shelter, Bargaun Village, Nepal.
© Archana Gurung, Practical Action

Validating the FRMC framework

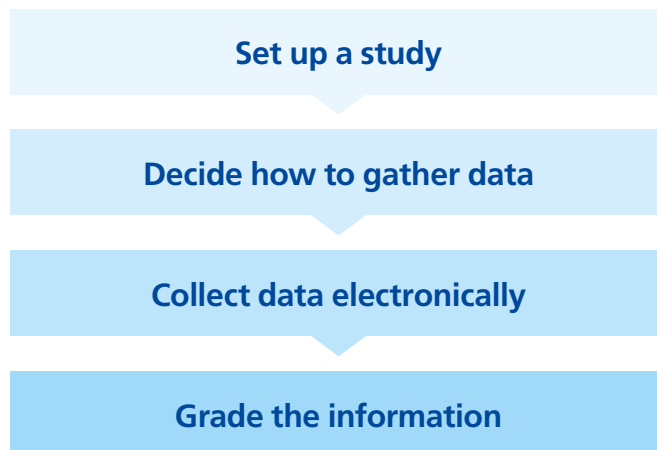
The FRMC framework provides a system and a set of definitions to measure the sources of community flood resilience.

The framework allows researchers to:

- Look at information within and across communities to empirically validate our resilience measurement approach and the framework.
- Measure in clear, concise terms how resilient a community is to floods.
- Track changes in resilience over time and explore how a change in one of the 5Cs affects a community's overall flood resilience level.

An essential method of evaluating resilience and validating the measurements is to measure the impact of an actual flood event using post-event studies. If we have implemented interventions in the community, this data helps us see if the impacts have been reduced because of the community's increased resilience. This data is also critical for assessing the combination of sources and outcomes of resilience. This will help us to come closer to verifying the sources of resilience as a proxy for resilience itself.

Post-event studies use the same process as T-line studies:



For more information see the FRMC guide for post-event studies on www.floodresilience.net/FRMC



Book for recording gauge levels in Nepal.
© Michael Szönyi, Zurich Insurance Group



For more information
visit www.floodresilience.net/FRMC
or follow [@floodalliance](https://twitter.com/floodalliance)
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