POLICYBRIEF

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Integrating Data to Ensure Inclusive Education for Climate-displaced Populations

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Highlights

Increasing numbers of children and adults are displaced or migrating due to the impacts of climate change, affecting their right to education. Gaps in data at the intersection of climate-related risks and human mobility hinder governments from ensuring undisrupted and inclusive learning in the context of climate change.

Recommendations:

- Integrate education-in-emergencies data into education management information systems for crisis-sensitive education planning.
- Explore utilization of innovative data sources to project potential mobility of learners, especially in disaster-prone areas.
- Apply computational simulations to forecast education needs in the context of climate change and human mobility.
- Develop capacity and a sense of ownership among education policymakers, planners and administrators to enhance use of data for climate resilience.

The Impacts of Climate Change Displacement on Education

Global records indicate that weather-related disasters caused over 26.4 million internal displacements in 2023, far exceeding the number of conflict-related displacements (IDMC 2024). The impact of climate change, including displacement by extreme weather events, has emerged as a serious threat to ensuring inclusive and equitable education and promoting lifelong learning for all (SDG 4). For instance, the 2020 Jakarta floods affected 290 schools in the area, of which 12 were totally destroyed and 89 became inaccessible (ReliefWeb 2020). In Malawi, Cyclone Freddy forced massive school closures, affecting 5 per cent of students across the country (Marin et al. 2024). The devastating 2023 floods in Pakistan affected a third of the entire country, and only 40 per cent of children had returned to school in the affected area six months after the flooding (Dahlin & Baron 2023).

Evidence shows that drop-out rates are higher among children from families that have been displaced by climate change (UNESCO and UNU-IAS 2023). Governments and education ministries are recognizing the links between climate change impacts and education disruptions; however, they face multiple and intersectoral difficulties in conducting data-informed

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planning to ensure undisrupted learning in response to displacement. One of the universal issues is multifaceted gaps in tracking and projecting climate-related risks and student mobility (UNESCO-IIEP 2023). These gaps include disconnects between education data and climate change data, the limited granularity of data in the education sector, and the lack of data-driven predictive modelling to understand how climate change will affect education.

This policy brief provides insights and recommendations for policymakers in the education and environment sectors on utilizing intersectoral and innovative data to ensure inclusive education for all in the context of climate change.

Scenarios and the Need for Data

There are various scenarios in climate-induced human mobility. Sudden-onset events such as storms, floods, landslides and wildfires force people to immediately evacuate to temporary shelter. Slow-onset events such as sea level rises, temperature rises and droughts drive seasonal or permanent migration, primarily for employment, financial or food security reasons — or more often, a combination of all three. Planned relocations occur at various scales when the impacts of climate change are projected to make an area uninhabitable. There are also trapped populations that voluntarily or involuntarily choose to stay in their location despite the current and projected impacts of climate change (IOM 2024). Each mobility scenario entails unique barriers to inclusive education opportunities.

Research commonly identifies several acute barriers to returning to school after disaster displacement, including household financial challenges, the unsafe condition of roads or school buildings, psychological anxiety, food insecurity and inadequate supplies of educational materials (Dahlin & Baron 2023; Empatika 2018; UNESCO & UNU-IAS 2023). In addressing these barriers, data-informed policy decisions are crucial to provide focused interventions for at-risk populations, such as girls and women, people with disabilities and adolescents in poverty. Advance preparation for emergency responses can help to minimize the exacerbation of such barriers for vulnerable populations (UNHCR 2020), but this requires up-to-date real-time data to locate those populations and prevent over- or under-deployment of humanitarian aid.

Data on student mobility induced by slow-onset impacts of climate change are even more difficult to collect and analyze. National census data and other tools, such as the WorldPop database, capture the influx and outflux of people and their reasons for moving, but climate change is rarely identified by migrants as the immediate cause.

Integrating Data in Education Management

Many countries face challenges in collecting, analyzing and using education data for evidence-based decision making. Particularly in low- and lower-middle income countries, education management information systems (EMISs) mainly contain census-based administrative data on education (such as enrolments, attendance and completion rates), which are updated occasionally at best. According to the UNESCO Institute for Statistics (2020), 53 per cent of countries worldwide still rely on paper-based information, significantly hindering the timeliness and effective use of data. Even when digitization is conducted it is often limited to data entry using spreadsheet templates, and rarely extends to live updates through a web-based system.

Data on school locations is also critical for building a climate-resilient education system both for climate disasters and slow onsets. Unfortunately, 29 per cent of education ministries worldwide remain unable to locate schools precisely (UNESCO Institute for Statistics 2024).

There is also a lack of individual student data that can be linked to patterns of climate impacts and frequent natural disasters. In emergencies, responding to multiple and fragmented data requirements can also divert critical human and financial resources. Lacking an integrated and robust EMIS has negative impacts not only on immediate responses to natural disasters but also on the longer-term preparation, recovery and resilience of education systems.

Finally, limited sources of data are an issue in tracking student mobility during sudden climate events — and more importantly, in forecasting mobility patterns before slow-onset impacts fully take hold. To provide a real-time projection of education needs in the context of climate change displacement, innovative approaches to collecting and integrating real-time data can be explored. This may include wearable devices, mobile data, satellite geospatial data and synthetic AI data.

Policy Recommendations

1. Integrate education-in-emergencies data in EMISs for crisis-sensitive education planning.
EMISs in many countries are insufficiently equipped to effectively help anticipate and respond to climate-induced emergencies and displacements of learners.

Education-in-emergencies data specifically applies a risk management perspective, identifying and addressing risks and consequences in education. As this data is collected by multiple government and non-government actors, it is critical for ministries of education to align and coordinate the data before integrating it into EMISs, enabling a timely and effective response.

This starts with an assessment of the existing EMIS along multiple dimensions such as data quality and coverage, timeliness, availability of risk mapping, data management processes and data interoperability across sectors and ministries. Such holistic analysis helps to plan for enhancing EMISs to be more responsive to climate-induced emergencies and to project their long-term impacts, such as migrations. Frameworks and practical tips exist to support the diagnosis of current EMISs and improvements in emergency settings, such as one developed by UNESCO-IIEP (2023).

It is also important for emergency aid to be planned in advance based on data from EMISs as well as other pertinent sources, such as humanitarian systems. By integrating EMIS, geographic and demographic data, emergency aid can be deployed in a more timely and effective way.

2. Explore utilization of innovative sources of data to project potential influx and outflux of learners due to displacement, especially in disaster-prone areas.

Once data in the EMIS are enhanced with education-in-emergencies data, other types of data beyond the education sector should be explored and utilized. This is to establish a solid understanding of the impact of climate change on displacement/human mobility and on education. In numerous instances multi-source data has significantly improved response capabilities in disasters. For example, data from social media, internet search patterns or e-commerce activities helped map human mobility and the needs of displaced people during recent hurricanes in Latin America and other regions (Acosta et al. 2020; Santos-Lozada et al. 2020; United Nations 2024). Government commitment to cooperation with the private sector and harnessing data from IT service providers for the public good is essential in realizing such multi-source data utilization, while ensuring the ethical and responsible use of data in humanitarian action. In addition to big data, satellite geospatial data or geographic information system (GIS) data can provide real-time updates on the patterns of slow-onset events. Such geospatial data enables governments to make informed decisions on prioritization of the relocation or renovation of education facilities in high-risk areas.

Artificially generated or synthetic data can help to represent the perspectives of marginalized learners and other stakeholders who are typically overlooked due to data scarcity (Marwala et al. 2023). While regulations and ethical considerations are increasingly debated, synthetic data has the potential to address data scarcity issues without breaching the privacy of temporarily displaced persons.

3. Apply computational simulation to forecast education needs in the context of climate change and increasing human mobility to support data-driven planning for inclusive education.

Collecting and analyzing multi-source data is important, but making such data easily usable is crucial for informed policymaking. Education planning should include computational modelling to visualize the relationship between climate change impacts, human mobility and education provision, and to simulate future patterns. Both agent-based models that seek to understand the system's behaviour through the attributes of individual agents, and system dynamics models that analyze the non-linear behaviour of complex systems over time are already used to simulate population influxes and outfluxes under a changing climate (Entwisle et al. 2016). A recent effort by the United Nations Satellite Centre (UNOSAT 2024) highlights the great potential of such simulation tools for national-level education planning, combining geospatial data, hazard risk scenarios and school location data in six countries in the Caribbean. Visualization of school and hazard maps supports informed decisions by predicting hazard risk factors for current school locations, to find new and safe locations to which they can relocate.

4. Develop capacity and a sense of ownership among education policymakers, planners and administrators to enhance use of data for climate resilience.

Innovative data systems serve no purpose if users are not capable of using them effectively. Developing capacity and a sense of ownership among EMIS users to apply the data in decision-making is therefore essential. It is critically important that the users of EMISs understand the benefits of a new system for effectively planning, deploying and monitoring inclusive education for all, despite the constant and intensified uncertainty that the world faces. Users of the system, including government budget officials, education ministry officials, school leaders and teachers, must be consulted and meaningfully engaged from the very first stage of the EMIS reform process. This includes documentation of data use cases, identification of bottlenecks and possible solutions, and capacity development needs assessment. Once the new EMIS is designed, the competency framework of users should also be revised and necessary training should be provided to ensure effective use.

NOTE

This brief is based on research published in the book *Asia-Pacific Regional Synthesis: Climate Change, Displacement and the Right to Education* (UNESCO and UNU-IAS 2023).

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