Climate Resilience Measurement for Communities

Post-event study: user guide

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Climate Resilience Measurement for Communities

About this document

This is the User Guide showing you the necessary steps to deploy the post-disaster study in the Climate Resilience Measurement for Communities (CRMC).

This document is not meant to be used in the field directly with communities or to provide field workers with basic knowledge about the resilience aspects covered.

Only trained assessors will need to use this document to measure outcomes, based on data gathered through field work. Similarly, the results will provide data for consideration by implementation teams and research analysis, rather than feeding directly to a community (results will be shared and discussed though).

Naturally, some of the information collected may be used by local governments, NGOs, and possibly other interested parties when they communicate with communities and wider audiences.

Many of these stakeholders may already collect most of this data as part of their own evaluations of the event.

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To learn more about the CRMC and find out how it can add value to your programs, please email us here: info@zcralliance.org

CRMC household surveys being conducted in Moala Village, Fiji. Photo: Cale Johnstone, IFRC

Measuring climate resilience at the community level

Why climate hazards?

As our planet warms and weather patterns change, we are seeing more frequent and intense floods, heatwaves, storms, and wildfires.

These events can take lives, cause serious injury, and inflict lasting psychological trauma. They can uproot communities, separate families, destroy livelihoods, and erase cultural heritage and sense of identity. In their aftermath, we often see ripple effects, such as increased poverty, early marriage of girls, children dropping out of school, or forced migration of men in search of work.

At the same time, they damage critical systems – such as water, electricity, transportation, and communication – and devastate homes, schools, health centres and local hospitals.

Without action to build climate resilience, the situation will get worse because of:

- increasing population, urbanization, and economic development in hazard-prone areas;
- increasingly interconnected and interdependent critical systems, where impacts to one system can have cascading effects;
- increasing occurrence of compound events, where individual climate risks occur simultaneously or in rapid succession.

With climate disasters impacting communities around the world, the need for community resilience has never been greater.

Why resilience?

We find that every US$1 invested in prevention saves US$5 in future losses.[1]

But only 13 per cent of aid spending goes into pre-event resilience and risk reduction; 87 per cent goes to post-event relief.[2]

We define 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.[3]

Why measure?

Measurement enables us to assess and demonstrate the real impact of improvements. Since there was no global framework available to do this, the Zurich Flood Resilience Alliance originally developed a consistent Flood Resilience Measurement Framework and the tools to implement this framework, which has now progressed to the Climate Resilience Measurement for Communities (CRMC) framework and associated tools.

Using our measurement framework and data, we are contributing to the evidence on how to build resilience. In turn, this will help to increase social, political, and financial investment in building resilience to climate-related hazards.

Why focus on communities?

While acknowledging that national and global drivers play a significant (and essential) part in building resilience, we have chosen to focus on resilience measurement at the community level.

This is the level where impacts from climate-related hazard events are felt most immediately and where much action on enhancing resilience can be taken.

Communities are not homogeneous – they are made of people with diverse identities, needs, and vulnerabilities. By working at this level, we can better understand and address those differences, ensuring that resilience-building efforts are more inclusive and equitable.

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.

1 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.

2 Kellett, J. and Caravani, A. (2013) Financing disaster risk reduction: a 20-year story of international aid, ODI, London/Global Facility for Disaster Reduction and Recovery at the World Bank, Washington, DC.

3 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. https://zcralliance.org/resources/item/disaster-resilience-what-it-is-and-how-it-can-engender-a-meaningful-change-in-development-policy/

Use of the CRMC in Peru identified the need for improved river monitoring to keep communities informed of potential risks. Photo: Giorgio Madueño, Practical Action

The Climate Resilience Measurement for Communities (CRMC)

The CRMC comprises two parts: the Alliance's conceptual framework for measuring community resilience to a set of climate-related hazards, and an associated tool for implementing the framework in practice.

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

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

For more information on the conceptual framework, please see the CRMC overview document.

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

The CRMC process

Set up the project
1
Select a site
2
Define and understand the community
3
Recruit fieldworkers
4
Set up a study
(either t-line or post-event)
5
Plan the data collection
6
Collect data in the community
7
Grade the sources
(or outcome variables)
8
Analyse the results
9
Share the results
10
Implement interventions
11
Assess the interventions
12
Continued user and content validation
13

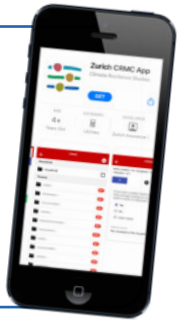
- Set up measurement activities
- Select data collection methods
- Send assignments to fieldworkers' smartphones

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

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

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

- Store the resilience measurement results for comprehensive analysis and validation



Read this before the disaster strikes

Users of the CRMC must be familiar with the post-event study. The post-event study is conducted after a disaster event occurs in the community at any point during the CRMC process.

It is critical to understand and set up the post-event study in the CRMC system long before the disaster happens, so that it is ready to be activated when needed. This document outlines the purpose of a post-event study and explains how to conduct one.

A post-event study is separate from CRMC t-line studies (i.e. baseline, midline, and endline studies) and differs from these studies in important ways.

This guide explains the key differences between the post-event study and t-line studies and why it is important not to directly compare the two types of study.

What is a post-event study?

A post-event study is conducted in the months following a disaster event in order to document and better understand the characteristics of the event (e.g. type and magnitude of the flood or storm, duration and intensity of the heatwave or wildfire), the impacts of the event on the community, and the way in which the community and its enabling environment responded. In other words, the post-event study assesses how the community's resilience performed when a disaster occurred.

How is a post-event study different to a t-line study?

T-line studies, sometimes called baseline, midline, or endline studies, measure a community's disaster resilience using the 'sources of resilience'. The results are used by the community and its stakeholders to help inform resilience-enhancing efforts and to track changes in resilience over time. Each t-line study conducted in the community uses the same sources of resilience hazard by hazard, so that a consistent measurement can be taken across different points in time.[4] For each community where the CRMC process is being used, at least two t-lines (baseline and endline) should be completed, with optional midlines. The recommended time frame between the end of one t-line study and the start of the next is 18 months.

A post-event study should be done whenever a significant disaster event occurs at any point between the baseline and endline studies. Post-event studies are only conducted for disaster events that correspond to the hazards that have been measured in t-line studies.

Post-event studies measure the outcomes of resilience in relation to one specific disaster event using 'outcome variables'. These variables are not directly comparable to the sources of resilience from the t-line studies. In a post-event study, we need to measure differently, because we are looking at the impacts of a disaster event and how the

4 T0: baseline; T1–TN: consecutive studies (midlines and endlines).

community responded. The impact of and response to one disaster event will be different from another disaster event, even for the same hazard. This is due to many factors, including the severity and extent of the hazard event. For this reason, we need to account for the hazard itself by capturing some characteristics of the event (we use non-graded indicators called 'hazard trait' variables in the post-event study). The post-event study can provide insights into the community's resilience, but it cannot tell us whether the underlying resilience of the community has increased or decreased over time.

Note: Do not directly compare grades from a post-event study with t-line studies.

The post-event study outcome variables

Like the sources of resilience in the t-line studies, the outcome variables are assigned to a context (community level or enabling environment) and a theme (assets, livelihoods, natural environment, life and health, lifelines, governance, and social norms). Outcome variables are also assigned to a new categorization called 'revealed resilience', which has four groups:

- Three **'hazard trait'** variables about the size and type of event. These are not graded.
- **'Direct impact'** variables that are graded A–D. A direct impact is one that is caused directly by the disaster; for example, injuries, damage to homes, or environmental contamination.
- **'Indirect impact'** variables that are graded A–D. An indirect impact is one that is not caused by the direct impact of the event; for example, lost income (indirect impact) because a shop is flooded or work suspended due to heat (direct impact), causing it to be shut down; ill-health (indirect impact) because of contaminated water (direct impact) after a flood or smoke contamination from a wildfire; and fuel shortage (indirect impact) due to flooded roads or storm damaged distribution centers (direct impact) preventing fuel to be delivered to a given place.
- **'Action'** variables that are graded A–D. Actions are things that people did during and following the event; for example, the performance of the early-warning system, community members taking out high-interest loans, or support from outside the community.

Post-event study data collection

A post-event study uses the same approach that is used in a t-line study: it involves gathering data and comparing it to grade definitions.

All data is gathered through focus-group discussions and key informant interviews with community representatives from all affected groups, including women, youth, and minorities, and secondary sources. In a few variables, household surveys are possible. Asking household questions is optional and requires judgement because of sensitivities following a disaster. Only ask questions to households if you are certain it will not cause any distress to household respondents. The questions that are used to assess the outcome variables are the same regardless of the data-collection method selected, with slight exceptions for the few household questions. As with t-line studies, collecting data from more than one source (i.e. a group discussion and a key informant) is more reliable.

Differences between t-line studies and post-event studies

	T-line studies	Post-event studies
Measures	Community resilience at different points over time	Outcomes of resilience to one specific disaster event
Indicators used	• 26 generic sources – universal and applicable to all hazards • Some 25 hazard-specific sources – exact number depending on whether the hazard is flood, heat, wildfire, or storm	• 20 general outcome variables • Between 11 and 16 hazard-specific outcome variables for a total of 31–36 variables depending on the hazard of the disaster event
When	2–3 studies over the project life	1 study following a disaster event, always for a specific disaster event (cannot combine several hazards)[5]
Lenses	• 5 capitals • 4 Rs (robustness, redundancy, resourcefulness, rapidity) • 7 themes • 5 disaster risk management (DRM) cycle categories • 2 context levels • 7 Resilient Cities Network resilience characteristics	• 7 themes • 2 context levels • 4 revealed resilience categories
Data collection	• Household surveys • Focus-group discussions • Key informant interviews • Secondary source data	• Household surveys • Focus-group discussions • Key informant interviews • Secondary source data

5 We acknowledge that hazards do not exist in isolation. Multiple hazard events can affect a community and even interact to form cascading and compounding effects. The CRMC, as the evolution from the FRMC, can be applied to multiple hazards (flood, storm, heatwave, wildfire). For the post-event studies, however, we take a single disaster event – single hazard approach as it relates to how to prepare for and conduct the post-event study itself. It is outside of the remit of a post-event study to analyze how different hazards may have interacted. However, if this particular disaster event was influenced by other hazards or hazardous events, this needs to be recognized in the study. We explain this later in this guide.

Flooded house in Jonuta, Mexico. Photo: Michael Szönyi, Z Zurich Foundation

The post-event study plan

Putting plans in place to conduct a post-event study before a disaster happens means staff will be ready to implement the post-event study when it is needed. The more prepared teams are, the easier and more efficient this process will be. Prepare for the post-event study by drawing up a post-event study plan. The plan template is in Appendix 1.

The plan should include the following information:

- **Staff resources:** who will be responsible for each step of the post-event study, and how will they do it?
- **Budget:** where will the budget required to implement the post-event study come from? Get approval for utilizing this budget as part of the planning process. The project must set aside contingency budgets to enable post-event studies to take place when disasters occur in the community. This budgeting process is essential, because the post-event study is just as important as t-line studies.
- **Information collection:** what information will be collected during and following the event? For example, someone should collect and save news reports and meteorological information.
- **Data collection:** how could data collection for the post-event study be combined with work you already typically do following disasters? For example, could you collect data during relief work or when making other impact assessments? Ensure this specifies how data will be collected from all affected groups (i.e. women, minorities, people with disabilities, and different age groups).

Now is the perfect time to set up your post-event study plan.

Timeline

Project leaders must be aware of what data is needed to fill out the study and be ready to collect this information during and following the event. As soon as the disaster occurs, start to monitor local media reports and post-disaster-impact assessments done by governments or other bodies. Where appropriate, connect with local community responders and provide assistance where feasible.

Now

Read through this guidance document including the outcome variables. Develop your post-event study plan. Be ready to set up one post-event study for each community in the CRMC system, but do not do it just yet, as each post-event study is hazard-specific, so you need to know which hazard to analyze when you set it up in the system.

Leading up to the event

You may have some warning that a big event is coming. This might come from your knowledge about the community's typical flood or hot weather season, the weather forecasts, or an early-warning system. Also, some events have a very slow onset, building up over several weeks. As soon as you suspect a disaster might be on its way, activate your post-event study plan.

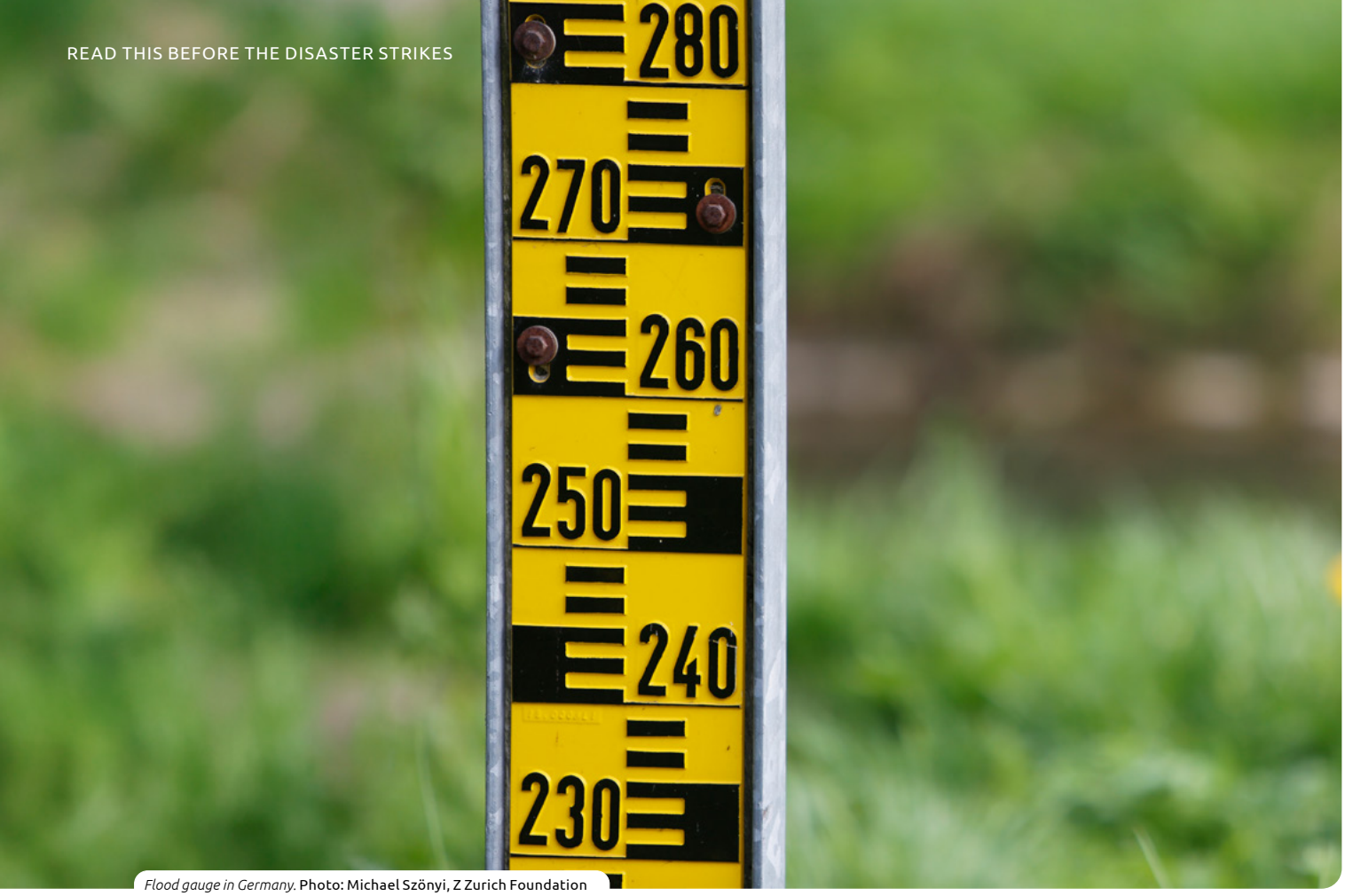
During or immediately after the event

Set the post-event study up in the system for the hazard that materialized and activate the study for each community that experienced a disaster (see 'Disaster definition' below). During and/or immediately after the disaster event is the time to collect information on the hazard trait variables. These are most easily identified and collected during or immediately after the event. For example, information on the extent of a flood is usually available at its height; information on the temperatures reached during a heatwave is available immediately afterward. We also suggest you monitor media and keep any news reports about the event for later reference.

One to three months after the event

The bulk of the data should be collected between one and three months following the end of the disaster event.

At this time, people are starting to recover, but they have not forgotten or moved on to other priorities. Project leads should consider the best time to conduct focus-group discussions and key informant interviews. Many of the questions in these ask about the extent of the impact and time to recovery, and they cannot be answered until the recovery phase is under way (approximately four to eight weeks following the event).



Flood gauge in Germany. Photo: Michael Szönyi, Z Zurich Foundation

Disaster definition: Event size that will trigger a post-event study

A post-event study should be conducted when the event reaches the level of 'disaster' for the community. A disaster is defined[6] as 'a serious disruption of the functioning of a community involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources'.

Disaster impacts may include loss of life, injury, disease, and other negative effects on people's physical, mental, and social wellbeing, as well as damage to property, destruction of assets, loss of services, social and economic disruption, and environmental degradation.

These impacts are not borne evenly across communities and often exacerbate existing inequalities. It is important to bear in mind that there are a wide range of experiences in a community, and impacts on some individuals or groups may be less apparent. It is critical to ensure a wide range of experiences and perspectives are taken into account when considering disaster impacts, including of people of diverse ages, genders, and abilities.

Some events are clearly disasters due to the high level of disruption and impact, and/or are declared a disaster by the community or authorities.

However, if you are unsure whether an event qualifies as a disaster, then ask yourself the following questions:

- Was normal life in the community seriously disrupted for at least one day?
- Were there any deaths and/or injuries?
- Was there significant damage to property?
- Were normal essential services disrupted?

If you answered 'yes' to two or more of these questions, then you can go ahead with the post-event study.

6 UNDRR disaster risk reduction glossary: https://www.undrr.org/terminology/disaster

Interpreting and using post-event study results

There are four ways to think about and use the results of a post-event study:

- **As a disaster impact assessment,** to document and understand the ways in which the community was impacted by the event and how it responded. By doing a comprehensive impact assessment, staff implementing the CRMC process, the community, and other stakeholders will gain valuable insight into the impact of the event on the community.
- **As an opportunity to assess, learn,** re-evaluate **and improve existing climate-resilience interventions, including where and who to target with these.** A post-event study is an important source of information for the ongoing process of improving community resilience. It can help the community, government agencies, NGOs, businesses, and researchers to measure the effectiveness of interventions, and thus to better evaluate and budget for interventions of these types in the future, and target and tailor these to the needs of the community including vulnerable and marginalized groups.
- **To support resilience research and CRMC development.** The Zurich Climate Resilience Alliance research team can use the data collected in t-line and post-event studies to analyze resilience and improve the CRMC approach over time.
- **To advocate for the CRMC approach.** Post-event studies can be a powerful tool to promote your community resilience-enhancing activities. You can demonstrate to local decision-makers how the CRMC approach is used not only to assess a community's level of resilience and track changes over time (t-lines), and also help us learn from disaster (post-event study).
- When interpreting and using post-event results, it is important to remember that t-line study grades cannot be directly compared with post-event study results. T-line studies should only be compared with other t-line studies. For example, it is meaningless to say that a community had an average grade of 40 for the education theme sources of resilience in its baseline, and an average grade of 50 for the education theme outcome variables in the post-event study. This is not an indication of improvement. However, it would be possible to look at strengths and weaknesses in a baseline study and think about how those sources of resilience performed during the event, as in the second bullet point above. The table below goes into more detail on interpreting post-event study results.

Dos and don'ts when interpreting post-event study results

Do:

- Document and understand the event and its impact on the community.
- Share results with the community and its stakeholders, ensuring inclusivity of all groups, including vulnerable and marginalized groups.
- Use results to learn, analyze, and plan for future disasters.
- Use the momentum to inform decision-makers about the disaster and show how the CRMC approach helped to gain this information.

Do not:

- Directly compare grades from a post-event study with t-line studies.
- Use the post-event study to draw conclusions about whether community resilience has improved or not.

Post-event study variables

Code	Name	Revealed Resilience	Hazard
O01	Post-event study trigger	Hazard trait	Generic
O02	Hazard event intensity	Hazard trait	Wildfire, Flood, Heatwave, Storm
O03	Storm type	Hazard trait	Storm
O04	Heatwave temperatures	Hazard trait	Heatwave
O05	Flood type	Hazard trait	Flood
O06	Days community was threatened	Hazard trait	Wildfire
O07	People directly impacted	Hazard trait	Wildfire, Flood, Heatwave, Storm
O08	Mortality	Direct impact	Wildfire, Flood, Heatwave, Storm
O09	Morbidity	Direct impact	Wildfire, Flood, Heatwave, Storm
O10	Damage to public assets	Direct impact	Wildfire, Flood, Heatwave, Storm
O11	Damage to private assets	Direct impact	Wildfire, Flood, Heatwave, Storm
O12	Damage to contents and equipment	Direct impact	Wildfire, Flood, Heatwave, Storm
O13	Performance of storm-resilient structures	Direct impact	Storm
O14	Environmental contamination	Direct impact	Flood
O15	Impacts to the natural environment	Direct impact	Wildfire, Heatwave
O16	Access to safe water	Indirect impact	Generic
O17	Water and vector borne disease	Indirect impact	Flood
O18	Health impacts from smoke	Indirect impact	Wildfire
O19	Aquatic system contamination	Indirect impact	Wildfire
O20	Continuity of education	Indirect impact	Generic
O21	Household income stability	Indirect impact	Generic
O22	Access to food	Indirect impact	Generic
O23	Crime and violence	Indirect impact	Generic

Code	Name	Revealed Resilience	Hazard
O24	Family violence	Indirect impact	Generic
O25	Healthcare system performance	Indirect impact	Generic
O26	Communications system performance	Indirect impact	Generic
O27	Transportation system performance	Indirect impact	Generic
O28	Waste management system performance	Indirect impact	Flood, Wildfire
O29	Energy system performance	Indirect impact	Generic
O30	Early warning system performance	Action	Generic
O31	Emergency management system performance	Action	Generic
O32	Large scale flood protection infrastructure performance	Direct impact	Flood
O33	Wildfire risk reduction performance	Direct impact	Wildfire
O34	Repair of damaged public infrastructure and their functions	Action	Generic
O35	Repair of damaged private buildings and assets	Action	Generic
O36	Learning from the disaster event	Action	Wildfire, Flood, Heatwave, Storm
O37	Mutual support	Action	Generic
O38	Support from outside the community	Action	Generic
O39	Sale of income generating assets	Action	Generic
O40	Risky livelihoods	Action	Wildfire, Flood, Heatwave, Storm
O41	High interest credit	Action	Generic
O42	Household and business insurance payments	Action	Flood, Wildfire, Storm
O43	Business continuity	Action	Generic

Appendix 1: CRMC post-event study plan template

This document provides a template for drawing up a post-event study plan. Post-event studies are an essential step in the Climate Resilience Measurement for Communities (CRMC) process and are conducted after a disaster event occurs in a community where the CRMC process is being implemented. Planning for the post-event study must occur early on, in normal/non-disaster times.

Community leaders point out riverbed erosion in Moala Village. Photo: Cale Johnstone, IFRC

What is a post-event study?

A post-event study is conducted following a disaster event in the community and consists of 20 general outcome variables, plus between 11 and 16 hazard-specific outcome variables for a total of 31-36 variables depending on the hazard of the disaster event; 4 of which are not graded. Details on the post-event study can be found in the CRMC post-event study user guide at the beginning of this document.

What is a post-event study plan?

While the post-event study is conducted following a disaster event, your post-event study plan must be in place before the disaster, so that you and your colleagues are ready to implement the post-event study when the event occurs. The post-event study plan details your estimates for staff resources and budget needed to implement the post-event study, and plans for data collection during and following the event.

You can estimate the resources needed to do the post-event study by thinking about what you used to do for the baseline. A post-event study will be less resource-intensive because it has fewer variables compared to the sources in the t-lines. Also remember that, because you and your team have already done a baseline study, you are more experienced in using the CRMC process and are therefore more efficient.

This template is a guide for setting up your post-event study plan. It needs to be revisited after every post-event study, or every year if no studies have been triggered.

Post-event study plan template

Before filling out this template and making your post-event study plan, it is essential that you study and discuss the CRMC post-event study user guide.

This template has two parts:
Table 1 is a series of questions to consider before you start; and Table 2 is a task list.

TABLE 1: Questions to consider before making the post-event study plan

Question	Answer
In which communities have we implemented baseline studies and therefore need to implement post-event studies in (if triggered)?	
When are the hazards that we have measured in our baseline most likely to occur?	
Are these types of events likely to occur in all communities at the same time?	
Are floods, storms, wildfires or heatwaves that will trigger a post-event study predicted in the next year?	
What warning systems are in place that we should monitor? Do they cover all the respective hazards, or only some of them but not others (e.g. floods and storms are covered, but not heat or wildfires)?	
How much warning time can we expect?	
Where are we likely to get information about the disaster during the event?	
Where are we likely to get information about the disaster following the event?	
Which people/groups are going to be involved in the disaster response and be good sources of information?	
If we are going to be part of the response and recovery, can we do some post-event study data collection during that period?	
What are the goals of our interventions that we can assess when the event occurs?	
How are we going to manage community expectations? (Note that the post-event study asks about many disaster impacts, which can raise community expectations.)	
How can we use the results in our work within the community?	
How can we use the results in our advocacy work?	

TABLE 2:
Post-event study plan task-list

Task	Person responsible	Tick when completed
Read and discuss the Post-event study user guide and answer the questions in Table 1.		
Discuss the post-event study with communities to make them aware that it will occur and to help manage expectations.		
Designate staff to monitor early warnings if the respective hazard is covered by it.		
Designate staff to collect media, meteorological, and other reports when a disaster occurs.		
Plan how you are going to collect data and who your post-event study field workers are going to be.		
Set up post-event studies (one for each community) in the CRMC system once an event is in the making – they are hazard specific – do not activate until the disaster has occurred.		
Develop a timeline for when you are going to activate the post-event study, collect data, do grading, and use results.		
Plan for how you are going to share results with the community and other stakeholders.		
Estimate the costs of undertaking post-event studies and using results to review priorities and adapt future projects.		
Get approval from those responsible for staffing and budget to undertake post-event studies when a disaster occurs.		
Based on elements from previous tasks (timeline, costs, responsibilities, etc.), write up your post-event study plan, ensure all relevant staff are aware of it, and refer to it regularly.		

Appendix 2: Post-event case studies from the Zurich Flood Resilience Alliance

Dhuhni, Hatibandadha, Bangladesh, 2022. Photo: Moktar Hossain

Case study 1: Bangladesh 2019, by Concern Worldwide

The flood event

Bangladesh experienced severe flooding in July 2019. Heavy monsoon rainfall occurred throughout the country, which led to extensive flooding in low-lying areas of northern, north-eastern, and south-eastern districts. Generally, Bangladesh experiences three types of floods: monsoon floods, flash floods, and long-term waterlogging. These are more or less common across various geographic regions. The flooding in 2019 was distinct due to the combination of all three types of floods occurring simultaneously across three different parts of the country.

The post-event study process

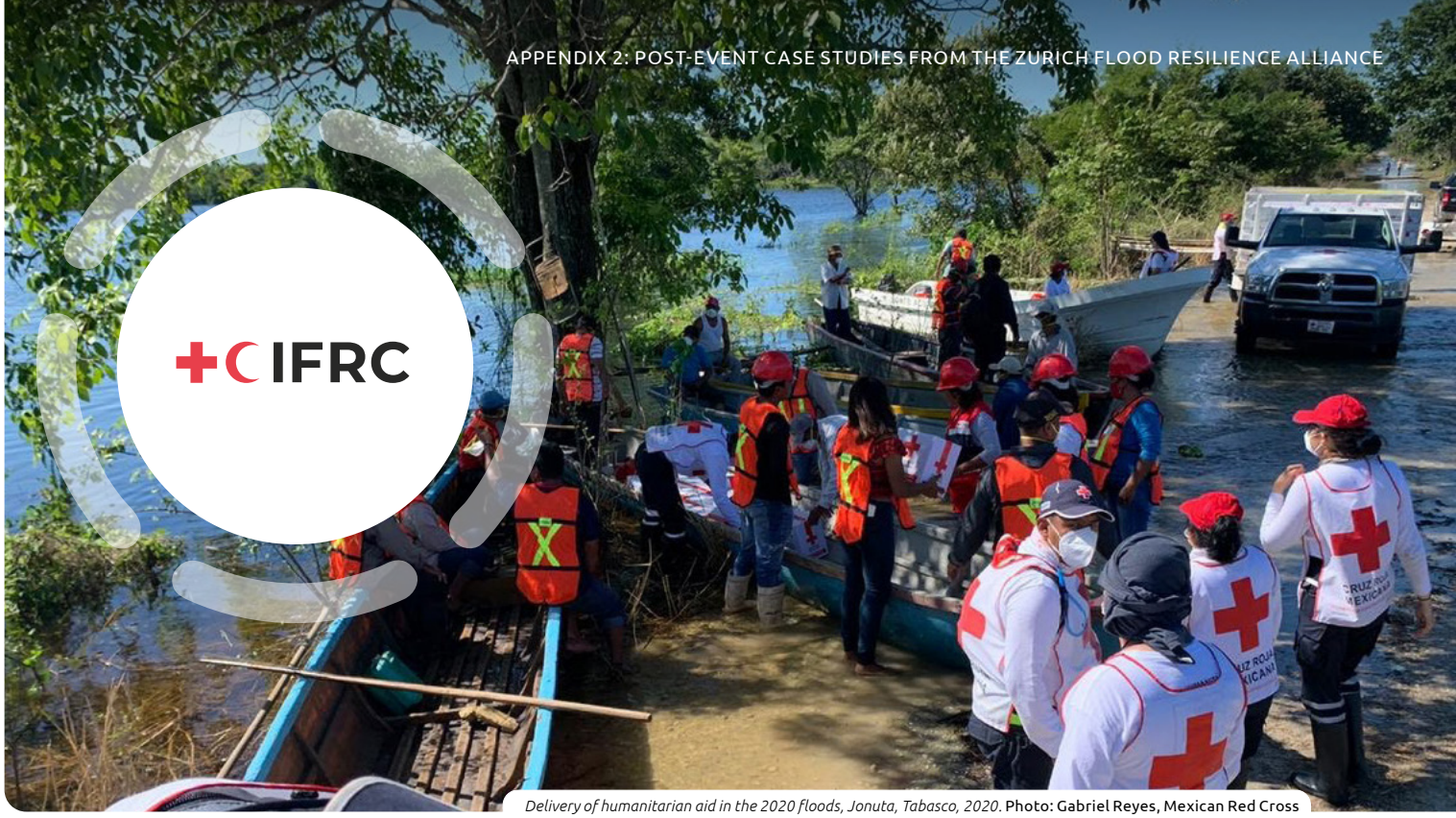
The post-event study was conducted after the flood event in November 2019, in both the Gaibandha and Lalmonirhat districts. The 'cluster system' is an approach applied by Concern Worldwide to better understand natural capital and its connections to different aspects of resilience, and to provide a framework for applying meso-scale, nature-based solutions. For the post-event study, by analyzing certain communities as clusters as well as separately, we were able to understand across a broader area the change in resilience and how project activities are building on existing resilience.

Key findings from the post-event study

- Within each district, there are relatively small differences between the clusters.
- Increasingly, there is a drive for green flood management solutions for flood management that recognize the inherent value of the riverine landscape in regulating flooding. The areas of focus identified are: the role of natural capital in buffering flood impacts; the connection of green solutions to grey solutions; and influencing how natural capital is used to strengthen flood mitigation.
- Governance, for managing resources, is critical to address flood risk. The study outcomes show a good level of awareness of flood risk in the communities, but a lack of practical actions at the governance level and the level of flood-risk learning.
- The need for a strong early warning cannot be over-emphasized. A locally owned system needs to complement the national early-warning system. A key issue is to enable the community to take the correct action at the right time based on their understanding of flood behaviour, even before a formal notice of a flood event. This could prevent mortality and ensure a safe evacuation and return to enable a faster recovery.
- There are few livelihood opportunities in terms of access to resources and support for change to cope with floods. The lack of connection between the community and governance structures affects the ability of households to access critical funds needed for meaningful change. Although there is a good level of knowledge of asset protection, it may not translate effectively into practices and behaviours that would lead to more positive outcomes regarding flood resilience.

Lessons learned

- More focus is needed on strengthening early warnings, livelihoods, natural capital and assets protection, and focusing on the right combination of approaches towards flood resilience. The project team needs to improve links between community action, governance, and flood-resilience impacts based on post-event study findings and recommendations.
- The recommendations from the post-event study were useful for ongoing advocacy and local-level FRMC interventions.
- The post-event study was also used to inform Concern Worldwide's natural capital work. Concern Worldwide is now working with Esolve, an environmental consultancy firm, to develop a natural capital flood risk management strategy to guide decision-making in this area.
- Teams should prepare for the post-event study from the beginning of the flood and gather information from a wide variety of sources. Following the flood period, the required data may not always be available from government authorities.
- There is a need for extensive training and capacity building of enumerators so that accurate information is collected from the field.
- Nature-based flood management should be added to the study design for those working with this approach; if it is incorporated with the post-event study, it may be helpful for those who are working with nature-based solutions.



Delivery of humanitarian aid in the 2020 floods, Jonuta, Tabasco, 2020. Photo: Gabriel Reyes, Mexican Red Cross

Case study 2: Mexico 2020, by the Mexican Red Cross

The flood event

In October and November 2020, a series of cold fronts and two cyclones caused severe flooding in the Mexican states of Chiapas, Tabasco, and Veracruz. In the state of Tabasco, significant rainfall, flooding, landslides and water discharged from the Ángel Albino Corzo 'Peñitas' hydroelectric dam left the region under water. In total, the storms and resulting floods inundated 14 per cent of the state and affected nearly 800,000 people.

The post-event study process

The Mexican Red Cross assessed the situation in four communities affected by the October and November 2020 floods in the municipalities of Jonuta and Teapa, Tabasco (the area in which the Zurich Flood Resilience Alliance project in Mexico operates).

Key findings from the post-event study

- Sources of income were impacted negatively in all four communities. Almost all of the population in the communities of Teapa reported that it would take between three and 12 months to recover from the floods, and 30 per cent of the population sought loans from financial institutions to cope with the damages caused by the floods. In contrast, in the communities of Jonuta, 30 per cent of the population reported that they would be able to recover within three months of the floods and did not need to seek loans from financial institutions. None of the communities reported that families resorted to selling productive assets to recover financially from the floods.
- The population received financial support for flood recovery via emergency funds managed by the federal government, as well

as humanitarian aid from the Mexican Red Cross, NGOs, and other donations. The population acknowledged that the support was extensive and equitable.

- In some communities, flooding caused the spread of pesticides that contaminated pastures and, when ingested by animals, caused their death. The decomposition of dead animals increased environmental contamination and community members' contact with contaminated water led to skin infections.
- Contaminated water and prolonged humidity, which only reduced approximately three months after the floods, caused various diseases among the population. An increase in diseases (such as dengue fever, diarrhoea, respiratory infections, dermatitis, and foot fungus) was observed. In addition, continued humidity led to the loss of medical records, which interrupted ongoing medical attention for residents.
- While the community members reported that there is no early-warning system within the community itself, they receive flood warnings from local authorities and, in some cases, from members of the community brigade. The post-event study found that the communities have their own monitoring mechanism through direct observation of the rivers. The communities share information through loudspeakers, megaphones, and social media, which is sometimes limited given that not everyone has internet access.

Lessons learned

- Early-warning system technical components exist at the state and federal level and, in 2020, flood warnings were disseminated and received by some communities. Community brigades facilitated the sharing of early-warning messages and monitored rivers with hydrometric scales painted on wooden sticks or trees. However, the communication strategy needs to be improved, especially to reach the most remote communities.
- Financial mechanisms for emergency response and recovery facilitated the management of the 2020 floods. In one case, the community brigade contacted key government actors to manage external support. There is a need to promote connections with government institutions to ensure support in the case of flooding.
- The promotion of family savings strategies is important in the case of flooding as well as more generally. Savings strategies allow families to cover everyday expenses during floods when access to sources of income may be temporarily blocked.
- The distribution of humanitarian aid by the Mexican Red Cross was efficient. Basic family details were incorporated into a community census via a mobile phone app to avoid the duplication of aid.
- The extended prevalence of post-flood illnesses indicates the need to promote participatory hygiene and sanitation transformation training (PHAST).

Women carrying drinking water in boats from faraway places, Charnasirpur, Faridpur. 2021. Photo: S M Ashikul Islam, Practical Action

Case study 3: Cyclone Amphan 2020, Bangladesh, by Practical Action

The flood event

Cyclone Amphan devastated Bangladesh in the middle of the COVID-19 pandemic in 2020 and was followed by severe flooding. The flood water damaged embankments, spilled into surrounding settlements, and waterlogged 0.2 million hectares of agricultural fields and fish farms, which also affected 5.4 million people and 1,059,295 households in Bangladesh. Communities in Faridpur experienced flooding three to four times between June and September.

The post-event study process

Practical Action assessed the post-flood status of the eight flood-affected vulnerable communities in Faridpur district (the area in which the Zurich Flood Resilience Alliance project in Bangladesh operates) after the major flood in July 2020.

Key findings from the post-event study

- Around 60 per cent of the population experienced unfavourable effects on their income sources.
- Most people did not recover from the detrimental impacts of the flood within three months. During the floods, 80 per cent of those impacted sold their productive assets/crops, such as rice, jute, wheat, maize, and cattle. People took up livelihood measures, such as fishing and working as transport labourers, drivers, and van pullers, among others.
- Many people were in debt because of loans from NGOs, government organizations, and local residents (mahajans), which worsened their financial load. There was no insurance in the affected areas that could aid with flood-damage recovery.
- People did not prioritize their health because of the distance to health centres and the lack of a stable medical team. It was estimated that 10–15 per cent of people suffered from hunger. Due to rising food prices and restricted sources of potable water during the floods, almost 90 per cent of families were unable to obtain healthy meals.
- During the flood, neighbourhoods were polluted by dead animal remains, rubbish, and various other waste products; as a result, water-borne diseases increased.
- Theft and robbery were more prevalent than usual. Most incidents affected local people and were committed at night.
- People mentioned that they did not receive proper support for river embankment protection and flood warnings, although the Water Development Board (WDB) claims to work all year to improve flood protection and dredging. The local Union Parishad only receives funds when a flood is predicted, implying that actions are centred on during/post-flood and short-term solutions. However the eight communities in the four working Unions of Practical Action, received early warnings as voice messages via mobile phones – and were able to take actions to protect themselves and minimize damages to their assets.

Lessons learned

- Local-level Union Parishads need greater funding and capacity building to be fully able to manage flooding locally.
- Flood early warnings need to reach the 'last mile' with adequate lead time.
- Improved coordination and collaboration between communities, local government, and institutions are required to better understand community needs.
- Emergency response actors can do more to reduce disruption and the recovery time frame.
- Local people believe that NGOs can distribute relief more effectively than the local authority.

Members of the Communal Civil Protection Commission cleaning the Cerrón Grande water reservoir prior to the rainy season in the community of Colima, March 2020. **Photo: Plan International**

Case study 4: Tropical storm Amanda-Cristobal 2020, El Salvador, by Plan International

The flood event

Between 29 May and 7 June 2020, a low-pressure system south of the coasts of El Salvador and Guatemala caused heavy rainfall over Central America. The event later became known as tropical storm Amanda-Cristobal impacting the lives of more than 53,000 households and damaging nearly 13,000 houses, 128 bridges, and 392 schools across El Salvador. "Amanda-Cristobal" also damaged 2,800 hectares of crops and forced 12,600 people to relocate to temporary shelters. This happened at the height of the COVID-19 pandemic, during which Salvadorian citizens already had to cope with extraordinary measures imposed by the government, such as mandatory quarantine that lasted several months.

The post-event study process

Plan International El Salvador assessed the post-flood status in two project communities impacted by Amanda-Cristobal: Colima, Department of Cuscatlán, and El Majahual, Department of La Libertad (see Figure A1).

The study was conducted between September and November 2020.

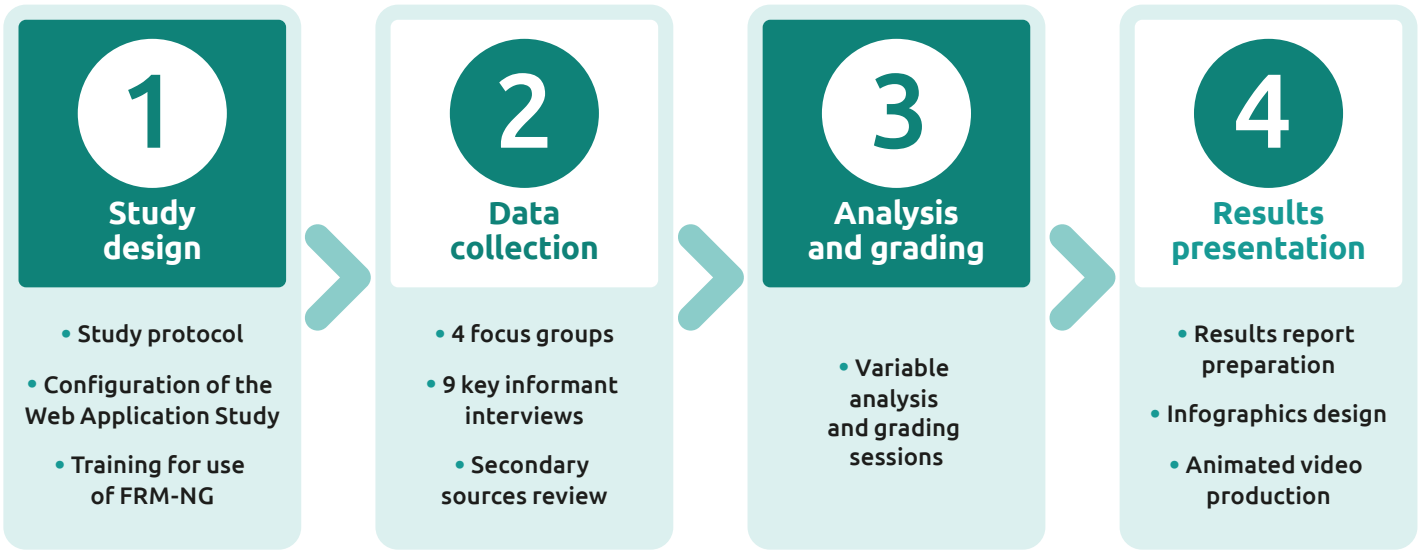


Figure A1: Process to implement the post-event study in El Salvador following tropical storm Amanda-Cristobal in 2020. © Plan International

Research participants

The focus-group discussions involved members of the Community Civil Protection Commission, the board of directors from the Community Development Association, local shopkeepers, and children and youth from both communities. In total, 78 people participated in the group discussions. Key informant interviews were conducted with local health promoters, school principals, community leaders, technical staff from the Municipal Environmental Unit, the General Directorate of Civil Protection, and a forecasting specialist from the Ministry of Environment and Natural Resources.

Key findings from the post-event study

- In both communities, more than 40 per cent of all houses, business premises, and agricultural land were severely damaged during the flood. The measures that the community took to protect their assets were limited and largely took place at the household level, which is an indication that the community response committees – established under the framework of the project – still need to be further strengthened. There was no external assistance, which can at least be partially attributed to the fact that local authorities were focused on combating COVID-19 at the time of the flood. The communal early-warning systems are still rudimentary, as a result of which most community members did not evacuate until the flood was imminent. The communal waste-management system does not function well, there is little to no connection to governmental services, and community members need to travel long distances to access hospitals.
- On a positive note, there were no fatalities. This could perhaps be because the flood was not severe enough, but also because most community members were aware of the general flood risk and had taken basic measures, like placing sandbags in front of their homes. Education facilities remained open, except for the time when the National Civil Protection Commission issued a red alert. Another reason why facilities remained open can be attributed to the fact that the whole country was in the midst of delivering schooling virtually at the height of the COVID-19 pandemic (which came with its own challenges).

Lessons learned

- The repair of community infrastructure took more than a year or was not completed at all. This can at least partially be attributed to the fact that two financially vulnerable communities had to face the dual burden of coping with Amanda-Cristobal and the COVID-19 pandemic.
- Flood resilience awareness-raising campaigns in advance of the flood event and delivered through the activities of the project led to some progress, but more remains to be done, so that everyone takes the necessary precautions and all community members evacuate on time.
- Given the restrictions to access the communities at the time (El Salvador was still under complete lockdown due to COVID-19 restrictions), the project team completed the post-event studies virtually using Zoom and WhatsApp as the main platforms. The team referred to the guidelines provided by the Alliance for online data collection, with slight adjustments to the methodologies for focus-group discussions. Plan International provided resources to people (via the internet) to participate in the sessions. It is important to consider the time that needs to be dedicated to virtual sessions and the limited access for some participants. Not all people have devices that optimally support platforms such as Zoom. This is why an introductory training on the use of virtual platforms should be considered for research participants. Plan International provided virtual tutorials to the research participants, showing them how to use these platforms.
- The early-warning system should be strengthened for timely evacuation. This needs to be coordinated through the local response committees (both at community and school level), which are linked to the General Directorate of Civil Protection. Plan International has already started working on this through interventions linked to the project.
- The communities need to establish stronger ties to the municipality, which can be facilitated by Plan International, to improve the solid waste-collection system and prevent rubbish from blocking canals.
- The project team has developed various knowledge products (infographics, videos, and reports) in Spanish and English to promote the dissemination of results in the communities and government institutions, with the aim of expanding their understanding of resilience and promoting Influencing actions. These outputs have been well received by the communities and government institutions, making it possible to promote some of our interventions in conjunction with government institutions at the national level.
- In general, public services often do not extend to vulnerable communities like Colima and El Majahual, and this remains a real challenge. The post-event study outputs (infographics, videos, and reports) can be powerful advocacy tools to improve this situation.
- It is easy to fall into the trap of comparing post-event study results with t-line study results. However, these two sets of studies are fundamentally different, should be treated separately, and do not allow for a like-for-like comparison.

Climate Resilience Alliance

Climate Resilience Measurement for Communities

Keep in touch...

Write to info@ZCRAlliance.org, visit ZCRAlliance.org/CRMC or follow us on LinkedIn.

Intellectual Property note:

a) Since 2013, the Alliance has successfully been developing and implementing the Flood Resilience Measurement for Communities ("FRMC") approach, which includes the underlying framework for measuring community flood resilience, the software to apply the framework (the FRMC tool) and associated training materials, which has been used in over 400 communities globally. The development and writing of the training materials including the user guides has been the joint work of the Alliance.

b) The Climate Resilience Measurement for Communities ("CRMC") is the next evolution of the FRMC, meeting the increasing demand to measure resilience to multiple hazards in order to accelerate climate change adaptation. The typology has been further sharpened whilst retaining the three core elements of community centricity, hazard specificity and development focus. The CRMC has been developed as a product of the Alliance.

c) The software: The FRMC and CRMC software has been developed and is maintained by Zurich. Currently, the software includes the four hazards developed for the framework and implemented by Zurich through the software provider, floods, heatwaves, storms and wildfires, and can be amended from time to time as appropriate as new technology becomes available or further climate-related hazards are added.

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 ultimately are 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. User organizations can download all of their data at any time.

e) Use-rights: The Foundation and the Alliance are keen for the CRMC to be used as widely as possible. Existing partners are encouraged to expand use of the tool within the remit of their work.

Front cover: *Inundaciones en Piura, Peru.* Photo: Rodrigo Rodrich, Practical Action

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