Task Force 3
LiFE, Resilience, and Values for Wellbeing

BUILDING A CLIMATE DATA ECOSYSTEM FOR DISASTER-RESILIENT INFRASTRUCTURE AND SOCIETIES

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Abstract

It is beyond contestation that a sound data ecosystem can help drive strategic decisions towards building disaster-resilient infrastructure, cities, and societies. However, data that could enable such strategic decisions is scattered across different agencies, scales and formats, limiting their utility for informed decision-making. This results in inefficient actions or ad-hoc responses that fail to cater to urgent needs during emergencies or provide sustainable long-term solutions. There is an urgent need to commit towards a comprehensive G20 Climate Data Ecosystem that allows modelling intelligent solutions using advanced artificial intelligence and machine learning techniques to inform decision-making. Such an ecosystem needs to look at climate data holistically and make interoperable, AI-ready, standardised datasets available across current data silos.

The Challenge

1

Access to near-real-time, standardised, and AI-ready data, with the potential to drive innovations for climate adaptation and disaster risk reduction amid intensifying extreme weather events, is key to science-based policymaking. According to the *World Meteorological Organisation Report 2021*, the world experienced an extreme weather event nearly every day over the past 50 years, leading to daily losses of over US$ 200 million (World Meteorological Association 2022). These disasters have had massive impacts on essential infrastructure, the natural environment, economic development, and social wellbeing.

The imperative is to build disaster-resilient infrastructure, cities, and societies. In turn, this task requires accurate and timely data to not only inform policies, decisions and actions, but also to assess the impact of efforts or investments made towards building resilience, which can be seen in the form of budgetary allocations, public procurement data, and other expenditure datasets. However, data which could help make disaster-risk response and management more effective, is scattered across different agencies, systems, scales, and formats, leaving the data of less utility for impactful decision-making ('A New Open Contracting Model for Disaster Management in Assam, India - Open Contracting Partnership' 2022).

To begin with, there is no consensus yet on what constitutes 'comprehensive climate data', and for this reason, many critical datasets such as those on public expenditures are not considered in discussions on climate action. For example, WESR – Climate Geospatial Information ('WESR: Climate' 2023) which includes macroeconomic indicators such as 'Average Annual Loss', fails to account for public expenditures made to address losses caused by climate change. This often results in inefficient procurement processes and policies or ad-hoc responses that fail to adequately cater to urgent, often life-saving needs in times of emergency or provide a sustainable long-term solution where needed.

Defining 'Climate Data'

There have been multiple global and regional efforts to index open data for use in analysing disaster risk and climate change; however, such data is mostly seen as a function of weather

data, specifically temperature and precipitation (Lavell et al. 2012; Pörtner and Roberts 2022). IPCC's Sixth Assessment report notes that several agencies have started collating data on losses and damages, along with data on vulnerability, but often as a 'fresh' dataset that cannot be readily integrated with existing datasets (Pörtner and Roberts 2022, tbl. 8.4). Depending on the use case, what qualifies as 'climate data' keeps changing, preventing a holistic understanding of impacts and actions needed in case of disasters.

Tracking public commitments

Investing in timely and strategic infrastructure can help mitigate some of the worst effects of climate change-induced disasters. However, there is no existing mechanism for effectively tracking the commitments made towards building disaster- and climate-resilient infrastructure and the effectiveness of investments already made that could be seen through budgetary commitments, public procurement data and other public expenditures data, if made publicly available. Such datasets are crucial for conducting any analysis of the framework for climate action.

Missing governance framework for climate data management

The nature of climate data is diverse and spans across scales and jurisdictions, not just at transnational scale but also at national and sub-national levels. This impedes the comprehensive management of data.

The imperative of a climate data ecosystem

A climate data ecosystem can aid the building of disaster-resilient infrastructure. This task requires data standards and interoperability of data. To be sure, there are set standards across different data categories, including the following:

- OpenReferral ('Open Referral' 2022) for structure and exchange information about the accessibility of health, human, and social services;
- OpenContracting Data Standard ('Open Contracting Data Standard — Open Contracting Data Standard 1.1.5 Documentation' 2023) for publishing procurement data; and

- Humanitarian Exchange Standard ('Humanitarian Exchange Language (HXL)' 2023) that aims to improve coordination across agencies responding in times of crisis through a standard that speeds up data processing and creates interoperability across data source.

However, the challenge is in developing overarching data standards for the entire climate data ecosystem (Lee 2016).

The G20's Role

2

In this age of Anthropocene, where humans are the dominant drivers of change on Earth, the G20 countries must take the lead in advocating for a functional and holistic climate data ecosystem. Such an ecosystem should not only take into account the diverse factors to guide climate change adaptation but also allow an understanding of climate change as a global issue beyond state boundaries.

A more holistic approach

Traditionally, environmental issues such as air and water pollution can be addressed through local, state or national interventions. However, climate change is a problem of the global commons, and greenhouse gas emissions from one source impact the entire planet. Therefore, the problem needs to be addressed in a more holistic way that encompasses strategies adopted uniformly across the globe.

Transitioning to low-carbon

The G20 has pledged to reduce greenhouse gas emissions, support renewable energy, and help the transition to a low-carbon economy. To reach these goals, policymakers, planners, and managers need access to reliable and comprehensive climate data.

Recommendations to the G20

3

In the efforts to create a more effective climate data ecosystem, the G20 can play a crucial role in the following domains.

Expanding the definition of 'climate data for human wellbeing'

There is hardly any argument that the definition of what constitutes 'climate data' should be multifaceted, not only relating to Earth's climate system but also its relationship to human societies, economics, and natural ecosystems. In this manner, climate data can contribute to developing a holistic and interdisciplinary understanding of climate change.

'Climate data' includes data from multiple sources such as primary surveys, on-ground sensors, remote sensing, government machinery, public finance, and crowdsourced data. These data sets could provide comprehensive and accurate information on climate conditions, with the aim of supporting evidence-based policymaking, planning and management to build resilient infrastructure and enhance the wellbeing of societies.

There is an urgent need, therefore, to commit towards developing a comprehensive G20 Climate Data Ecosystem that will include the collection, analysis and dissemination of information on physical, biological, sociocultural, and economic aspects, including public finance data and qualitative indicators of human wellbeing. This ecosystem should encompass information on the past, present and future impacts on natural ecosystems, human societies and economies.

This will allow the modelling of intelligent solutions using technological tools such as artificial intelligence and machine learning techniques to guide decision-makers. A key objective should be to prioritise channeling public funds for the most vulnerable populations using up-to-date, data-driven models. Such an ecosystem needs to look at climate data holistically and make interoperable, AI-ready, standardised datasets available across the following categories of climate and climate-related data:

1) Geospatial and weather
2) Socio-economic and demographic vulnerabilities, including public health

3) Losses and damages caused by disasters

4) Access to critical infrastructure for coping with disasters such as transportation networks, community buildings, relief shelters and hospitals.

5) Governance response and public finance

Decentralised and federated governance framework for better coordination

Climate data is currently fragmented. Furthermore, there are institutional and political barriers to data-sharing and co-creation between countries, or even between organisations and sections within countries. In recent years, though, tech developers have created web-based platforms that facilitate improved disaster risk assessment and provide insights for better preparedness and response by creating more collaborative systems.

At the global level, WESR – Climate Geospatial Information ('WESR: Climate' 2023), developed by a network of organisations including UN entities and regional and national organisations—is an open-access portal of environmental data, information and knowledge that focuses on climate change. Such a repository of data supports decision-making, policy and action at the global, regional, national and local levels. The WESR-Common Country Analysis (WESR-CCA) provides country-wise environmental information on an open platform for baseline assessment and transition towards sustainable development goals ('Home | WESR - CCA Portal' 2023).

Similarly, there are regional platforms such as Mekong X-Ray ('Mekong X-Ray' 2023) for the Lower Mekong Region, and country-level platforms such as Malawi's MASDAP ('www.Masdap.Mw' 2023).

However, without collaboration between governments across boundaries, such initiatives can achieve little. There is still a lack of insights on a real-time basis or even at regular, frequent intervals about public investments for disaster preparedness and mitigation. Most disaster risk reduction platforms are designed to function only during times of disaster. The nature of data is diverse and is produced in the context of specific administrative boundaries, making it imperative for the local and regional government to work together along with other stakeholders to provide holistic, real-time data.

G20 countries should actively participate in coordinating the development of a policy and governance framework of a decentralised, federated structure among multiple stakeholders to facilitate data coordination and deal with issues of data quality and consistency. Such decentralised structure should enable government agencies, non-governmental organisations, academic institutions, and private entities to contribute to the data ecosystem and collaborate through a federated network. This could further encourage public accountability and transparency, as more people are observing and using the data.

The benefits of such frameworks can be seen, for example, in how the initiative, 'EU Cities Mission's 100 climate-neutral and smart cities by 2030', is using data from a wide variety of sources to tackle societal and climate challenges (Autero et al. 2023). They document the benefits of data and data standardisation as a way forward to create an intelligent region where all players can access available services and data to support cross-silo cooperation between sectors, involve citizens and companies active in policymaking processes to improve the quality of decision-making and acceptance of the outcomes, to set up transferable services and data standards to maximise efficiency and open the market.

Setting up Data Standards

Decentralising and expanding the definition to include diverse datasets comes with a challenge of maintaining interoperability of data, if each agency collates data in institutional specific ways. It is here that there is a strong need for data standards. Lack of data standards affects the way data is captured and shared, limiting the ability to consume data for any meaningful analysis. It also creates silos by preventing interoperability of data while providing keyhole analysis for select issues. Setting up data standards can ensure availability of high-quality, machine-readable and clean data that will allow comprehensive analysis using advanced statistical machine learning methods.

There are ongoing independent efforts to standardise data. The 'Global Data Barometer Report' and Data for Development using data based on primary surveys for the period May 2019 to May 2021 also state that

health and climate datasets are the most likely to have significant quality gaps (Davies, Tim and Fumega, Silvana 2022). There are multiple examples to demonstrate how the availability of high quality, standardised data can enable impactful analyses and data modelling (CivicDataLab 2022; 'Defra Data Services Platform' 2023).

Although more than 50 countries provide datasets online on emission biodiversity and vulnerability, there is significant variation in how the data is provided and how timely and detailed it is. This underlines the need for international data standards along with guidelines on making data available to maximise the value realised from the data collection exercise (Davies, Tim and Fumega, Silvana 2022).

There are examples of third-party verification and aggregation of data using standardised place names and codes across geographies for ease of access of present and historical data that can be easily analysed, interpreted and combined with other datasets with standardised place names or codes. WFP Climate Data on HDX is an example that processes complex climate data describing weather patterns like rainfall, temperature, and vegetation and health datasets covering 32 countries with place codes generated to ensure unique identifiers ('WFP Climate Data on HDX – The Centre for Humanitarian Data' 2023).

Every country needs to adopt a 'Common Operational Datasets (CODs)' and P-codes that ensure consistency and simplify the discovery and exchange of data. Common Operational Datasets are baseline data adopted by many countries. CODs are developed and endorsed by the Inter-Agency Standing Committee (IASC) (IASC Working Group meeting 2010), and disseminated by OCHA. These ensure data preparedness, the first step to informed decisions that will ultimately shape the response.

Building communities focused on wellbeing

A strength of the G20 is that it is able to build cross-sectoral, global alliances for common goals. For the above recommendations to succeed, it is of utmost importance to invest in building a network of private enterprises, data and climate scientists, economists, and political leaders who would form pathways to developing a

holistic climate data ecosystem that can promote collaborations across geographies and sectors.

An example of successful collaboration is described in OECD's 'Responding to societal challenges with data'—which looks at how the use of both public and private sector data can empower users and enhance innovation in areas such as education, health, science and research, smart cities, government services and development outcomes ('Responding to Societal Challenges with Data' 2022). The report cites the example of Hunger Map, an interactive tool that helps in making informed and timely decisions relating to food security, by combining key metrics from various data sources such as food security, weather, population size, conflict, hazards, nutrition and macro-economic data ('HungerMap LIVE' 2023).

At a policy level, the Agricultural Market Information System ('Agricultural Market Information System: About' 2011) is an inter-agency platform that helps prevent unexpected price hikes through more timely, accurate and transparent information on global food markets to inform coordinated policy actions to strengthen global food security. (OECD 2020). Another real-world example is how UPS designed their vehicle routing software, using GPS data, to eliminate as many left-hand turns as possible (in countries with right-hand traffic); the company claims that this measure saves fuel and increases efficiency (Priceonomics 2014). Further, estimates by Deloitte based on open data provided by Transport for London (TfL) confirm the positive net benefits of open data ('Assessing the Value of TfL's Open Data and Digital Partnerships' 2017) in creating more jobs and generating annual economic benefits and improving the wide environment.

Creating a structure for such a data ecosystem will have its share of challenges, with a need for consensus and actions across geopolitical boundaries. The G20 provides an apt opportunity to tackle the challenge and fast-track actions. For any technological or financial barrier, active collaboration across stakeholders from private sectors, philanthropic groups, academic community, governments, and citizen groups can provide solutions. The ecosystem should be the starting point for a safe operating space for humanity, leading to resilience and wellbeing.

The climate data ecosystem should help explore and illustrate different scenarios emphasising the impact on key policy goals such as poverty, inequality, women's empowerment, and food and energy transitions (Dixson-Declève et al. 2022). It should be instrumental in detailing an economy that "removes poverty, promotes social and environmental well-being, and measures progress by how well people and the planet thrive" (Dixson-Declève et al. 2022, 29).

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