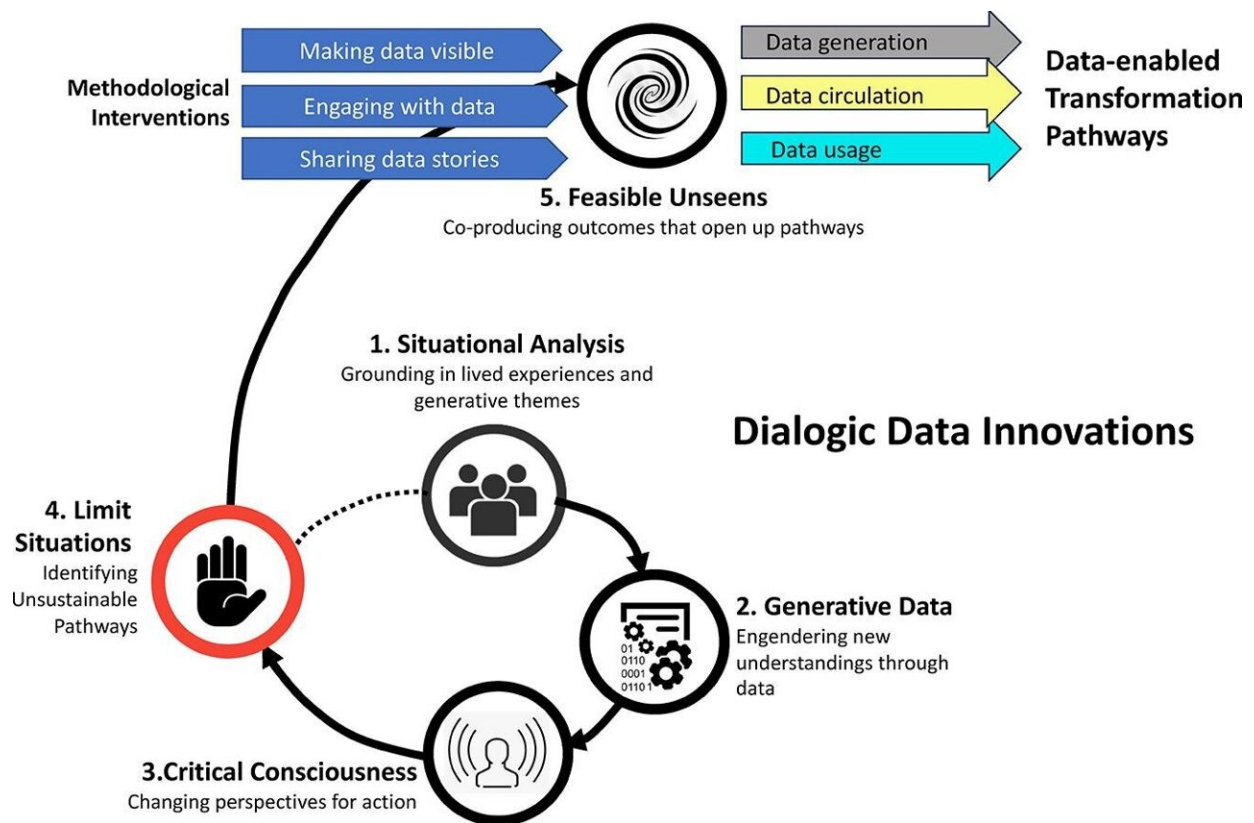


Method involving citizen participation found effective to address risks of environmental disaster

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Graphical abstract. Credit: *Global Environmental Change* (2023). DOI: 10.1016/j.gloenvcha.2023.102730

A digital map of flood-prone areas in Brazilian cities São Paulo and Rio

Branco created by public school students; a history of floods recorded in a poor neighborhood of São Paulo based on the residents' recollections; new communication channels with the Civil Defense authorities to improve the early warning system—these are some of the instruments for citizen participation and mobilization shown to be effective in initiatives to increase survival of urban disasters.

They now constitute a methodology [published](#) in an article in the journal *Global Environmental Change*.

The authors describe a three-year research project involving 17 scientists from Brazil and other countries, whose main findings were that the transformative pathways through which urban data can enable change should encompass not only the development and deployment of novel digital technologies, but also the co-production of new understandings, perspectives, social practices, and transformed governance arrangements.

This, they write in the conclusion, includes a combination of data analytics with a wide range of participatory methods to enable "just and sustainable transformations".

Climate change and rising numbers of vulnerable people worldwide have exacerbated the socio-economic and environmental impacts of disasters. As many as 1.81 billion people, or 23% of the world population, are [estimated](#) to be directly exposed to significant flood risks, but these risks are unequally distributed, with 89% of the world's flood-exposed people living in low- and [middle-income countries](#).

In Brazil, four in ten municipalities are vulnerable to disasters due to floods and landslides, according to the National Disaster Surveillance and Early Warning Center (CEMADEN), which currently monitors 1,038 municipalities on a daily basis and issues warnings when there is a

risk of above-average rainfall.

"The article synthesizes the trajectory of a project, its conclusions, and in particular its continuation via the CEMADEN Education Program as public policy for environmental education on reducing the risk of disaster," said João Porto de Albuquerque, first and corresponding author of the article. He is a researcher at the University of Glasgow in the United Kingdom.

"Its main scientific contribution is the methodology we constructed, involving a new way of producing data with information technology and a process of co-production with communities and residents. We also took pains to make it multidisciplinary, assembling a research group that includes professionals in public administration, [urban studies](#), geography, computer science and [environmental education](#), as well as humanities and software development."

The results are part of Waterproofing Data, a project involving the Universities of Glasgow and Warwick (UK), the University of Heidelberg (Germany), and CEMADEN and Getúlio Vargas Foundation (FGV) in Brazil.

One of the most evident symptoms of the ongoing climate crisis is the increasing frequency and intensity of extreme weather events, according to the Intergovernmental Panel on Climate Change (IPCC). A study conducted in January 2023 by the Brazilian Geological Survey (SGB) found 3.93 million people living in 13,500 high-risk areas across the country.

In 2018, 8.2 million Brazilians lived in areas subject to floods and landslides in 872 municipalities, according to a report issued that year by CEMADEN and IBGE, the national census and statistics bureau. Examples of such areas are the parts of Rio Grande do Sul state hit by

severe flooding in early September, with dozens of deaths and widespread destruction, as well as the disaster seen at the start of the year in several areas of the northern part of the coast of São Paulo state, with more than 60 deaths and major economic and financial losses.

Collecting data

"Our work has a very clear application to topics relating to the climate emergency and evidenced-based decision-making. Lack of data is a real problem in Brazil and several other countries, as well as the inequality that must be taken into account when formulating public policy. The project showed there are ways to change how the government handles the question of data, including people and territories," Maria Alexandra Cunha, a professor at FGV and co-author of the article, told Agência FAPESP.

The research has resulted in a free smartphone app ([available](#) for Android) that can be used to collect data at strategic sites via citizen science to monitor rainfall, flooding and river levels. The data is transmitted in real time to a [digital platform](#) with interactive maps accessible by local communities.

The platform has been integrated into the website of the CEMADEN Education Program, which works with schools and communities and is being used as part of a nationwide disaster prevention campaign.

To make the lessons learned in the project available to other regions, a [Learning Guide](#) was created to help students and volunteers with the production of data and knowledge about disasters caused by excessive water flows and lack of urban drainage.

"CEMADEN Education has created participatory and transformative methodologies to build a network of schools, young people, residents and

local communities. Projects like Waterproofing Data are part of this process, helping us move on from the [case study](#) to gain scale. We expect the methodology to be used in many more areas," said Victor Marchezini, a researcher at CEMADEN and also a co-author of the article.

Steps

The researchers used innovations inspired by what they call dialogic pedagogy, an approach developed by Paulo Freire, and based on the creation of knowledge construction networks, including (1) a situational analysis of lived experience and topics that fuel debate; (2) generative data originating new understanding; (3) critical reflection to change perspectives for action; (4) threshold or limit situations involving unsustainable living conditions; and (5) feasible unseens offering new paths to transcend threshold situations.

They produced methodological interventions that made citizens and their experiences visible by means of data, motivating the community to engage with the process and share stories. In one case, an inhabitant of Jaboatão dos Guararapes (in Pernambuco state, Northeast Brazil) wrote a poem using the cordel form derived from popular culture and describing the data practices in which they participated.

The community generated data and information, which circulated and were used more widely, opening up new paths to solutions and transformations. "The first step in the search for solutions to problems is to make them visible, producing data, evidence and knowledge in each community. We hope to see the project continue as this approach is implemented in other regions and even abroad, in countries like Colombia, where we've already worked," Albuquerque said.

More information: João Porto de Albuquerque et al, Dialogic data

innovations for sustainability transformations and flood resilience: The case for waterproofing data, *Global Environmental Change* (2023). DOI: [10.1016/j.gloenvcha.2023.102730](https://doi.org/10.1016/j.gloenvcha.2023.102730)

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