The Climate Resilience Measurement for Communities (CRMC)

This document provides detail on the conceptual framework behind the Climate Resilience Measurement for Communities (CRMC) and explains how it is applied practically, including the software used.

Since 2013, the Zurich Flood Resilience Alliance has successfully been developing and implementing the Flood Resilience Measurement for Communities (FRMC) process, which has been used in over 400 communities globally.

The 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 currently includes the hazards of floods and heatwaves, but **can be expanded** to other climate-related hazards. It is being piloted in several communities through the Z Zurich Foundation's Adapting to Climate Change programme, with more to be added soon.

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

From flood resilience to climate resilience measurement at the community level

The Zurich Flood Resilience Alliance ('the Alliance') is a cross-sector collaboration between Zurich Insurance Group, NGOs, and academia. Zurich Insurance Group works with the humanitarian and civil society organizations Concern Worldwide, the International Federation of the 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). The Alliance was originally launched in 2013 with the goal of shifting focus from flood response and recovery to pre-event risk reduction. Based on the successes achieved in this first phase, in 2018 the Z Zurich Foundation extended funding for a second five-year phase, and in 2020 support was further extended through to 2024.

Together with the Z Zurich Foundation, the Alliance is harnessing the learning from our flood-resilience programme to consider how this could apply to other climate hazards. We have already been able to expand both our FRMC process and our post-event review capability (PERC) methodology into heatwaves. They can also be expanded to other climate-related hazards. This paves the way for further development in the future.

In 2020, Alliance members decided to explore the possibility of updating the FRMC and adding new hazards to the framework. Three parallel, independent approaches were used to explore the feasibility of this expansion: a research-led review of state-of-the-art resilience measurements, an Alliance internal scoping exercise consisting of six work packages, and a peer-review process with a dozen participating experts. It was concluded that an expansion of the FRMC was desirable and feasible, if it followed certain conditions. Heatwaves were selected as the first new hazard to be added to the approach, and in 2021 a team of Alliance members and other experts developed the content and functionality of the CRMC.

A key motivation for exploring new hazards is that many communities are at risk from other hazards in addition to floods. This implies that the addition of new hazards to our community resilience measurement 'ecosystem' would mean working together in such a way that a user team could measure for more than one hazard within the same process.

Our vision:
Floods have no negative impact on people's and businesses' ability to thrive.

Our goal:
To increase social, political and financial investment in community-based flood resilience-building through public, private and third sector partnerships.

Our objectives from 2018 to 2023 are therefore to:

Objective 1: Increase funding for flood resilience

Objective 2: Strengthen policy at global, national or sub-national level to support flood resilience

Objective 3: Improve flood resilience practice.

What is the CRMC?

The Climate Resilience Measurement for Communities (CRMC) comprises two parts: 1) the Alliance's framework for measuring community resilience to climate-related hazards; and 2) an associated tool for implementing the framework in practice. For the Alliance, community resilience to climate hazards goes beyond infrastructure. We therefore define community climate resilience as:

"The ability of a community to pursue its development and growth objectives, while managing its climate risks over time in a mutually reinforcing way" (adapted from Keating et al., 2017a[1]).

In addition to making the community resilience measurement approach work for multiple climate-related hazards, we have further sharpened the content with regards to the natural capital sources and have provided additional analytical lenses. We have widened the data disaggregation capabilities along gender, age, social inequities, and disability axes. And, most importantly, we have updated the content to make it even more tailored for the application in various contexts, including urban and rapidly urbanizing.

How does the CRMC work?

The CRMC framework

Our framework, also called the 5C-4R framework, combines a series of indicators – so called sources of resilience, on five complementary 'capitals' (5C) as well as four properties derived from resilient system-thinking (4R), that can help people on their development path and also provide capacity to withstand and respond to shocks.

The 5Cs comprise human, social, physical, financial and natural capital. The 5Cs provide greater richness of data about a community's sources of resilience than any single metric such as average income.

The five capitals (5Cs):

Human (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, livestock).

Natural (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).

1   Keating, A, Campbell, K, Mechler, R, Magnuszewski, P, Mochizuki, J, Liu, W, Szoenyi, M, and McQuistan, C (2017a). Disaster resilience: What it is and how it can engender a meaningful change in development policy, Development Policy Review 35 (1): 65-91. DOI:10.1111/dpr.12201.

Each capital group contains a set of generic and discrete sources of resilience (which can be thought of as sub-indicators). Across the 5Cs there are 44 sources of resilience, each specifically defined. Sources of resilience are grouped under the four headings of robustness (ability to withstand a shock), redundancy (functional diversity), resourcefulness (ability to mobilize when threatened), and rapidity (ability to contain losses and recover in a timely manner).[2]

This 'systems thinking' approach takes into account the assets, interactions and interconnections at community level, and provides consistency when it comes to identifying and testing sources of resilience.

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

Robustness (ability to withstand a shock), for example, housing and bridges built to withstand a flood.

Redundancy (functional diversity), for example having many evacuation routes.

Resourcefulness (ability to mobilize when threatened), for example a group within a community that can quickly mobilize to convert a community center into a flood shelter.

Rapidity (ability to contain losses and recover in a timely manner), for example quick access to sources of financing to support recovery.

2   Based on the properties of a resilient system developed at MCEER at the University of Buffalo.

A selection of resilience

As an evolution to the sources approach in the FRMC, we have now divided the sources of resilience into three categories: general, hazard-specific, and hazard-unique (see Table 1 for some examples in each of the three categories). We have added heatwave-specific and unique sources, so the CRMC can now be run for floods, for heatwaves, or for both hazards at the same time. Additional hazards can be added following the same logic, such as wildfires or storms, for example.

General sources	Hazard-specific sources	Hazard-unique sources
Asset protection knowledge	Business continuity	Communication interruption
Community disaster risk management planning	Community participation in flood related activities	Community representative bodies
Community structures for mutual assistance	Conservation budget	Disaster response budget
Education commitment during floods	Environmental management awareness	Evacuation and safety knowledge
First aid knowledge	Flood emergency food supply	Flood emergency infrastructure
Flood exposure awareness	Flood healthcare access	Flood safe water
Future flood risk awareness	Governance awareness	Household asset recovery
Household income continuity strategy	Integrated flood management planning	Inter-community flood coordination

Table 1: Sources of resilience across the three categories

There are currently 52 sources if you run the CRMC for flood only, 50 sources if you run it for heatwaves only, and a total of 76 sources if you run the CRMC for both flood and heat.

For further details on the theoretical underpinnings and process for developing the phase 1 version of the framework, see Keating et al., 2017b.[3]

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3   Keating, A., Campbell, K., Szoenyi, M., McQuistan, C., Nash, D. and Burer, M. (2017b) 'Development and testing of a community flood resilience measurement tool', Natural Hazards and Earth System Sciences, 17: 77–101, <https://doi.org/10.5194/nhess-17-77-2017>.

The CRMC

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

To measure each source of resilience in a given community, data can be collected in four different ways (i.e. household surveys, key informant interviews, focus group discussions, and through the use of secondary sources) according to context and need.

After data is collected on the app, it is uploaded to the web application. Assessors grade each of the sources of resilience on a scale from A–D (where A is best practice and D is poor). Trained assessors compare source definitions with the collected data, drawing on their experience, training, the user manual, and related guidance.

The grades between A and D awarded to each community are then aggregated in different ways for analysis. Aggregations, or 'lenses', by which resilience can be viewed include the 5Cs and the 4Rs. Further lenses are the seven themes by which questions are sequenced thematically (such as healthcare, education, livelihoods, etc.), the five steps of the disaster risk management (DRM) cycle (preparedness, response, recovery, prospective risk reduction, and corrective risk reduction), and many more.

How do we measure the sources of resilience?

We grade each source based on the quantitative and qualitative data points and the benchmarks for best practice.
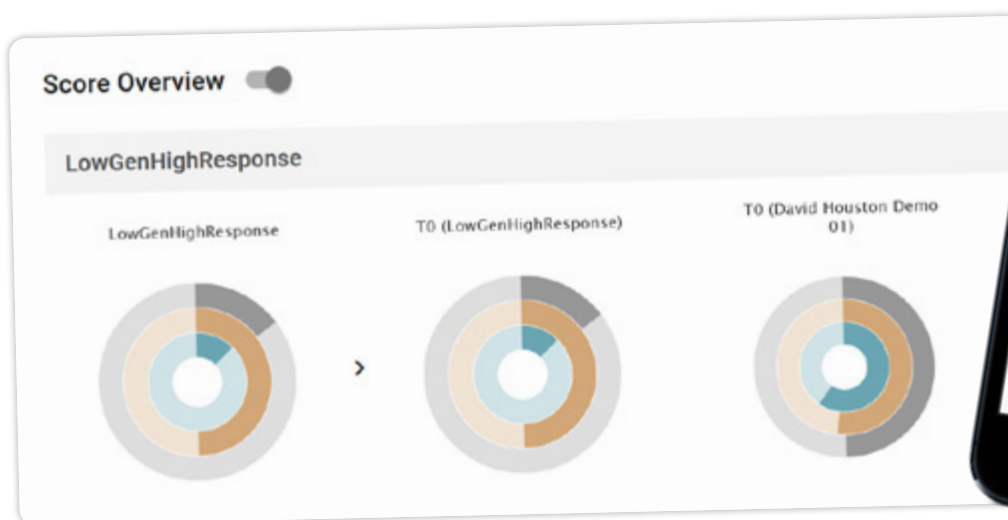
A — Best practice for managing the risk

B — Good industry standard, no immediate need for improvement

C — Deficiencies, room for visible improvement

D — Significantly below good standard, potential for imminent loss

What does the CRMC do and not do?

The CRMC focuses on a set of climate-related hazards at the community scale. After a long review, and while many aspects or elements of resilience are more general, we believe many are very hazard-specific, which we wanted to focus our attention on. The CRMC currently covers flooding and heatwaves, with wildfires in preparation. Also, while resilience can be measured at different scales (national, regional, local), we have chosen to focus on the community level, where climate-change impacts are felt most strongly, and where much action on improving resilience needs to be taken. Also, many humanitarian and civil society organizations (including our Alliance members) primarily work at the community level. Our approach to measuring resilience can be applied to other hazards. We can discuss with you how to apply it to a different hazard using our expertise.

The CRMC supports decision-making and provides evidence of how resilience in a community changes over time. The CRMC is a fully integrated framework and tool to deploy at various stages of a long-term (multi-year) community resilience-building programme to support decision-making and give evidence of how resilience in a community changes over time.

The CRMC is not a monitoring and evaluation tool. It is not intended to be used as an ex-post project or intervention evaluation framework by external assessors to evaluate a project's efficiency or effectiveness.

The CRMC is a decision-support tool to highlight strengths and weaknesses in community resilience using different perspectives. Results generated with the CRMC can be visualized, arranged, and displayed flexibly. This visualization of results provides data for discussions and prioritization exercises, together with the programme communities, to identify interventions to use that could improve community flood resilience. It is also possible to measure the change in resilience in the community over time as strengths are extended and weaknesses improved.

The CRMC is not a decision-making tool. It will not identify and select solutions. The grades and scores should provide insight into planning processes as one of many sources of information.

The CRMC framework helps you think deeply about resilience. It helps you think about the community with all its interdependencies and lets you visualize the system in which a community functions, with its linkages to higher and smaller scales (e.g. regional and precinct or household scales).

It helps you identify connections to other aspects of resilience and the interdependencies that connect them. It also helps you think about how interventions and solutions can support more than just one element or source of resilience, and helps you identify intended as well as unintended consequences.

The CRMC provides information about changes in flood resilience and the direction of the journey for the communities themselves. The CRMC is not a competitive tool to compare the performance of communities. The aim is not to compare overall resilience scores or compare individual sets of strengths and weaknesses of communities. The numbers/grades and the quantitative aspects of the CRMC are a guide to what the data means, not the outcome. Numbers should not be used as absolutes; rather, they should be considered relative and as part of a trajectory over time.

To learn more about the CRMC and to find out how it can add value to your programmes, please contact info@floodresilience.net.

Can I use the CRMC?

If you operate in a not-for-profit environment to meet community needs, we will happily consider your interest. The original FRMC and the new CRMC have been and continue to be applied by the ten organizations comprising the Zurich Flood Resilience Alliance across the world in different geographic, cultural, and climate-related hazard contexts. Critically, the tool has been designed to be as broadly applicable as possible.

For instance, it is currently being deployed in both developed and developing countries, as well as urban, peri-urban, and rural settings. It can be applied in communities facing all types of floods, as well as extreme heat threats.

The framework works the same universally – the framework, tool, and the data collection processes are the same everywhere – but the interpretation of results and therefore the decision-making processes are highly contextual and can be adapted to specific needs.

The underlying 5C-4R framework and data collected remain comparable and structured, adding to our growing pool of data. We can then analyse that data to further refine the framework and improve the overall understanding of what resilience is and how resilience works.

If you fulfil the criteria below, we encourage you to get in touch to discuss how you could benefit from applying the framework in the context of your community work.

How do I apply to use the CRMC?

The FRMC and the CRMC have come out of a not-for-profit multi-organizational alliance and required a heavy in-kind and financial investment. As such, the CRMC will remain purely for not-for-profit societal use and cannot be used in a for-profit business environment. The Alliance and the Z Zurich Foundation also need to review what additional cost they might incur by using the CRMC with you (e.g. cost of conducting training, additional IT infrastructure use, etc.), and how you could help cover that cost.

Please fill in the following questionnaire so that we can learn about your organization, the programme in which you intend to apply the CRMC, and the purpose of your CRMC application.

Please send the completed form to info@floodresilience.net with the subject line 'CRMC usage request'.

We will review your application and get in touch to discuss the next steps. We will also clarify the exact conditions under which the collaboration will work.

Conditions will include things like:

- signing a terms of reference document that lays out the terms and conditions of the collaboration
- the time frame in which you intend to operate
- the level of mutual engagement foreseen.

Conditions also include more technical agreements of:

- how you will use the tool
- how you will help us grow the underlying database to analyse community resilience (including agreement of the corresponding data protection)
- your training needs to get ready to use the tool
- the support you will need to successfully implement the entire process
- how any cost incurred by doing this can be covered.

Expression of interest in using the Zurich Flood Resilience Alliance and Z Zurich Foundation's Climate Resilience Measurement for Communities

We would like to learn more about the CRMC.
Please review the information provided below and contact us to discuss the next steps.

Contact details:

Name of organization:

Website:

Contact name at organization (last name and first name):

Function of contact person:

Full postal address:

Telephone number:

Contact email address:

Organization details:

Type of organization (non-profit, research/academic, government, public or civil society sector, other[4]):

Focus area of organization (briefly describe what programs you typically implement):

Area of operation (which global/regional/national/local programmes you typically implement):

Key expertise (briefly explain which key areas of expertise relative to disaster risk management, resilience-building or similar your organization has):

Project details:

Type of project where you intend to use the CRMC (briefly describe the aim and scope of the project):

If known, which geographic area is this project operating in and at what scale (name of region, communities, etc.):

Project duration:

Need/motivation to measure community flood resilience (briefly explain how you intend to use the CRMC to measure community flood resilience as part of your project):

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4 Non-profit groups may include groups such as community groups, NGOs, labour unions, indigenous groups, charitable organizations, faith-based organizations, professional associations, foundations, etc.

The Climate Resilience Measurement for Communities (CRMC)

For more information visit floodresilience.net or follow @floodalliance on social media.

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