



# The intersection between climate change and education

Mapping and analysis of the evidence base (desk study)

**SYNTHESIS PAPER**

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# 1. Introduction

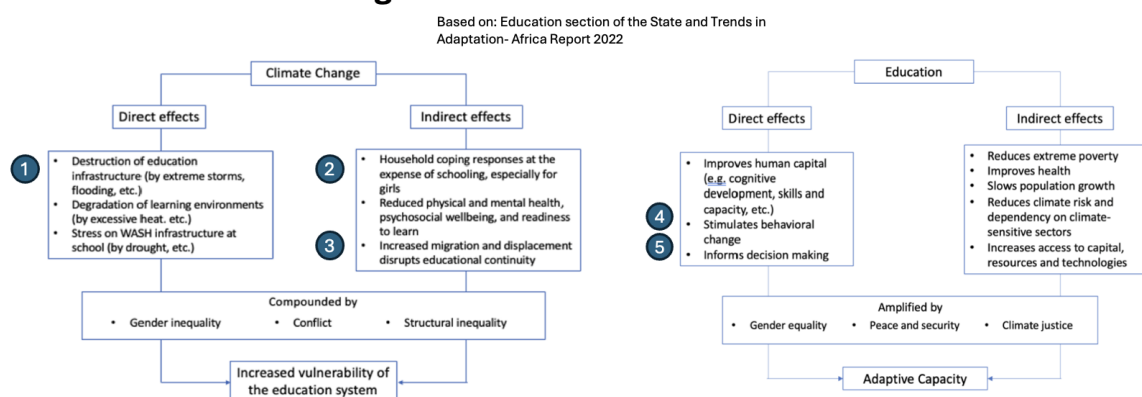
## Background

This synthesis paper was commissioned by the Danish Ministry of Foreign Affairs and reflects the main outcomes of the desk study, which maps and analyses the state of evidence on the intersection of climate change and education and includes an Africa-focused supplement because of the conversion and severity of the impacts of climate change that aggravate the dire state of foundational quality education on that continent.<sup>1</sup> It serves to present the intersection of climate change and education and highlights the implications for future donor programming and policy development (section 2). The synthesis identifies thematic areas that emerged as particularly relevant for future work and donor support and points to thematic areas that stood out in the analysis as particularly pertinent for future donor support (section 3).

## Approach and selected thematic areas

The review is based on the principles of a human rights-based approach, particularly focusing on the right to education, which is a key element of Denmark’s official development assistance. The relationship between climate change, mitigation and adaptation, and education is complex but generally seen as *bidirectional*.<sup>2</sup> Climate change leads to learning losses, school dropouts, and long-term negative impacts on education, necessitating adaptation and mitigation strategies. Conversely, education drives climate action by fostering innovation, skills, and behaviours that support mitigation and adaptation.<sup>3</sup> The desk study analysis distinguishes between climate change's direct and indirect impacts on education. *Direct impacts* include physical damage to schools from events like cyclones, floods, and extreme temperatures, disrupting education and affecting the health and well-being of students and teachers. *Indirect impacts* arise from gradual changes like drought, sea level rise, salinity intrusion, food and water insecurity, diseases, economic shocks, and increased conflict, migration, and displacement. These indirect pathways reduce students' readiness to learn due to health and nutrition issues, decrease demand for schooling as households adjust, and disrupt education services due to displacement and conflict.

## Climate Change and Education Intersection framework



Focusing on school education, the desk study identified five themes to cover the bidirectional relationship and the mix of direct and indirect impacts: (1) climate change-induced destruction of education infrastructure and degradation of physical learning environments; (2) climate change, education, vulnerability, and gender inequality; (3) climate change-induced displacement and its impact on educational outcomes; (4) education as empowerment and the role of children and youth as agents of change; and (5) education as a driver for achieving climate goals.

## **2. Main findings of the desk study**

### **Quality Education as part of Agenda 2030 is off track and underfunded**

High levels of learning poverty<sup>4</sup> and the lack of progress on Agenda 2030 and Sustainable Development Goal (SDG) 4 are disconcerting. Progress on Sustainable Development Goal 4 on Quality Education for All is far behind the global commitments of Agenda 2030.<sup>5</sup> Based on global learning poverty rates, 6 out of 10 children cannot read and understand a basic text by age 10. Alarming, this is the case for 9 out of 10 children in Sub-Saharan Africa.<sup>6</sup> The global education sector is thus not on track to deliver foundational quality education for all. The global education sector is underfinanced even before considering additional costs related to climate change mitigation and adaptation. The proportion of official development aid (ODA) to education decreased from 11.7% in 2010 to 9.7% in 2021, while the annual global funding gap for the education sector in low - and middle-income countries is 100 USD billion<sup>7</sup>.

### **Extreme weather disproportionately affects education in poor countries**

Climate change is leading to more frequent and severe extreme weather events, such as cyclones, floods, droughts, wildfires and heatwaves.<sup>8</sup> Low-income countries are more impacted by such extreme weather events.<sup>9</sup> Over the past 20 years, schools were closed in around 75 per cent or more of the extreme weather events that impacted more than 5 million people.<sup>10</sup> Extreme weather events can require students to relocate to alternative areas, lead to the closure of schools, hinder students' learning, and increase the poverty and vulnerability of students and their families.<sup>11</sup> Climate change – whether through sudden disasters or slow-onset events – worsens existing inequalities and severely impacts people living in poverty, limiting their access to education.<sup>12</sup>

### **Climate hazards affect the poorest groups and women and girls the most**

These groups are more vulnerable to climate change as they have less control over and access to resources and assets that support greater resilience to climate impacts. Geographically, the most vulnerable regions are located in South Asia, Micronesia and Melanesia, Central America and East, Central and West Africa.<sup>13</sup> Notably, 25 of the 33 countries where children shoulder extremely high vulnerability to climate shocks are in Africa.<sup>14</sup> The impacts of climate change are gendered. After the 2010 floods in Pakistan, 24 per cent of girls in sixth grade dropped out of school compared to 6 per cent of boys.<sup>15</sup> As highlighted by leading child rights organisations, the impacts of climate change are a threat to child's rights more broadly,<sup>16</sup> including the right to education - especially for girls.<sup>17</sup>

### **Foundational education addresses gender inequities and is crucial for climate resilience**

Robust evidence underscores that foundational education is essential for building climate change resilience and adaptation strategies, helping to reduce vulnerability, especially in low-income and middle-income countries.<sup>18</sup> The relationship between climate change and education is gendered. Girls are particularly vulnerable to climate change, and increased foundational education among girls decreases their individual vulnerability to climate-related disasters.<sup>19</sup> Education equips girls with the life skills and socio-emotional competencies necessary to navigate and adapt to a changing world, and contributing to community resilience against climate impacts.<sup>20</sup> Educated women are better able to make decisions that protect their families and communities from climate risks, such as using sustainable agricultural practices and supporting climate-friendly policies.<sup>21</sup>

## **Sudden-onset climate disasters degrade educational infrastructure and learning environments**

Strong evidence confirms that the destruction of educational infrastructure and learning environments will accelerate due to the increasing frequency and severity of climate events. Consequently, recovery costs will increase exponentially. When Cyclone Idai hit southeast Africa, in Mozambique alone, 3,400 classrooms were destroyed, and 305,000 children were left without a place to learn. Recovery costs in the region, including Comoros, Malawi and Zimbabwe, were estimated at USD 122 million.<sup>22</sup> Bangladesh suffered damages to education infrastructure for almost USD 6 million during floods in 2022.<sup>23</sup> The impacts of climate-related disasters on educational infrastructure highly affect children's access to quality education and were highlighted as an area of main concern by all stakeholders interviewed for this review.

## **Integration of extreme heat and slow-onset events in policy and practice**

At the country level, responses to slow-onset climate effects, such as increasing temperatures and thereby hotter classrooms, droughts and desertification, air pollution, loss of biodiversity, land and forest degradation, seasonal flooding, sea level rise, and salinisation, are often inadequate. When education is included in national climate plans, it usually focuses on climate-induced disasters and emergency responses. National policies and plans should incorporate greater emphasis on adapting to slow-onset events and mitigating their impacts on learning.<sup>24</sup>

Strong evidence confirms that learning is compromised when experiencing heat that exceeds a certain temperature threshold. Frequent and intense heat waves, combined with inadequate investments in heat safety adaptations for classrooms, negatively impact learning environments in developing countries and hit the poorest hardest.<sup>25</sup> How much learning is lost remains uncertain and varies across climate zones.<sup>26</sup> Heat is linked to negative impacts on students' health and well-being and can affect their concentration. Poorly ventilated spaces, including school buildings, have been reported to present desperate conditions during extreme heat and common sandstorms in North Africa, resulting in children missing class days.<sup>27</sup> A focus on heat safety adaptations in education facilities is therefore urgent.<sup>28</sup>

## **The negative effects of climate-induced displacement on education**

Climate-induced displacement and human mobility will increase because of extreme weather events; most of the displacement occurs in low-income countries.<sup>29</sup> Such displacement is often multi-causal, with climate change considered a risk multiplier.<sup>30</sup> For example, about half (46 per cent) of the 68.3 million persons displaced by conflict and violence and 7.7 million displaced by disasters live in Sub-Saharan Africa, with significant geographical overlaps of conflict, water scarcity and extreme heat.<sup>31</sup> Since displacement relates to several risks, singling out the effects of climate-induced displacement on education is methodologically challenging, and current analytical models are ill-suited.<sup>32</sup> At the same time, political considerations on attributing internal and cross-border displacement to climate change are highly charged, as reflected in debates around 'climate refugees'.<sup>33</sup> With this caveat in mind, according to some estimates, in 2022, an estimated 13 million children of school age in 27 countries were displaced due to climate shocks,<sup>34</sup> and up to 8 out of 10 children on the move are not achieving expected literacy proficiency levels.<sup>35</sup> In Sub-Saharan Africa, internally displaced children are 1.7 times more likely to be out of primary school than their non-displaced peers.<sup>36</sup> According to these sources, duty-bearing countries and organisations struggle to ensure that children on the move enjoy their right to education

## **Human mobility needs place-based development solutions – including for quality education**

The right to education is universal and not conditional on migration status or reason for moving. The knowledge gap on children on the move because of climate change impacts undermines the enjoyment of education and contributes to the fact that duty-bearing countries and organisations struggle to ensure that children on the move enjoy their right to education.<sup>37 38 39</sup> Climate change could force 216 million people to migrate within their own countries by 2050.<sup>40</sup> (Lack of) access to quality education poses a subset of issues for people on the move, whether they are displaced by sudden-onset disasters or move as a climate adaptation strategy.<sup>41</sup> Rural-urban movement increases settlements in slums, which can further marginalise children and limit their access to quality education.<sup>42</sup> This implies a place-based focus on addressing the root causes of displacement and the sustainable integration of populations into new territories, towns and cities, including their impact on and inclusion in social protection, health, and educational services, as well as access to dignified livelihoods, such as decent employment.<sup>43</sup>

## **Climate change education and children as agents of change**

Empowering children to become agents of change through education is a key policy priority within the climate change and education intersection and is closely related to the issue of ensuring gender-equitable quality of education.<sup>44 45</sup> Children and youth have long been viewed as victims of climate change, but they are recognised as agents of change in the Sendai Framework for Disaster Risk Reduction.<sup>46</sup> Their right to actively participate is also recognised under the UN Convention on the Rights of the Child.<sup>47</sup> Climate change education is relevant to the ongoing process of rethinking education in the context of climate change and resilience.<sup>48</sup> The evidence reviewed supports the importance of education *in general* in reducing climate vulnerability and increasing climate awareness and agency. However, limited evidence specifically addresses the positive impacts of *climate change education* on climate behaviour and action, especially in developing countries. In this regard, peer-reviewed articles offered mixed and often context-specific findings. Some evidence, including from studies in South Africa, substantiates that enhanced knowledge about climate change increases the desire to take climate action but also the risk of students feeling overwhelmed.<sup>49</sup> Other findings are that students in South Africa were generally more concerned about short-term risks, such as crime, lack of access to basic services, and unemployment, than long-term risks, such as climate change.<sup>50</sup>

As an important global policy priority, supporting the area with substantial evidence and robust data through research and strong evaluations is important. The review found that at the intersection of climate change and education, the evidence base for empowerment policy priorities and contexts-specific evidence in low-income and middle-income countries needs to be developed and deepened through a combination of academic research and robust evaluations.

## **Funding the climate change and education intersection**

Action on the intersection of climate change and education requires policymakers to act on multiple fronts, including as part of Education in Emergencies,<sup>51</sup> education management for resilience, resilient school infrastructure, ensuring learning continuity in the face of climate shocks, and leveraging students and teachers as change agents.<sup>52</sup> Such actions require sufficient funding. No global figures exist to summarise the additional financing needed for this effort. Looking at damages due to tropical cyclones alone, global estimates indicate the education sector experiences financial losses of USD 4 billion annually. The specific financing needs at the intersection of climate change and education come

in addition to an estimated annual shortfall of USD 100 billion globally towards achieving SDG 4 on quality education mentioned above.

Disaster risk reduction interventions, in general, are severely underfunded. While climate-related disasters have almost doubled in the past 20 years, disaster risk reduction funding has only increased by 0.5 per cent from 2010-2019.<sup>53</sup> This financing landscape includes that in 2022, only 30 per cent of education needs in 2022 humanitarian response plans and appeals received funding. Only 3 per cent of humanitarian funds are allocated to Education in Emergencies.<sup>54</sup> Between 2006-2023 only 2.4 per cent of climate finance delivered through four key multilateral climate funds supported projects that incorporated child-responsive activities, with education-specific projects being negligible.<sup>55</sup>

### 3. Future work

#### Addressing evidence and knowledge gaps to unlock education financing from multilateral climate funds

While some data explains the intersection of climate change and education and its implications, it is insufficient to ensure strong evidence-based policy-making supporting the long-term climate-related benefits of investing in education. Priority should be given to generating data and evidence in regions and countries most affected by climate change and building national and local capacities. This approach aims to address the structural bias that currently favours knowledge and evidence in the global north over the global south at the intersection of climate change and education.

This includes country- and context-specific data on the direct impacts of extreme events leading to the destruction of infrastructure, extreme heat leading to degradation of the learning environment, and droughts stressing essential water, sanitation, and hygiene facilities critical for school attendance and retention. It also includes missing data on the indirect impacts through household coping responses in the face of loss of income and livelihoods or displacement, leading households to withdraw children (especially girls) from schooling. More needs to be learned on the impacts on the health and well-being of educators and learners, reducing their readiness to teach and learn.

This enhanced knowledge could then be utilised to integrate education systematically into climate change policy processes and funding mechanisms, thereby unlocking education financing from multilateral climate funds.<sup>56</sup>

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<sup>1</sup> Baaré, A. & Orry Ahlmann, I. 2024, Desk Study 2: The intersection of Climate Change and Education.

<sup>2</sup> (GCA, 2022) (World Bank, 2024b).

<sup>3</sup> (GCA, 2022) (World Bank, 2024b).

<sup>4</sup> Learning poverty means being unable to read and understand a simple text by age 10.

<https://www.worldbank.org/en/topic/education/brief/what-is-learning-poverty>.

<sup>5</sup> (United Nations, 2023).

<sup>6</sup> (World Bank, 2024b).

<sup>7</sup> (UNESCO, 2023).

<sup>8</sup> (IPCC, 2023).

<sup>9</sup> (OECD, 2024).

<sup>10</sup> (World Bank, 2024b).

<sup>11</sup> (OECD, 2024).

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- <sup>12</sup> (World Bank, 2020).
- <sup>13</sup> (IPCC 2022, p.1231, World Bank 2020, 2023)).
- <sup>14</sup> (GCA, 2022).
- <sup>15</sup> ( Save The Children, 2021)).
- <sup>16</sup> (UNICEF, 2021).
- <sup>17</sup> [Young Lives 2021](#).
- <sup>18</sup> Sources: (Tan-Soo, Li, & Qin, 2022); (Nor Diana, Zulkepli, Siwar, & Zainol, 2022); (Pankhurst, 2022); (Sims, 2021); (Yadav & Lal, 2017); (Drabo & Mbaye, 2015); (Chigwanda, Mutopo, & Mutanana, 2023); (Bangay, 2021); (Hoffmann & Muttarak, 2017); (THEIRWORLD, 2018); (Malala Fund, 2021); (GPE & StC, 2023).
- <sup>19</sup> Pankhurst, 2022).
- <sup>20</sup> (World Bank, 2024c).
- <sup>21</sup> (World Bank, 2024b) (OECD, 2024).
- <sup>22</sup> (GCA, 2022) Sims, 2021).
- <sup>23</sup> (Care Denmark & Danish Red Cross, 2023).
- <sup>24</sup> (GPE & StC, 2023).
- <sup>25</sup> (UNICEF, 2022) (GCA, 2022) (World Bank, 2024) (World Bank, 2024b)
- <sup>26</sup> (World Bank, 2024b).
- <sup>27</sup> (GCA, 2022).
- <sup>28</sup> (Lala & Hagashima, 2023).
- <sup>29</sup> (OECD, 2024).
- <sup>30</sup> (UNICEF, 2019).
- <sup>31</sup> [IDMC accessed May 2024; \(GCA, 2022\)](#).
- <sup>32</sup> (IDMC, 2020).
- <sup>33</sup> See for example: [The concept of 'climate refugee' Towards a possible definition - European Parliament Briefing 2023](#).
- <sup>34</sup> (Education Cannot Wait, 2023).
- <sup>35</sup> (UNICEF, 2022b) latest data 2022.
- <sup>36</sup> (Education Cannot Wait, 2023).
- <sup>37</sup> (IDMC, 2021) (UNESCO, 2020).
- <sup>38</sup> (Kagawa F., 2022) (UNESCO, 2020) (UNHCR, 2020)
- <sup>39</sup> UNHCR analysed data from 70 countries hosting refugees and found that the gross enrolment rates for refugees are as follows: pre-primary school 38%, primary school 65%, secondary school 41%, and tertiary school 6%.
- <sup>40</sup> (World Bank, 2021).
- <sup>41</sup> (GCA, 2022) (OECD, 2023) (UNICEF, 2022b) (World Bank, 2018) (World Bank, 2021) (World Bank, 2024b).
- <sup>42</sup> (UNESCO, 2020).
- <sup>43</sup> (OECD, 2023).
- <sup>44</sup> (Chigwanda, Mutopo, & Mutanana, 2023); (Kutywayo, et al., 2022); (Nkoana, 2020); (Sims, 2021); (UNICEF, 2019); (Bangay, 2021); (Malala Fund, 2021); (Education Cannot Wait, 2023) (OECD, 2024).
- <sup>45</sup> (Malala Fund, 2021) (UNICEF, 2022) (GPE, 2022) [The Declaration on the common agenda for education and climate change at COP28](#).
- <sup>46</sup> [UNDRR Sendai Framework for Disaster Risk Reduction](#).
- <sup>47</sup> <https://www.unicef.org/child-rights-convention>.
- <sup>48</sup> (OECD, 2024).
- <sup>49</sup> (Sims, 2021); (Kutywayo, et al., 2022); (UNICEF, 2019).
- <sup>50</sup> (Nkoana, 2020).
- <sup>51</sup> (GGHEE, 2023).
- <sup>52</sup> (World Bank, 2024b).
- <sup>53</sup> (UN General Assembly, 2023).
- <sup>54</sup> (Education Cannot Wait, 2023).
- <sup>55</sup> (GPE & StC, 2023) (CERI, 2023).
- <sup>56</sup> (GGHEE, 2023); (UNICEF, 2019); (GPE & StC, 2023).