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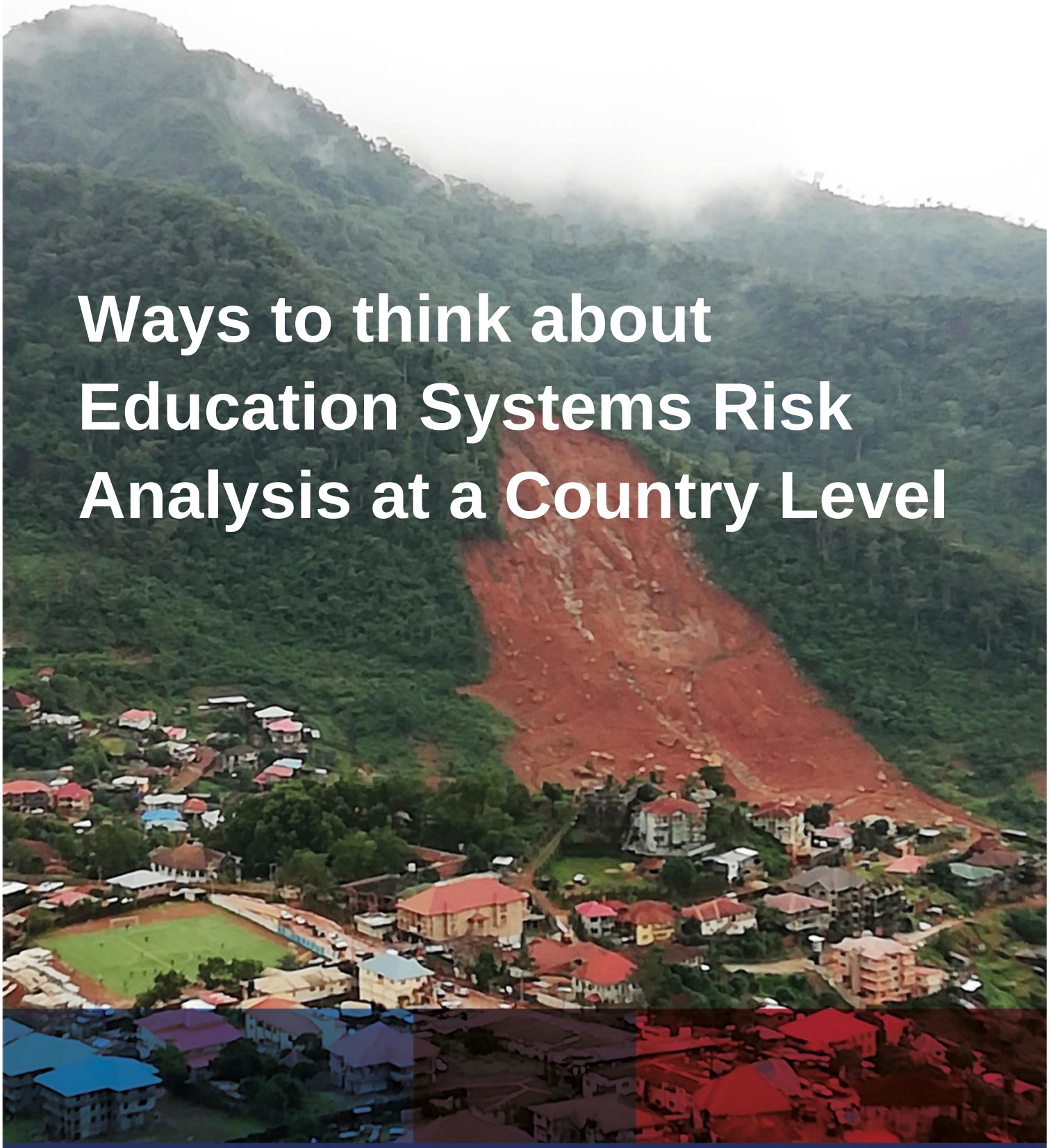

Ways to think about Education Systems Risk Analysis at a Country Level

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Introduction

"[E]nsure all learners acquire the knowledge and skills needed to promote sustainable development." UN Sustainable Development Goal 4.7[1]

"If all education is about the future, then the future needs to be a more explicit concern at all levels of education." David Hicks[2]

Climate and environmental change already effect the lives of children and on the education systems that provide their education. This will continue and, in many instances, the impacts will worsen.

This paper intends to help those involved in education to better understand a world in which extreme weather events will become more frequent. In turn, it is hoped that it will support the evolution of education systems to become attuned to new realities related to climate and environmental change. This will involve the consideration of whether virtually every aspect of education delivery is fit for purpose, through greater attention to anticipatory action, greater attention to infrastructure resilience, and reflection on the 'what?', 'why?' and 'how?' of teaching and learning.

The focus of this guide is to support education systems' reform for resilience. However, it should not be forgotten that the role of education should be to prepare future generations for the opportunities and challenges they will encounter. In an era of rapid climate and environmental change, a healthy education system must view its participants as agents of positive change, rather than 'empty vessels' to be filled with knowledge, or victims of climate shocks. This requires education that goes beyond literacy, numeracy and factual knowledge, and into the realms of agency and social justice. The science is clear and the impacts are evident; it is the individual and collective action that will make a difference.

[1] SDSN, n.d., 2016

[2] Hicks, D. (1994) 'Preparing for the future: Notes and queries for concerned educators'.

Climate and Environmental Impacts

Climate and associated environmental impacts will vary around the world. However, the most common manifestations will be increased incidence, and often more severe floods and coastal inundation, drought, heat waves and wild fires[3]. These can in turn lead to greater soil erosion and landslides, large displacements of people, and closures of school or disruption to education as schools are turned into emergency shelters.

Adaptation and Mitigation

Climate change is a global phenomenon driven by carbon dioxide (CO^2) emissions, largely from the use of fossil fuels (i.e. coal, oil and gas). Historically, the predominant emitters have been industrialised countries.

Climate change is already happening, and its impacts will worsen, particularly in the tropical regions. Countries need to take anticipatory action to prepare for this changed world. This is called: **adaptation**.

Actions that reduce carbon emissions, potentially slowing the speed of climate change are called **mitigation** measures. While all countries can contribute to mitigation, single countries cannot reverse climate change in their own territories.

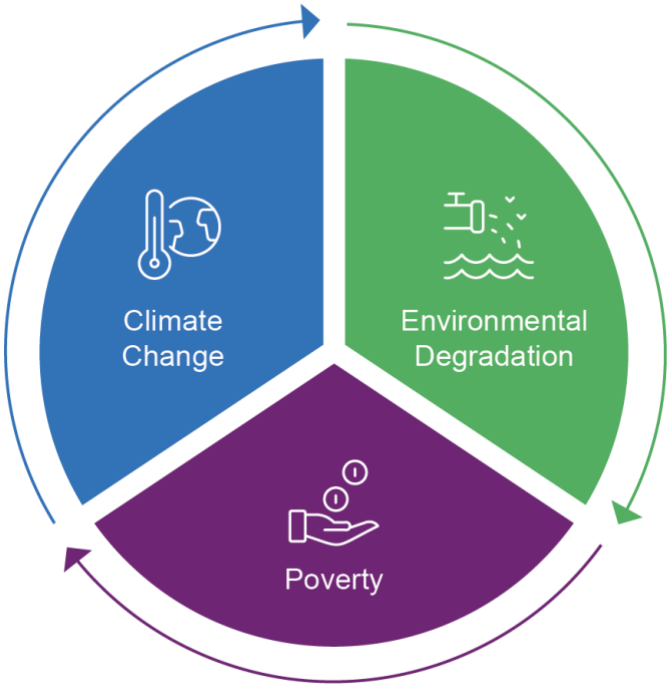
For both adaptation and mitigation, reducing carbon emissions are critical to address further detrimental change.

[3] https://www.bbc.co.uk/news/science-environment-58073295

Why Climate and Environment?

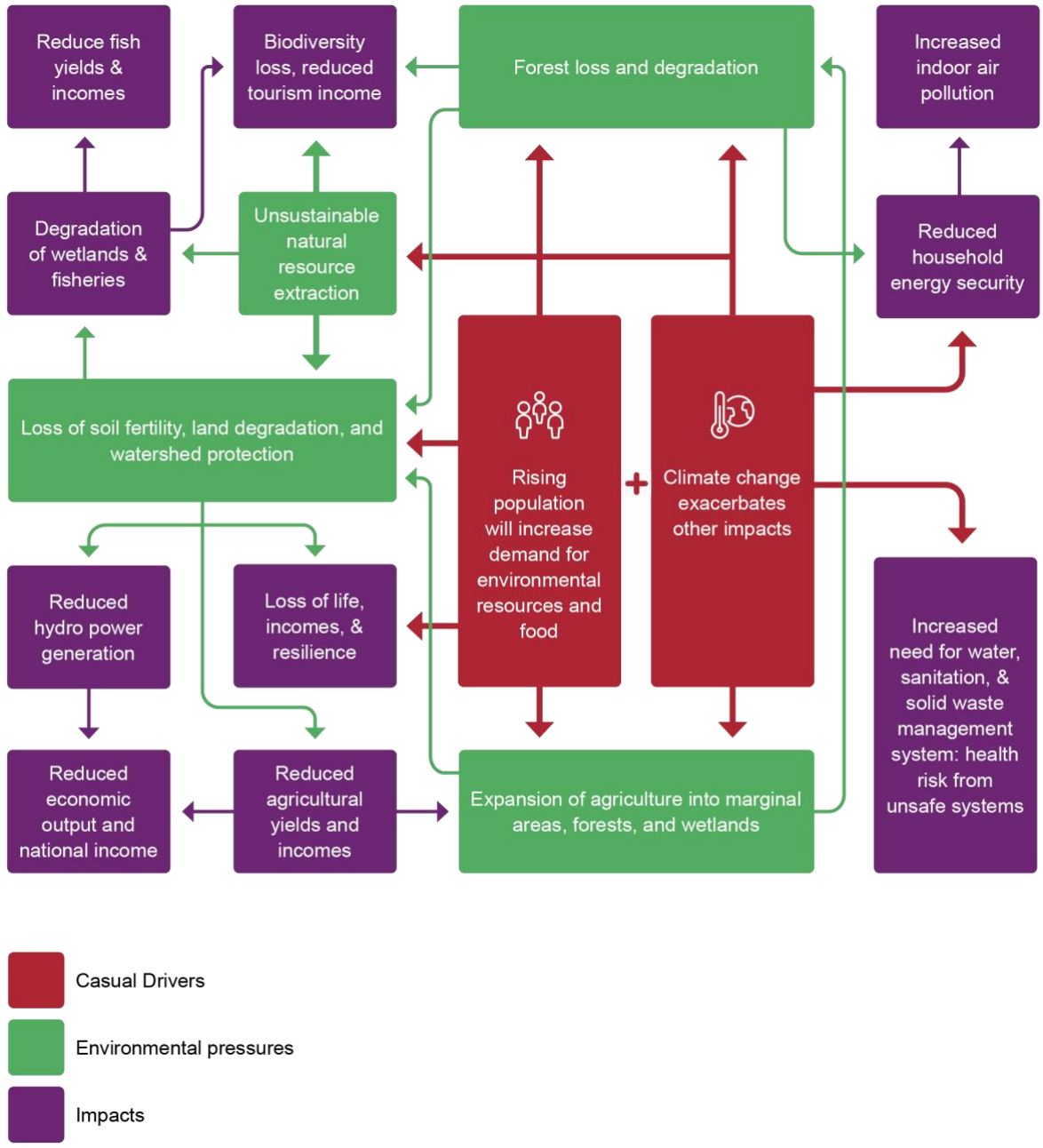
Climate change is driven by global forces; however, impacts on the ground generally stem from the interplay between climate change, environmental degradation and poverty (which limits peoples choices around sustainable living).

Figure one: Impact felt by climate change on the ground



For example, poverty and limited access to land may cause people to deforest steep hillsides so they have somewhere to live and/or farm. When combined with increasingly intense rainfall, caused by climate change, this raises the risk of landslides. Thus, meaningful solutions to a changing climate require focus on broader environmental and livelihood challenges at national and local levels (see figure two): governments and communities have real agency when using a framing that considers climate and environment.

Figure two: Environmental Pressures, Drivers and Impacts in Malawi: an example of links between climate, environment and human actions[4]



[4] [World Bank : Malawi Country Environmental Analysis January 2019]

Impacts of Climate and Environment on Education by Supply and Demand

The impact of climate and environmental shocks on education can be viewed in terms of:

1. **Direct or supply side factors,** which determine the ability of an education system to provide education services.
2. **Indirect or demand side factors,** which influence the ability of households or individuals to afford to attend school or effect their educational performance in school.

Table one: Direct and indirect factors in the impact on education by climate and environmental shocks

Direct / Supply Side Factors	Indirect / Demand Side Factors
Destruction of schools through flooding or fire.	Deteriorating livelihoods reduce household income resulting in choices being made on which children are sent to school.
Large scale displacement of populations from flooded areas.	Malnutrition reduces capacity to learn.
Localised displacement of children from schools when being used as community refuges.	Increased disease prevalence (e.g. Malaria, cholera) reduces both teacher and student attendance.
Disruption of school calendars – examinations, textbook delivery, etc.	
Sub-optimal building design results in hot and poorly ventilated classrooms which impede learning.	

Impacts of Climate and Environment Change by Geography

Climate and environmental impacts are often geographically specific. Temperature and rainfall patterns vary by geography and by altitude. Coastal areas face different kinds of challenges to steep mountain slopes. The adaptation of education systems to climate and environment should reflect these differences. The following should be considered:

School building location, orientation and design:

Where schools are built, and the orientation of school buildings to prevailing winds and the path of the sun, are important consideration when adapting to increased flood, landslide and heat stress. Geographic Information Systems (GIS) can quickly and cheaply provide information on risks and inform school siting. It is critical that national building regulations do not rely on a single 'blueprint' for school buildings, but instead recognise the need of building designs to respond to localised conditions and risk levels.

The way in which schools are designed, and what their building materials, will impact upon classroom temperature, acoustics (especially during heavy rains) and light intensity: all these factors influence the ability of children to learn (hot children in noisy and dark classrooms don't do so well).

Water and sanitation

Changing environmental circumstances will increase health risks and water stress in many areas. Provision of water, sanitation and hygiene in schools (SWASH) will need to respond to this. Careful consideration of the choice of toilet technologies and the provision and use of water will become increasingly important.

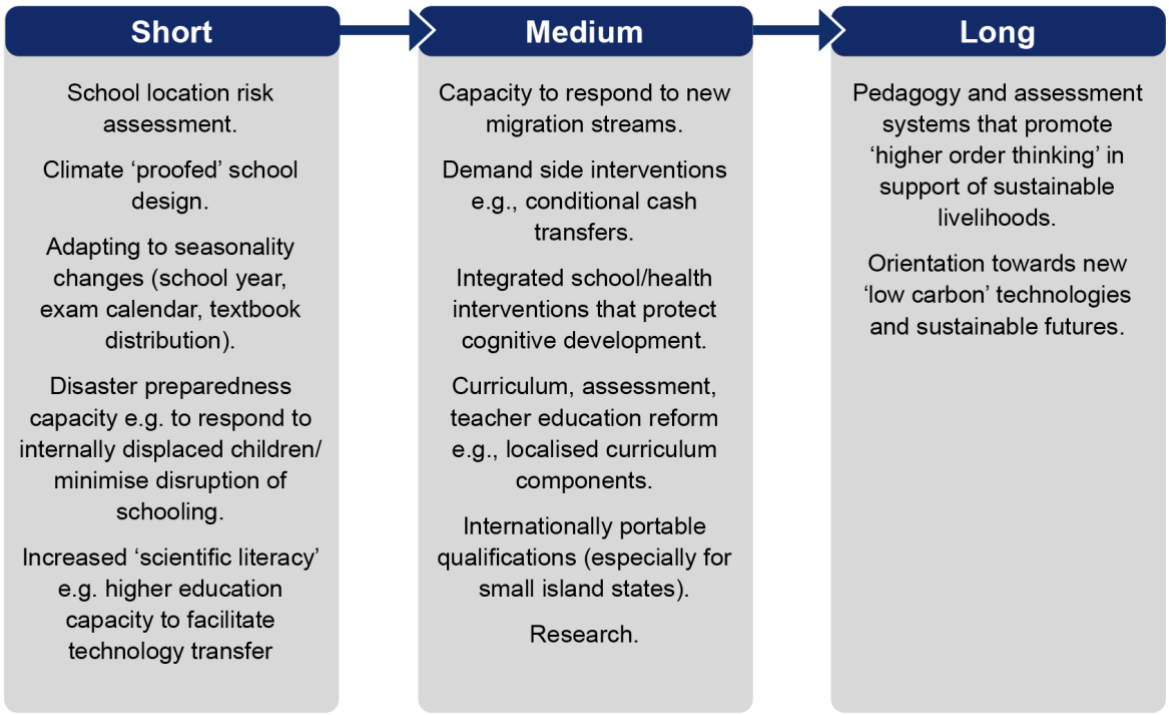
Climate and environmental change will likely increase exposure to waterborne diseases and diseases carried by animals e.g. mosquitos, bats etc. These may cause serious health risks and have a significant effect on student and teacher attendance and, through this, on learning.

While some areas become wetter, others become drier leading to water scarcity and thirsty children who are less able to learn. Understanding if, and how, schools are provided with water is critically important. For example, many schools are dependent on bore hole wells, so monitoring the depth of the water table and checking for heavy metals and groundwater contamination will be important for them. In some instances of projected water stress, rainwater catchment and storage systems may be appropriate.

Impacts of Climate and Environment Change Over Time

For many countries, climate and environmental changes are already having an impact and it is important to consider the order in which they should address new challenges. In the first instance, it is sensible to think about preparing for climate and environmental shocks and protecting existing resources, such as classrooms. In the medium term, new coping strategies must be adapted and adopted for changed circumstances. In the longer term, it is essential to reform the nature of education so that next generations are equipped for a sustainable future. These stages are a continuum, and not mutually exclusive, but it may help to think of the following maxim: Prepare and Protect, Cope, Change.

Figure three: Short-, Medium-, and Long-term Response to Environmental Change: From adaptation to mitigation[5]



[5] Bangay, Education, anthropogenic environmental change, and sustainable development: A rudimentary framework and reflections on proposed causal pathways for positive change in low- and lower-middle income countries, 2022

Impacts of Climate and Environment by Season

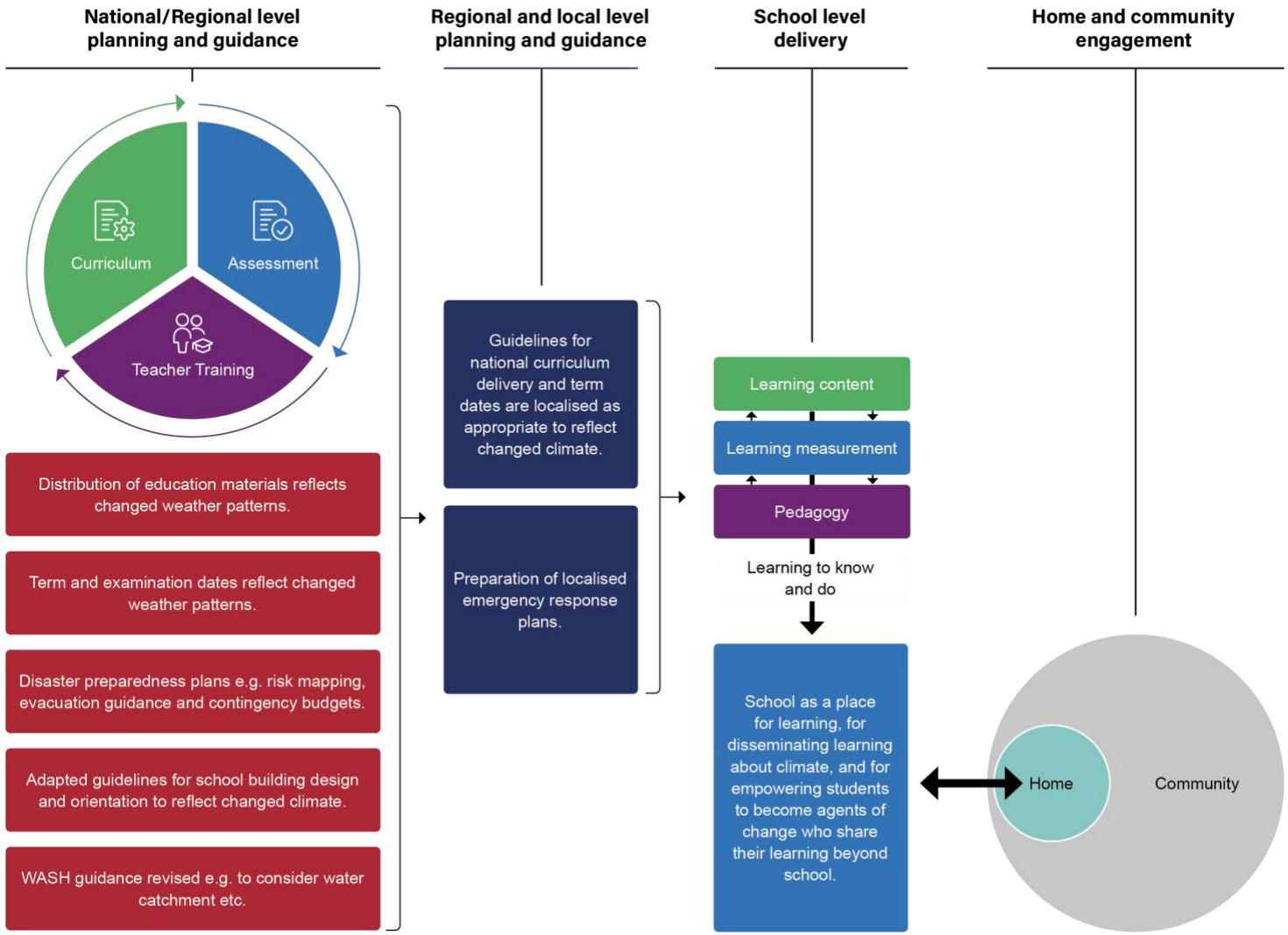
Historically, school calendars have been organised around the climatic and agricultural calendar. In many countries, climate change will make the weather less predictable, which will potentially disrupt key education events, such as the distribution of textbooks or timetable of examinations.

Closer attention to the timing of seasonal and climate disruptions, how this affects school attendance and what parts of curriculum are commonly missed will require further attention, as addressing these issues could be helpful in targeting remediation support. More radically, some countries may consider realigning the school calendar with changing weather patterns. In large countries with significantly different climates, it may be sensible to have regionally-adjusted term dates (while still complying to a national standard of number contact days).

Conclusion

An education system can be thought of as a delivery chain, which is set up to support strong learning interactions between teachers and students. In developing a comprehensive response to disruptions cause by climate and environment, it can be helpful to think about the ways in which they will impact the different components and links within that delivery chain at national, local, school and household and community levels – see figure four.

Figure four: National, local and school level response to climate and environment issues



Action and Next Steps

In order to craft a country-specific response, it is important to have a good understanding of the big picture. Table two provides a template that can be filled in to generate a national and regional climate assessment with some pointers on how these might impact upon education delivery. Table three provides links to a range of useful open-source reference documents that provide information on climate and environmental issues by country, which can help in building a country profile.

Table two: National and Regional Climate Assessment: a template

Vulnerability	Societal Implications	Geographic Specificity (national / local)	Education Issues	Education responses
Food security	*What is predicted to happen to crop yields over what period?*		• Poor nutrition / health impacts on learning.	• School feeding. • Conditional cash transfers.
Energy security	*What is predicted to happen to energy production and use over what period?*		• Unreliable electricity – prevents / disrupts use of IT.	• Solar / wind / hydroelectric powere generation (micro or mini grids).
Flooding	*What is predicted to happen to rainfall amounts, timing, intensity?*		• School flooding. • Routes to schools. become impassable. • Schools used for emergency shelters. • Water contamination.	• Geographic Information Systems (GIS) risk mapping to identify at-risk schools and routes to schools, and identify best locations for new schools. • Adaptation of vulnerable school buildings and compounds. • New, more resilient school building designs. • School contingency plans for flooding. • Local and regional education authority preparatory planning to cope with widespread flooding. • Contingency budget provision.

Drought See: K4D Learning Journey on Water Security (ids.ac.uk)	*What is predicted to happen to rainfall – amounts, duration likelihood of extreme events (e.g. more intense 'cloud bursts'), and reliability?*		• Lack of water and increased classroom temperatures present health hazards and reduce learning. • Falling water table cause wells to dry. • Water table contamination. • Fire risk.	• Monitoring of water tables and testing of bore water. • Water catchment systems. • Access to emergency water tankers.
Population Dynamics	*What is predicted to happen to population and demands on physical resources and social services over time?*		• Displacement / migration cause major changes in demand for schooling and need for school places (e.g. in urban locations).	• Census data and population projections routinely referred to in budgeting and planning. • GIS used to identify best locations for new schools.
Extreme weather events	*What are the predictions on the frequency and intensity of extreme weather events (e.g. heat waves, floods, droughts, wild fires)?*		• Extreme weather events become more frequent.	• Education authorities better connected to weather and emergency forecasting. • Detailed contingency plans in place calibrated to escalating levels of risk (i.e. 'if this, then this').
Geographic vulnerabilities	*What is the likely incidence of increased flooding, coastal inundation, soil erosion, desertification, Landslides, etc? Where will it happen? Which areas/populations are most vulnerable to it?*		• Specific areas more at risk to a range of threats, e.g. flooding, landslides, drought.	• Geographic Information Mapping to identify vulnerabilities down to school level. • Anticipatory action strategies on how to retrofit schools to make them better able to deal with expected threats, possible re-siting of the most vulnerable schools,

				and appropriate siting of any new schools. • Detailed contingency plans in place calibrated to escalating levels of risk (i.e. 'if this, then this').
Health / Water and Sanitation **See:** https://washdata.org/reports/jmp-2022-wins	*What health implications are expected to accompany climate change?*		• Climate change results in increased disease burdens (Malaria, intestinal parasites) and risk of contagious disease outbreaks (e.g. Cholera) impacting on school attendance by teachers and students.	• Strengthened coordination and collaboration between health and education services. • Revised school water and sanitation guidance (e.g. bore hole depths, consideration of rainwater catchment, etc) and support for preventative maintenance.

Table 2: Useful sources of information on Climate and Environment Issues by Country

Source	Description	Link
The World Bank Climate Risk Country Profiles	Selected country profiles with detail of present and projected risks	Climate Risk Country Profiles | Climate Change Knowledge Portal (worldbank.org)
World Bank Country Climate and Development Reports (CCDRs)	Regional and individual country overviews	Country Climate and Development Reports (CCDRs) (worldbank.org)
USAID Climate and Environment Fact Sheets	Short country-led climate and environment overviews	Search | U.S. Agency for International Development (usaid.gov)
Asian Development Bank Climate Risk Country Profiles	Individual country summaries of climate characteristics and projections, and vulnerability to natural hazards	Search by country e.g. Climate Risk Country Profile: Afghanistan | Asian Development Bank (adb.org)
Nationally Determined Contributions (NDC) Partnership	Overviews of country's nationally determined contribution plans, detailing government plans for mitigation and adaptation	https://ndcpartnership.org/about/members
United Nations Framework Convention on Climate Change (UNFCCC) Education and Training: Resources	Range of online resources for educators	Education and Training: Resources | UNFCCC
UN Climate Change Learning Partnership	Portal of online learning courses	Knowledge Sharing Platform (uncclearn.org)
Yale Environmental Performance Index (EPI)	Ranking of 180 countries on climate change performance, environmental health, and ecosystem vitality	Welcome | Environmental Performance Index (yale.edu)

UNEP World Environmental Situation Report	Data archive on climate environment issues searchable by country, region, topic etc	Main page | WESR (unep.org)
Met Office Climate risk reports	Regional Risk Reports for MENA and Africa	Climate risk reports - Met Office
Maplecroft Global Risk Data Set	Subscription-based (not free) detailed analysis of multiple variables and analysis of levels of adaptation /resilience for 198 countries	Climate Risk Dataset | Maplecroft

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