



Education

KEY MESSAGES

- Education is a heavily climate-impacted sector in Africa. It is also a key building block of adaptive capacity. However, investment in education is low in Africa, creating a significant barrier for climate adaptation. Despite growing evidence about the synergies between education and adaptation, education has also not been central to climate and adaptation strategies.
- Climate-related disruptions to the education sector have far-reaching negative effects on the adaptive capacity of climate-vulnerable populations in Africa. 25 of the 33 countries where children shoulder extremely high vulnerability to climate shocks are located in Africa.
- The indirect impacts of climate change also impair educational attainment, especially for girls. The Malala Fund estimates that climate disruptions will mark an abrupt end to schooling for at least 12.5 million girls every year globally.
- Climate-adapted educational infrastructure can help sustain learning during climate-related emergencies, while strengthening the resilience of communities to climate impacts. A climate-adapted education workforce is critical to delivering education that unlocks adaptation solutions in other critical sectors in Africa, not to mention generations of empowered climate-adapted citizens.



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- Education is itself a key adaptation solution for Africa. More education is correlated with strengthened adaptive capacity and reduced climate vulnerability. Climate change education is vital to the development of climate literacy, which is itself vital for improved adaptation. Education also helps to build a breadth of green skills to fuel a just transition to green jobs for adaptation and resilience for all of Africa.
- To make progress on using education as a lever of climate adaptation, a global effort in the form of an “Education for Adaptation Accelerator (E4AA)” Alliance is urgently needed. Africa, as the continent with the fastest-growing youth population, could lead this Alliance.

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Every day that we delay adapting to climate change is another day wasted. Another day when we’re delaying investment now, but paying the cost later. Failure to capitalize on the economic benefit of adaptation through high-return investment now will result in the loss of trillions of dollars in potential development. ... Education is vital for building a climate-resilient future.”

Ban Ki-moon

8th Secretary-General of the United Nations and Chair of the Global Center on Adaptation

INTRODUCTION

Underlying the climate and adaptation crisis in Africa is a human crisis. This includes a silent crisis in education, with unacceptable rates of learning and skills poverty, which threaten the prosperity of individuals, communities and nations. A low level of human development makes people more vulnerable to the impacts of climate change and prevents them from becoming a much needed and critical part of climate solutions.

The relationship between climate change, adaptation and education is complex and bi-directional. Climate change undermines educational attainment in Africa by damaging already fragile infrastructure and increasing the vulnerability of educators and learners, negatively affecting their ability to educate and learn. But education is also a key climate adaptation solution for Africa because it enhances the adaptive capacity of people, and especially children, by building critical green skills for adaptation action.¹

Around the world, there is growing recognition of the relationship between climate change and education. Article 12 of the Paris Agreement recognizes the critical role of education in empowering all members of society to engage in and take climate action—both adaptive and mitigative. Education is also a part of the 2030 Agenda for Sustainable Development, and climate action is a critical thematic priority of UNESCO's (2020) global framework on Education for Sustainable Development. In Africa, the Coalition for Education and Training on Climate Change acknowledges the role education plays in reducing the impact of climate change.² Similarly, the African Union's Climate Change and Resilient Development Strategy and Action Plan (2022–2032) and the Southern African Development Community (SADC)'s 2015 Climate Change Strategy and Action Plan both recognize formal and informal climate change education as key elements in enhancing responses to climate change and seizing opportunities in both mitigation and adaptation.³

Despite its strategic importance to adaptation efforts, however, education has been overlooked by the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), and more broadly in the formulation of climate and adaptation strategy on all levels. The annual UN Climate Change Conference did not feature education in a high-level official discussion until COP26 in Glasgow in 2021, when ministers of the environment engaged ministers of education in a first-ever joint ministerial dialogue on education for climate action.⁴ The global education community has also de-prioritized education for adaptation; it was sidelined, for example, at the Transforming Education Summit—the first-ever meeting of heads of state on the topic of education at the UN General Assembly meetings.⁵

At the time of writing, only 40 of the 133 nations that have submitted an updated, revised, or new Nationally Determined Contribution (NDC) mention climate change education as an adaptation (or mitigation) strategy in their NDC.⁶ Out of the 43 African countries that have submitted their updated, revised, or new NDCs, 16 mention climate change education.

Acting on the greater integration of education in adaptation is urgent. Africa's population is young and growing. In 2050, more than half of Africans will still be under the age of 25,⁷ and the continent



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will boast a workforce of over 1 billion.⁸ Yet if Africa continues at its current pace of educational investment, the continent will not be able to respond to the climate crisis. On current trends, a UN and African Union Commission report estimated that it would take another 100 years to reach universal primary education, and another 235 and 280 years to reach universal lower secondary and universal upper secondary education. Progress on climate resilience is similarly slow: The authors of the ND-GAIN Country Index estimated in 2013 that it would take the world's poorest countries, many of which are in Africa, a century to achieve the climate readiness of the richest countries.⁹

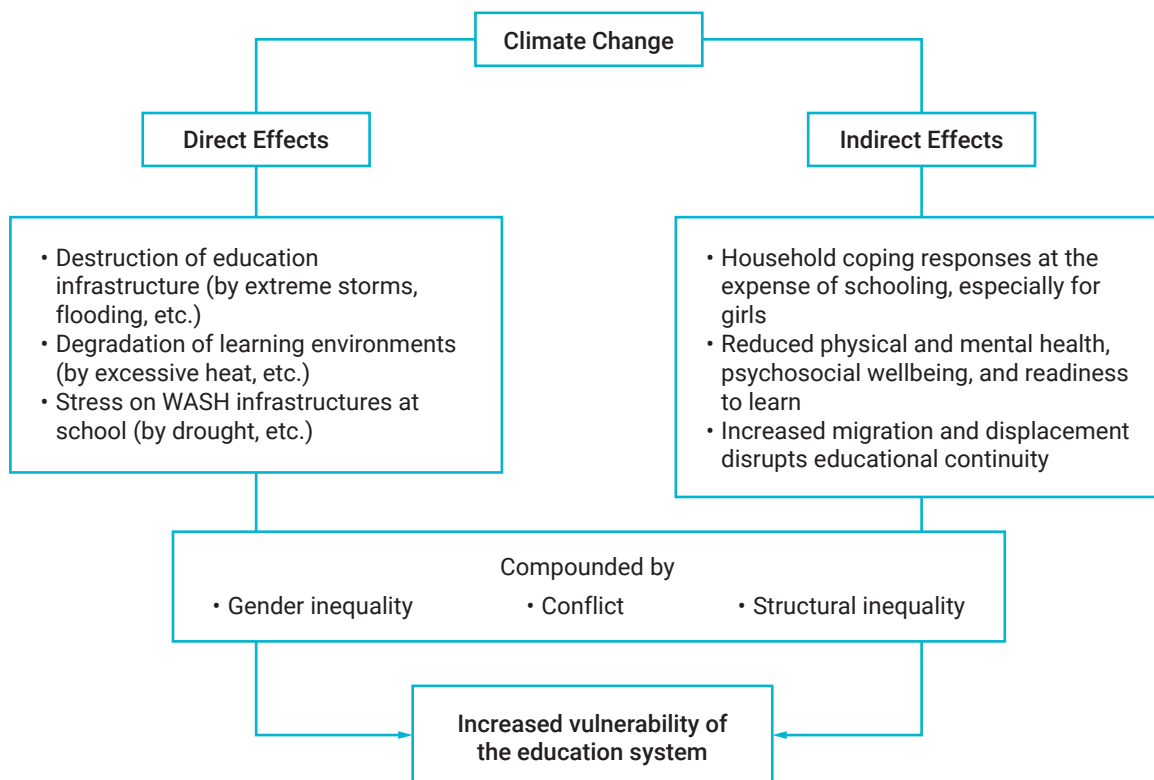
This chapter argues for a greater recognition of the need to adapt education systems themselves, but also to recognize education itself as a critical and central strategy for climate adaptation in Africa. Section 1 highlights the challenges faced by the education sector in adapting to climate change impacts and the need for greater investment in education to fully realize its potential as an

adaptation solution. Section 2 assesses the state of education in Africa today and makes a case for education as an important building block of adaptive capacity. Section 3, the most substantial section of this chapter, maps out four strategies to accelerate the project of education for adaptation in Africa. Section 4 concludes with recommendations, including a proposal for an "Education for Adaptation" global Alliance to be led by Africa.

Challenges to Education from Climate Change

A wide range of impacts of climate change on education infrastructure, educators, and learner outcomes have been observed.¹⁰ This section breaks down these impacts into three categories: direct, indirect and compounded. The relationship between these effects is diagrammed in Figure 1. However, access to consistent, reliable, and comprehensive data that links climate and education is often anecdotal and related to specific events. This affects our ability to assess the scope and scale of the impacts across Africa.

Figure 1. The Relationship between Climate Change, Vulnerability, and Education



Direct Effects

The direct impact that climate change has on African education systems is most visibly manifested in the destruction of education infrastructure by sudden-onset impacts such as storms and floods. For example, Cyclone Idai, which hit southeast Africa in 2019, demonstrated the extensive vulnerability of education infrastructure in Africa. The damage ranged from the complete collapse of school buildings to the destruction of teaching and learning material. In Mozambique alone, the cyclone destroyed 3,400 classrooms and left 305,000 children without conducive places of learning.¹¹ Moreover, school premises that withstood the cyclone provided shelter to 142,000 displaced people,¹² which prolonged the time children were left without spaces for learning and increased dropout rates, especially among girls.¹³ Such destruction is costly for already tight education budgets. In Zimbabwe, the total cost of educational infrastructure destruction reached nearly US\$7 million.¹⁴ With the frequency and intensity of heavy precipitation events in Africa on the rise, this type of destruction and educational disruption is only expected to get worse.¹⁵

Another direct impact of climate change on education is the degradation of learning environments by temperature rise and extreme heat. 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,¹⁶ but exact numbers are unclear, as countries do not appear to be proactively tracking such data. Evidence from other countries suggests that hotter temperatures affect student concentration and performance. For instance, evidence from the United States shows that without air conditioning, an increase in average annual temperature by 1°F (about 0.56°C) reduces that year's learning by 1 percent.¹⁷ With air conditioning, that impact is reduced by 78 percent.

Drought is another major challenge directly impacting education in Africa by stressing water, sanitation, and hygiene (WASH) infrastructure that is already unevenly developed. This is especially the case in poorer urban areas and in rural areas. Nearly 295 million children in Sub-Saharan Africa lack access to water for drinking and hand washing at school.¹⁸ These conditions are a significant deterrent for

children to attend school, especially for menstruating learners and teachers.¹⁹ With drought conditions expected to worsen access to water at schools across the continent, climate change will only worsen school attendance.²⁰

Indirect Effects

Climate change triggers a set of indirect effects on education by triggering household coping responses that often come at the expense of schooling—especially for girls. This is most prominent in the context of slow-onset and prolonged climate-related disasters, such as droughts, that have a high impact on climate-sensitive sectors such as agriculture and fisheries. For instance, rural agricultural households in Zimbabwe that experienced a loss of farming income during drought are left without enough money to pay for food, school fees, learning materials, or transportation.²¹ Drought-affected households without access to credit facilities are especially at risk of withdrawing their children, especially girls, from school—some to engage in income-generating activities and others to be married off.²² Such maladaptive coping responses further entrench the next generation in a vicious cycle of poverty and climate vulnerability.

Climate change also impacts the health and wellbeing of educators and learners, reducing their readiness to teach and learn. Climate-related events generate a variety of public health challenges, from the increased burden of waterborne disease caused by flooding and poor sanitation to the shifts in vector-borne diseases brought on by rising temperatures, to hunger and malnutrition caused by drought-induced food shortages.²³ For children, especially those in the first 1,000 days of life, health challenges such as malnutrition can lead to stunted growth, which negatively impacts their later cognitive abilities in vocabulary and mathematics, especially in households with low literacy levels.²⁴ Indeed, research suggests that children exposed to harsh climatic conditions in early life are likely to attain 1.5 fewer years of schooling than children from places with favorable climatic conditions.

Both sudden-onset and prolonged climate disasters can also affect access to essential menstrual and sexual reproductive health products,²⁵ with impacts on health, including potential pregnancy, as well as on school attendance and learning outcomes.²⁶

In addition, the physical destruction of school infrastructure, along with the significant loss of human life, including colleagues and classmates, can also lead to post-traumatic stress, anxiety, and other long-term mental health challenges for teachers and learners.²⁷

Lastly, climate-related migration and displacement disrupt access to education. While families with the means to migrate can move to places with better availability of resources such as food and water, often their children are forced out of school as a result, with girls at heightened risk. At the end of 2021, 27.2 million people in Sub-Saharan Africa were internally displaced, according to the Internal Displacement and Monitoring Center (IDMC)—mainly due to conflicts and violence, but more than 2 million due to disasters.²⁸ Among them, 7.3 million were children between the ages of 5 and 14, and 4.4 million were under 5. The largest numbers of displaced children were in the Democratic Republic of the Congo, Ethiopia, Nigeria, Somalia, and Sudan.

Combining data from the IDMC and the ND-GAIN Country Index (2020), our analysis found that in Somalia and Sudan, there is a particularly large confluence of high climate vulnerability and high child displacement. Both countries also have low adaptation readiness, indicating a great need for investment in adaptation and education.

Compounding Effects

The vulnerability of education systems to climate change are also compounded by, and in turn exacerbate, ongoing systemic challenges in society, including gender inequality, conflict, and historical structural inequality.

Gender inequality exacerbates the effects of climate change on education, especially for adolescent girls. For instance, adolescent girls spend more time walking long distances and waiting for long periods of time to collect water in times of drought, exposing them to greater risk of sexual violence while also causing them to miss school or show up too tired to



learn.²⁹ Indeed, globally, girls with no education have been found to be at three times the risk of marrying before the age of 18 than those who have completed high school;³⁰ uneducated girls are also at heightened risk of engaging in transactional sex for food and basic necessities.³¹ This puts them at increased risk of HIV infection, which has already been observed in Malawi and Lesotho, and further impairs their resilience and adaptive capacity.³² The Malala Fund estimates that climate disruptions will mark an abrupt end to schooling for at least 12.5 million girls every year.³³

Conflict magnifies already tenuous environmental conditions for the safe delivery of education. Only about 65 percent of children in conflict-ridden countries reach the last grade of primary school, compared with 86 percent across low-income countries in general.³⁴ Children in conflict settings are most affected by death, injuries, increased vulnerability to abuse, lower health, and a loss of school time.³⁵ Of the 33 countries that UNICEF has identified as bearing extremely high climate risks for children, 29 are also considered to be fragile contexts.³⁶ Such environmental conditions will no doubt amplify long-standing challenges of governance, increase socioeconomic inequalities, trigger civil wars over increasingly scarce natural resources, and increase conflict-induced displacement, all ultimately disrupting children's access to school.³⁷

Structural inequality not only exposes learners in Africa to uneven quality of education, but also heightens the risk of exposure to climate risks for some more than others. For example, the April 2022 floods in South Africa claimed 435 lives, including nearly 70 pupils from Black and poor communities in KwaZulu-Natal.³⁸ The uneven loss of life has been attributed to the legacy of the apartheid government's 1913 Land Act and 1950 Group Areas Act.³⁹ Through spatial planning, both pieces of legislation confined Black and "colored" communities to low-lying densely populated areas un conducive to the delivery of essential services. A combination of historical legacies of oppression and contemporary discrimination heighten the exposure of historically marginalized populations of children not only to intergenerational trauma, but also to an excess of environmental hazards that limit their opportunities to quality education.⁴⁰

HOW THE EDUCATION DEFICIT IMPEDES CLIMATE ADAPTATION

The potential for education to be a key instrument to help countries and communities adapt to climate change is severely hampered by the lack of investment in education, and indeed by the limited recognition and understanding of education as a key adaptation strategy. This section presents a broad overview of the education deficit, both in quantitative terms and in quality, in Africa. It then proceeds to show that education is often positively correlated to increased adaptive capacity, suggesting that an increase in human capital could deliver very positive outcomes for adaptation.

Education in Crisis

Investment and progress in education in Africa have been painfully slow. Over the period 2010–2017, only 20 African countries in a sample of 42 provided the minimum education funding recommended by the UN: at least 4 percent of GDP and 15 percent of the government budget. Seven met only one of the criteria, and 15 met neither.⁴¹ Globally, the Education Commission estimated in 2016 that annual aid to education stood at approximately US\$16 billion, leaving a US\$44 billion shortfall.⁴² The education financing gap is projected to get much worse as result of the COVID-19 pandemic's impact on countries' fiscal position.⁴³

Average years of schooling are the lowest in Africa compared to other regions, and over half of the world's out-of-school children of primary school age (34 million) are in Africa.⁴⁴ Progress in enrollment in secondary and tertiary education in Africa is slow, and enrollment in primary education has stagnated after experiencing a period of rapid progress around the turn of the millennium.⁴⁵

Yet a deeper and more structural problem lies in the quality of education in Africa. Millions of those who go to school emerge without basic literacy and numeracy skills. In Sub-Saharan Africa and the Middle East and North Africa region, only 11 percent and 23 percent of all youth aged 15–24 have basic secondary literacy and numeracy skills, respectively.⁴⁶ COVID-19 related school closures resulted in children losing a collective 1.8 trillion hours of in-person learning globally,⁴⁷ with those from marginalized communities suffering the most.⁴⁸ Before the pandemic, the global learning crisis was already

alarming, with 87 percent of children in Sub-Saharan Africa living in learning poverty—meaning they are unable, by the age of 10, to read and comprehend simple text in the language of instruction.⁴⁹ Post-pandemic, this figure is expected to increase globally at least by 10 percentage points if active measures for remedial learning and increased investments in education are not taken by governments.

The Impact of Education on Adaptive Capacity

While the evidence on the impact of education on countries and people’s adaptive capacity is still emerging, available data points to a strong positive relationship. UNICEF estimates that improving

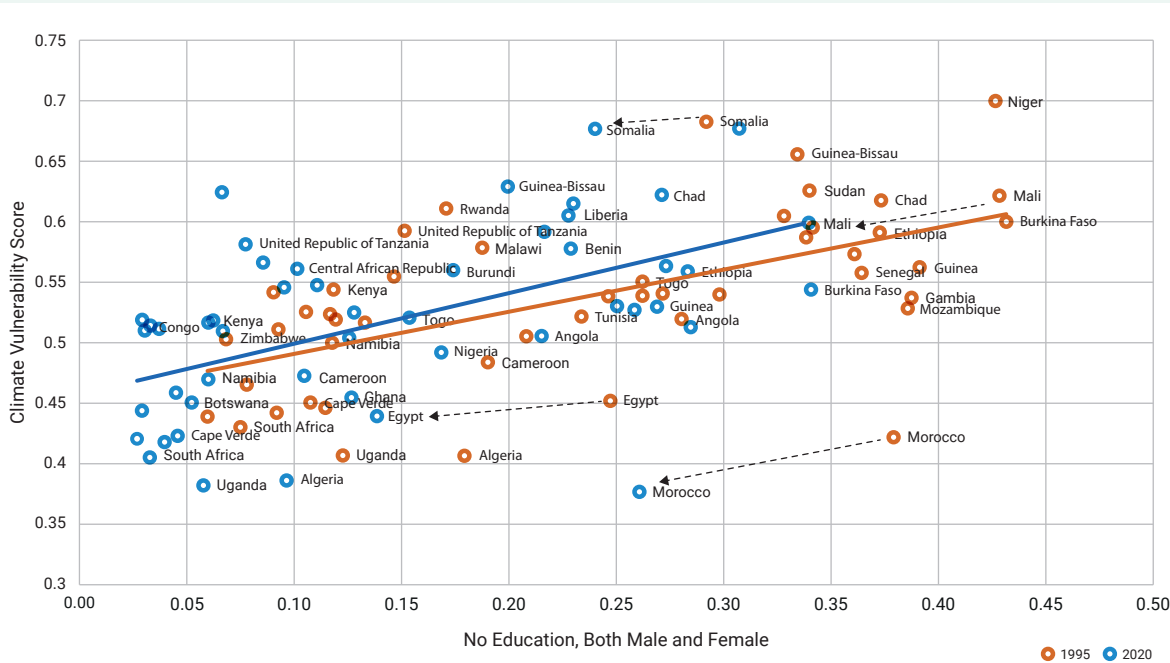
educational outcomes could reduce the climate risks borne by 275 million children globally.⁵⁰ New analysis for this chapter combining education data with the ND-GAIN Country Index also confirms the importance of education, especially secondary and higher education, for adaptive capacity.⁵¹ That is, no education is associated with higher climate vulnerability, and more education—specifically at the upper secondary and tertiary levels—is associated with higher adaptive capacity (Box 1). What this and other analyzes indicate is that education is an important building block of adaptive capacity.⁵² Research suggests that these foundations can be built in direct and indirect ways.

Box 1. Higher Levels of Education are Associated with Higher Levels of Adaptive Capacity

Over the past two and a half decades, the climate vulnerability score in Africa has, on average, decreased, but only marginally (Figure 2). This small change may be accounted for by improvements in education, both in the decline in the population

with no education and the increase in the share of the population with upper secondary and tertiary education. Figure 2 suggests a positive correlation between the lack of education and climate vulnerability scores.

Figure 2. The Relationship Between Climate Vulnerability and Population with No Education, Both Male and Female, in 1995 (Red) and 2020 (Blue) in 49 Countries in Africa



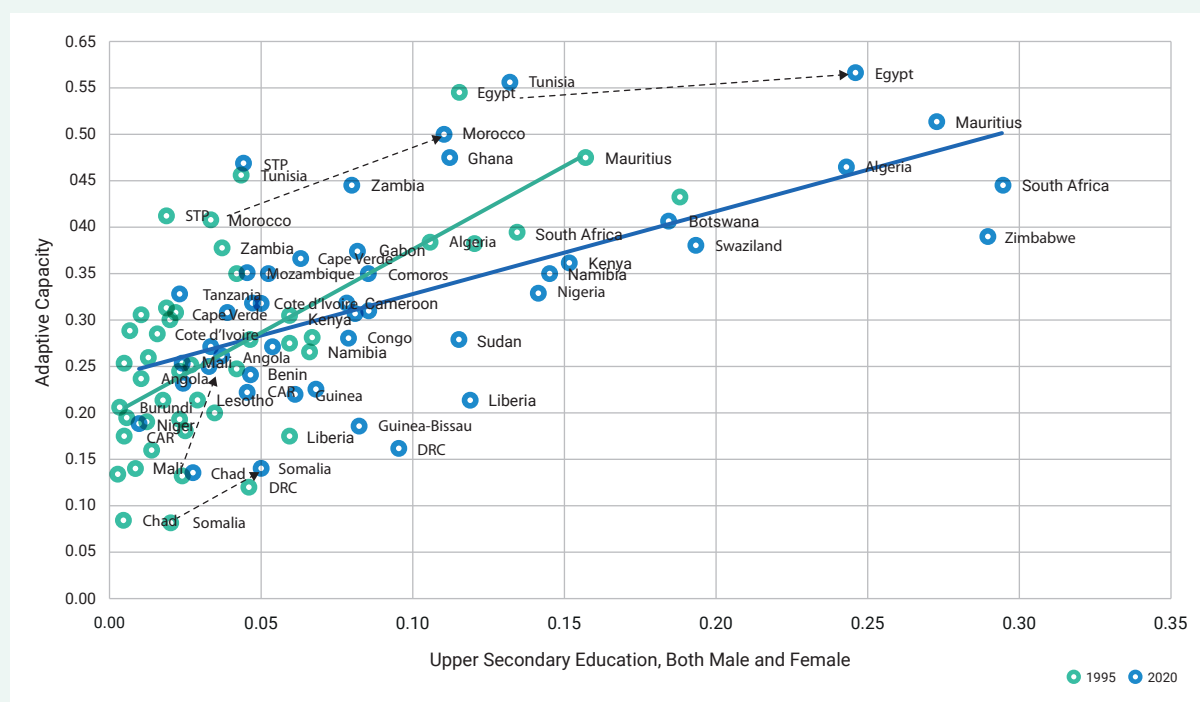
Note: The dashed arrow indicates the direction of change from 1995 to 2020 for Egypt, Morocco, Somalia, and Mali. Pearson correlations are positive and range from $r = 0.598$ in 1995 to $r = 0.554$ in 2020.

Data sources: ND-GAIN Country Index and Wittgenstein Centre Human Capital Data Explorer⁵³

Similarly, there is a positive correlation between the level of secondary education and the adaptive capacity score⁵⁴ in Africa (Figure 3). Of course, improved education may also correlate with other variables (e.g. health, gender equality, better nutrition

and improved energy access, etc.) which in turn affect adaptive capacity. The graph below establishes correlation not causation. Further work to analyze this relationship is needed.

Figure 3. The Relationship Between Adaptive Capacity and Population with Upper Secondary Education, Both Male and Female, in 1995 (Green) and 2020 (Blue) in 49 Countries in Africa



Note: Pearson correlations range from $r = 0.631$ in 1995 to $r = 0.618$ in 2020. The dashed arrow indicates the direction of change from 1995 to 2020 for Egypt, Morocco, Somalia and Mali.

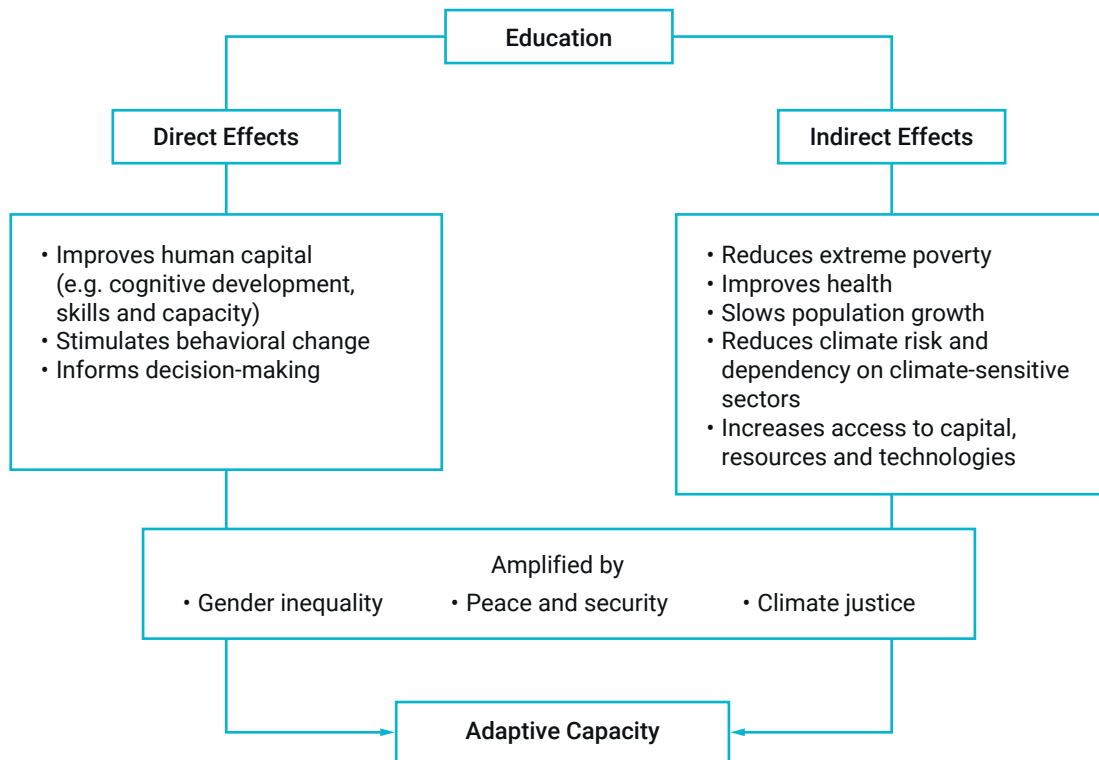
Data sources: ND-GAIN Country Index and Wittgenstein Centre Human Capital Data Explorer⁵⁵

Several studies have underlined the potential symbiotic relationship between human capital—and, specifically, education—and adaptive capacity.⁵⁶ Figure 4 outlines the direct and indirect elements of this relationship, in a manner analogous to the direct and indirect impacts of climate change on education described in Figure 1. Pre-primary to post-secondary education allows for cognitive development and builds important skills and capacities. Education about climate change, its impacts, and adaptation solutions can also help to stimulate behavioral change and enable individuals and society to make informed decisions about climate adaptation.⁵⁷ More indirectly, education helps to reduce extreme poverty, improves health, and slows population growth, thereby strengthening adaptive capacity of individuals, communities, and states.⁵⁸

With more education, individuals and households can better prepare for and respond to climate shocks through risk reduction, migration, and/or the adoption of climate-resilient technologies, practices and behaviors;⁶⁰ they are also more flexible to learn new skills, take on new jobs, or find new livelihoods.⁶¹ With more education, individuals and households can better perceive and reduce their risk, diversify their income, and become less dependent on climate-sensitive sectors. The increased access to capital, information, and resources gives them more agency in the face of crisis, opening up options to respond or adapt to the impacts of climate change.

The effect of secondary education on adaptive capacity has been observed to be highest for women,⁶² reinforcing the urgent need to ensure girls

Figure 4. How Education Contributes to Enhanced Adaptive Capacity



Source: Adapted from Figure 1 in Muttarak and Lutz (2014)⁵⁹



have access to 12 years of quality and empowering education.⁶³ This is especially the case for the 22 African countries where girls' education is expected to be disrupted by the effects of climate change the most.⁶⁴ Indeed, the effects of education on the empowerment of women and girls and youth not only amplifies the impact of education on adaptive capacity, but also contributes to reducing gender inequalities and addresses development gaps that put these groups at heightened climate risk in the first place.⁶⁵

And finally, the achievement of climate justice through education—that is, educating learners to redress and transform the systemic inequities and injustices that drive climate vulnerability and generate the unequal and uneven burden borne by some more than others—is critical to closing the loop between education, empowerment, and adaptive capacity.⁶⁶

FOUR WAYS TO ACCELERATE EDUCATION FOR ADAPTATION

In Africa, schools and other learning institutions are synonymous with developmental progress. They represent possibilities for children and provide nations with the human capital needed to drive toward a better future—even a future under climate change.⁶⁷ Indeed, schools connect people and places and offer hope, shelter and humanitarian assistance in a time of disaster. They are pathways for knowledge, skills and cultural exchange across diverse African communities, and thus they are essential in efforts toward strengthening climate resilience and adaptation.

Making education systems climate-adapted and ensuring that investments in education can in turn drive adaptation will require action across four distinct areas. First, data, diagnosis, and improved planning must underpin greater integration of education in adaptation strategies. Second, education infrastructure must be adapted to be more resilient itself and to act as a driver of resilience. Third, the education workforce must be supported and strengthened to play its role in educating young people and preparing them to be the climate-adapted workforce of the future. Fourth, education content and pedagogy must be oriented toward instilling climate literacy and a breadth of green skills for adaptation in all learners.

Monitor, Diagnose, and Plan for Integrated Education and Adaptation Strategies

It is clear that an investment in education does not present tradeoffs for African countries, but rather a multitude of co-benefits or win-win solutions when it comes to improving the climate resilience of essential social services and infrastructure, as well as strengthening the adaptive capacity of individuals and communities. However, data is a key challenge for adequately diagnosing the extent of disruption on education caused by climate change and for estimating the potential impact that greater investments in education could have on adaptation efforts.

More data is needed on a regular basis to better monitor, diagnose, and address local climate vulnerabilities of and local climate impacts on the education sector across the continent, including but not limited to data on school infrastructure, vulnerable groups of learners and teachers, days of learning lost, and “green” learning outcomes for climate adaptation. Importantly, this data must be user-friendly if it is to be integrated into adaptation policies.⁶⁸

In addition to more data and analysis of the relationship between education and adaptive capacity,⁶⁹ greater efforts should be made to include education in adaptation policies and to investments that give priority to the most climate-vulnerable communities and those that are least ready to adapt. This is especially critical in the face of intense climate injustice across the continent.⁷⁰ Climate adaptation should not increase or result in new inequalities.⁷¹

Invest in Climate-Adapted Infrastructure

As a large subset of public infrastructure, government schools across Africa could play a big role in helping African communities adapt to the impacts of climate change. Schools could be designed to be capable of withstanding and/or adapting to climate-related shocks. African countries should avoid further investments in traditional “gray” education infrastructure that is vulnerable to damage or destruction or place the people inside them at higher risk of exposure to climate-related hazards. “Gray” education infrastructure refers to schools built with iron roofs, corrugated asbestos sheeting, or from shipping containers—unsustainable materials that are known for their poor ventilation and insulation.



Photo: Avatar_023/Shutterstock

Air temperatures inside classrooms constructed with these materials often exceed 30°C, causing heat stress and other heat-related symptoms, including thirst and drowsiness. Many of these structures are easily destroyed during flooding or windstorms.

In contrast, “green” infrastructure is both sustainably constructed and built with sustainable materials, allows for natural temperature regulation, produces its own electricity, uses less water, reestablishes endemic flora and fauna thus conserving biodiversity, incorporates herbal and animal corridors, includes space for growing fruit, vegetable, and medicinal gardens on campus, and uses in-house solar panels and/or hydroelectricity generators.

To some, climate-resilient, “green” public schools may be a futuristic vision for Africa, but it is desirable and realizable with international support.⁷² African countries can tap into locally available renewable energy and material resources to build green, climate-adapted infrastructure that is both feasible and cost-effective. Evidence suggests that US\$1 invested in resilience could save US\$4 in post-disaster reconstruction.⁷³ Investing in climate-resilient infrastructure has been found to be 12 times more cost-effective than disaster relief assistance.⁷⁴ Failing to ensure that education infrastructure is resilient, in

contrast, is both unsustainable and cost-ineffective, as climate change will cause further disruptions, shorten the rehabilitation life cycle, and increase repair and rehabilitation costs. In low- to middle-income countries, infrastructure disruptions, many of them caused by natural hazards, impose costs estimated at between US\$391 billion and US\$647 billion per year, putting extra strain on already limited budgets.

Building a climate-resilient education infrastructure in Africa could take three forms:

First, **public schools could be designed to naturally fit in the landscape.** Adapting education infrastructure must go beyond simple “climate-proofing” to consider ways of harnessing nature’s capacity to reduce risks and build resilience, making schools practical examples of sustainability for learners and surrounding communities.⁷⁵ Such “green” climate-adapted schools can also create important opportunities to connect learners to Indigenous land practices and to nature, supporting both learning and learners’ psychosocial health. Indeed, evidence outside of Africa suggests that increasing learners’ access to such green space actually improves cognitive functioning, reduces stress, and improves wellbeing.⁷⁶

CASE STUDY 1: School Water-Harvesting Project in Seychelles

The Republic of Seychelles is a Small Island Developing State off the coast of East Africa that has struggled to meet its people's water and sanitation needs. The low-lying archipelago is threatened by rising sea levels, and highly variable precipitation, with short, intense rainy seasons alternating with long, dry seasons and droughts.

Heavy rainfall strains water storage facilities and sewer reticulation systems, leading to increased likelihood of water pollution and disease outbreak.⁷⁷ At the same time, despite significant progress in providing clean water access, the country struggles with persistent water scarcity, which has been exacerbated by socioeconomic and demographic

growth; on the main island, Mahe, demand was projected to rise by 130 percent from 2015 to 2030.⁷⁸ Schools' water consumption is also increasing, and the cost puts a large strain on their budgets.⁷⁹

In 2010, the Climate Change and Development—Adapting by Reducing Vulnerability (CC DARE) project, funded by the Danish International Development Agency, began a rainwater-harvesting project in schools around the country.⁸⁰ The project takes advantage of the extremely wet rainy season to capture water that would normally have been lost through runoff and stores it for use during dry seasons. Along with providing water for the schools, the project teaches schoolchildren and the community about climate change and its effects on water resources, as well as about rainwater-harvesting as an adaptation strategy. Children have also had the opportunity to investigate their own water consumption patterns at school and have identified which activities consume more water than necessary. As a result of both water-harvesting and greater awareness of water consumption, the project has seen school water bills reduced by US\$250 monthly. The cost savings are directed to other uses, including teaching and learning resources.

The harvested water has been used for organic garden projects at school that contribute to combating hunger and act as spaces for climate change education.⁸¹ The involvement of learners throughout the planning and installation of water tanks equipped them with vocational skills, including welding, masonry, and painting, that can be applied elsewhere. And the project also led to improved public awareness of climate change in communities surrounding the schools.⁸² The project partnered with several NGOs and government and has since been implemented nationally and has been incorporated into the national climate change adaptation strategy. The rainwater-harvesting system is part of building codes for new schools, government buildings, and communal infrastructure, with the larger aim of equipping all households with a rainwater-harvesting and water treatment system.



Photo: UN Women/Ryan Brown/Flickr

Second, **public schools in Africa can be the sites of government investment in renewable energy, new sustainable building materials, and sustainable design.** Extended roof surface areas and open grounds in African schoolyards can be utilized to set up solar systems, for example, to provide power to schools, enable more time for instruction and learning, and create living laboratories to study renewable energy and sustainability.⁸³ In South Africa, the introduction of solar-powered classrooms by Samsung generated nine hours of electricity per day per classroom, access to internet-based learning and teaching material, and led to improved pass rates from 66 percent to 96.5 percent.⁸⁴ Similarly, evidence from Ethiopia showed that investments in solar energy for school lighting led to more learning hours, including evening classes.⁸⁵ Research suggests that adapting education infrastructure in Africa does not have to be costly but can actually help countries save money while improving the quality of learning environments and learning outcomes. For instance, the solar energy firm Lumos estimates that adopting solar systems can reduce school expenditure on electricity and generators in Sub-Saharan Africa by US\$55 a month, from US\$70 down to US\$15.⁸⁶

Finally, as in other regions of the world, **public schools in Africa can be designed and built with multiple climate adaptation functions in mind beyond providing education.**⁸⁷ As a center for communities, schools can also improve resilience by providing shelter to communities (both people and livestock) during a climate-related event, serve as food distribution sites and conduct other post-disaster humanitarian assistance (especially if designed to help minimize post-disaster school disruptions), and can also provide land and utilities to enhance community resilience.

Invest in a Climate-Adapted Education Workforce

Strengthening the climate resilience and adaptive capacity of the education sector's human resources is critical to supporting the readiness of African education systems to respond to climate impacts. Importantly, a climate-adapted, climate-resilient education workforce—including teachers, trainers, facilitators, counselors, staff, administrators, school leaders, and others—is key to unlocking broader efforts across countries in Africa to build present

and future generations of a climate-adapted, climate-resilient workforce across economic and social sectors.

Building a climate-resilient workforce requires action in four areas.

First and foremost, **Africa must overcome its teacher shortage.** The UNESCO Institute for Statistics estimated in 2016 that 70 percent of countries in Sub-Saharan Africa faced acute shortages of teachers at the primary level, rising to 90 percent at the secondary level.⁸⁸ This amounts to approximately 6.3 million additional primary school teachers and 10.8 million additional secondary school teachers needed through 2030. For African countries to tap into the power and potential of education for adaptation, they will need to invest in empowering and resourcing the teaching profession.

Second, **teachers and other members of the education workforce in Africa, especially those in rural areas, must be better and more consistently compensated,** so they can avoid having to engage in additional livelihood activities, including subsistence agriculture, to make ends meet.⁸⁹ Such occupational precarity leaves teachers and educators vulnerable to climate shocks and creates high teacher turnover, further weakening the education sector's resilience to climate-related disruptions. Unfortunately, there is very little research or data beyond anecdotal evidence on how climate shocks impact teachers and their retention. More attention is urgently needed.

Third, **teachers and other members of the education workforce have a strong desire to help prepare learners for a climate-impacted world, but they need time, training, resources, and support to do so effectively.**⁹⁰ Indeed, research suggests that quality education for climate action, including for adaptation, rests on employing experiential, project-based learning approaches that build skills such as critical thinking, futures thinking, and systems thinking.⁹¹ Approaches to teaching and learning also need to be responsive to the traumatic impacts of climate change as they unfold across the continent in real time. And educators must themselves have a minimum understanding of climate adaptation, local adaptation needs, local resilience practices, and adaptation solutions—which many still lack.⁹² Moreover, many education systems in Africa struggle to implement student-centered pedagogies.⁹³



Photo: Giacomo Pirozzi/Panos Pictures

CASE STUDY 2: Sustainability Starts with Teachers

Sustainability Starts with Teachers (SST) is a capacity-building program with the objective of providing support to educators in implementing action-oriented transformative learning that integrates sustainability into all areas of education.⁹⁴ The program supports educators in 11 Southern African countries, targeting teacher educators in 118 teacher education institutes (TEIs), and covers early childhood, primary, secondary, and technical and vocational education and training.

The content covered in the program is anchored in all 17 Sustainable Development Goals, but guided especially by Goal 4, Target 4.7, which focuses on instilling in learners the knowledge and skills needed to promote sustainable development. It recognizes the role of teachers in translating climate change, environmental issues, and biodiversity conservation as informed by regional and global protocols into locally relevant educational content and pedagogical approaches. The program also recognizes teachers' role in shaping the worldviews and attitudes of

learners, as well as their skills to engage in climate adaptation in their communities and beyond. Teachers are guided by a 5-Step Action Learning Programme Framework to develop contextualized climate change lessons and to create transformative learning environments.

Participation in the program is free of charge and obstacles to participation have been removed. For instance, participants in the program have zero-rated internet access to course material, including videos on climate change, impacts and climate adaptation. E-material can also be downloaded for reference and use by educators after the program. The program builds on the achievements of the UNESCO Global Action Program on Education for Sustainable Development and is implemented in partnership with Rhodes University's Environmental Learning Research Centre, Southern African Regional Universities Association (SARUA) and the Swedish International Centre of Education for Sustainable Development (SWEDESED).



Photo: Richard Juilliant/Shutterstock

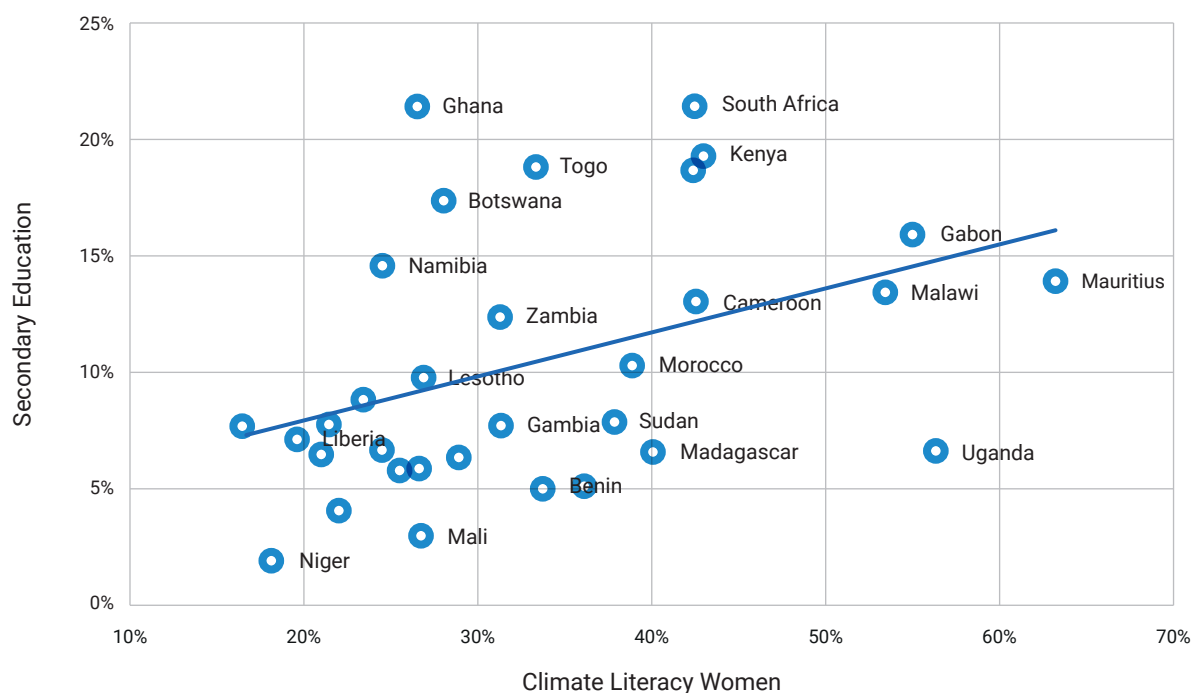
Finally, **cross-sectoral climate resilience teams could help climate-proof education systems, including teaching and learning.** To enable effective design of climate-adapted education systems, a new form of workforce collaboration will be required that reaches across sectoral boundaries. These cross-sectoral climate resilience teams should include those working in climate; WASH; energy; agriculture; health; construction; gender; and social protection—not to mention teachers who can ensure learning connections. Indeed, learning teams that engage different ministries (including but not limited to education), trade unions and employer networks can help to ensure that adaptation investments are in sync with available skills and unlocked with new skills.⁹⁵ The concept of learning teams is relatively new in education, but it is gaining increasing momentum as a win-win solution for education and climate action.⁹⁶ Such cross-sectoral teamwork requires a change in mindset: from consolidated practices by relevant sectors, to integrated expertise in service of building climate adaptation and resilience through education.⁹⁷

Invest in Climate Literacy and a Breadth of Green Skills for Adaptation

Education for adaptation creates the building blocks of adaptive capacity, which is especially important for climate-vulnerable countries across the African continent. Importantly, climate change education must integrate Indigenous technical knowledge and universalistic science, and it must reflect local practices in its approach to adaptation responses.⁹⁸

At minimum, all learners must first acquire basic foundational and secondary skills, including literacy and numeracy, to support climate adaptation efforts across every sector of the economy.⁹⁹ But in addition to basic skills, all learners must achieve **climate literacy**—or an understanding of the anthropogenic causes of climate change and the role that individuals, communities, and societies can play in adopting systems and behaviors that both mitigate against further environmental damage and adapt to present and future impacts of climate change.¹⁰⁰ Climate literacy enables informed decision-making about local adaptation by increasing the ability to comprehend climate information. Higher climate literacy is associated with reduced injuries and death from climate disasters, as well as higher community resilience.¹⁰¹ And, unsurprisingly, higher climate literacy is positively correlated with higher levels of education—especially secondary education, and especially among women (Figure 5).

Figure 5. The Relationship Between Climate Literacy (2016–2018) and Secondary School Attainment Among Women (2015–2020) in 30 African Countries



Data sources: Wittgenstein Centre Human Capital Data Explorer and Simpson et al. (2021)¹⁰²



Photo: Corrie Wingate Photography/SolarAid/Flickr

All learners will also need to build a breadth of green skills for adaptation to navigate the technical needs, socioemotional dynamics, and transformative potential of green jobs for adaptation and resilience.¹⁰³ This includes specific skills that green jobs for adaptation and resilience might require, from project management to product development, from ecosystem management to disaster risk reduction, from sales and marketing to science, technology, engineering, and math (STEM) to support adaptation innovations. Green skills for adaptation also include “portable” or transferable skills like critical thinking, decision-making, communication, empathy, flexibility, and adaptability that can facilitate climate-adapted thinking, being, and doing, regardless of one’s occupation. And finally, transformative skills like working within complexity, coalition building, collective action, solidarity, agency, and justice-oriented civic skills will be vital to supporting deeper systems change for long-lasting, equity-oriented, and equality-producing adaptation for transformation.¹⁰⁴

CASE STUDY 3: Building a Breadth of Skills to Support Adaptation in Agriculture

Despite their limited contribution to climate change, women are on the frontlines of climate change in Africa because of their gendered roles and responsibilities. To address this, the Campaign for Female Education (CAMFED), an international non-governmental organization working on issues of girls' education and women's empowerment across Africa, has started to equip thousands of female Agriculture Guides (former beneficiaries of CAMFED scholarships) with a breadth of green skills for adaptation to support their and their communities' adaptive capacity and climate resilience.¹⁰⁵ The program builds their technical knowledge and skills in climate-smart agriculture to improve the productivity, sustainability, and profitability of their agricultural enterprises. And the program uses its life skills focus to strengthen girls' critical thinking, decision-making skills, leadership, confidence, and sense of agency. Further, the program's attention to systems change builds girls' solidarity, collective action, and advocacy skills to transform social norms and harmful gender practices that have traditionally held girls back.

The Agriculture Guides then pass on the fruits of their education through training and mentorship to build the skills of smallholder farmers and parent support groups that grow food in school gardens to feed vulnerable children in their communities. The project is instrumental in mitigating against school interruptions for girls, especially those whose education is under threat from the indirect effects of climate change on their households. The program also helps young women build climate-smart livelihoods, enhance the food security of their communities, and build their individual leadership and collective resilience.

In Zambia, the project was boosted by the allocation of 304 hectares of multipurpose agricultural land to young women leaders to establish large-scale climate-smart demonstration farms led by the Agriculture Guides. The project's first phase benefited 40 CAMFED Agriculture Guides, who then cascaded their knowledge and skills to reach more than 8,500 women. Together, they were able



to achieve significant yield improvements, up to three times compared to baseline. Additionally, each Agriculture Guide went on to support three more girls to go to school and created an average of four paid jobs in her climate-smart agricultural enterprise.

CAMFED has over 7,000 government partner schools across more than 150 districts in Ghana, Malawi, Tanzania, Zambia and Zimbabwe, and has supported nearly 5 million children to go to school since 1993. CAMFED has a five-year ambition to scale this project to help 50,000 young women transition into productive and sustainable agricultural enterprises, to reach 750,000 more community members through the mentorship of CAMFED Agriculture Guides, and to create 150,000 new climate-smart jobs.

In short, effective climate adaptation means educating the workforce with the knowledge and skills needed to power the jobs that will support whole-of-economy adaptation efforts. This will require educating the present and future workforce to understand how climate change impacts their profession or livelihood and how their profession or livelihood might impact climate change. In some cases, education may also be required to build the capacity of those most vulnerable members of

society in climate-impacted livelihoods to move to climate-adapted ones. In Africa, this is more than just climate-smart agriculture; it also includes climate-resilient infrastructure (including adapting education infrastructure), natural resource management and nature-based solutions, climate information services, as well as adaptation-oriented micro, small, and medium enterprises that promise to create job opportunities while building climate resilience across Africa.¹⁰⁶



Photo: Laurent Weyl/Panos Pictures

RECOMMENDATIONS

To make progress on the four levers described in the previous section, a regional effort in the form of an “Education for Adaptation Accelerator (E4AA)” Alliance is urgently needed. The proposed objectives of the Alliance would be threefold: to bring stakeholders together to establish an irresistible case for education for adaptation; to support countries to identify and activate effective education for adaptation efforts across the four areas identified above that could be localized and scaled; and to build a global movement that champions education for adaptation. Africa, as the continent with the fastest-growing youth population, could lead this Alliance. More specifically, the Alliance could formulate an agenda encapsulated by the slogan “Analyze, Act, Amplify”:

Analyze: Establish an Irresistible Case and Evidence-Based Narrative

Spotlight the case around education’s impact on building the adaptive capacity and climate resilience of individuals and communities. Building on existing education, workforce, and climate science datasets, the E4AA Alliance should not only work to fill critical data gaps on education for adaptation, but also create a first-of-its-kind model for calculating the transformative potential of education in building the specific and adaptive capacities for climate resilience.

Bring together evidence of effective adaptation programs that put education at the center of climate adaptation efforts across the four areas identified above. Working together with partners across the African continent and beyond, the E4AA Alliance should build a set of adaptation education case studies to help the global community and African decision-makers develop tools and resources for implementing education that can unlock short-term and long-term adaptation, transition, and transformation.

Act: Support Countries and Communities to Invest in Education for Adaptation

By 2025, the E4AA Alliance could work with 10 of the most vulnerable countries (members of the Climate Vulnerable Forum, with an initial focus on Africa) to ensure adaptation education and adapted

education systems are a key part of their National Adaptation Plans.¹⁰⁷ The E4AA should support countries to coordinate and build domestic and global coalitions of organizations to provide technical assistance and build local capacity along all four acceleration pathways identified above. In addition, the E4AA should support countries to leverage international and domestic expertise, including youth, to conduct adaptation education needs assessments and to develop national adaptation education strategies or other relevant policy support.

By 2025, the Alliance could work with 10 education providers with community reach and expertise across Africa and a coalition of youth in Africa to develop localized adaptation education tools and content based on climate change education design principles and Indigenous knowledge. The E4AA should develop global climate resilience and adaptation education tools that can be localized to support implementation of education for adaptation. Importantly, such efforts should redress entrenched systems of injustice and inequality, including gender inequality, and should twin the goals of climate literacy and climate justice by building individual and collective agency for civic empowerment.¹⁰⁸

Amplify: Build a Movement for Climate Adaptation Through Education

Establish a High-Level Advisory group, including youth representation, to steer the work of the E4AA Alliance and to help mobilize national and global champions of education for adaptation. Such a network should work to direct attention to education for adaptation at high-level events like COP, UNGA, and the Global Education Forum in order to mobilize resources to education as a key pillar of adaptation efforts.

Develop a communications and engagement strategy to create visibility and uptake for the knowledge work of the E4AA Alliance. This could include the publication of a flagship report, guidance notes, technical briefs, and an annual synthesis of best practices in adaptation education; the dissemination of web-based calculator tools to support decision-making; a global social media campaign that raises the visibility of locally led programs; and the facilitation of peer-to-peer learning.