Education Development Trust

RESEARCH REPORT

Climate change and education in Kenya

Rachael Fitzpatrick and Donvan Amenya

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About EDT

Education Development Trust is an international not-for-profit organisation working to improve education outcomes and the transition from education to work. Our work is informed by expert research on what works, and is focused on the intelligent design and delivery of highly contextualised improvement programmes which operate at scale.

At Education Development Trust, our vision is a world in which all lives are transformed through excellent education. We combine global research and our longstanding expertise with regional knowledge to inform education policy and practice and deliver programmes around the world. Through our work and expertise – which spans early years education right through to post-school careers – we seek to strengthen education systems, transform teaching and learning, ensure effective transitions into work, and contribute to global responses to key education challenges.

We improve national learning outcomes by informing education policy and putting our knowledge into action in our programmes and consultancy work. We work in varied contexts all over the world, in education systems as diverse as those in Brunei, Kenya, England, Rwanda and Dubai. This often includes challenging environments, hard-to-reach localities and marginalised communities where the need is greatest. In all these locations, we use evidence-based methods to raise education standards, deliver innovation in schools, help teachers to improve their teaching quality, empower educators to effect sustainable and cost-effective transformation in their schools, and reduce disparities in educational outcomes.

We are a trusted partner of governments, academics and multilateral agencies across the globe. Our work helps to drive global understanding of education solutions, and we support global dialogues among international policymakers on education system improvement. Our expert knowledge, programme design and implementation expertise are also deployed in delivering Ofsted-rated outstanding careers services in England, and in owning and managing a family of independent schools, in which we put our knowledge about excellent teaching and learning into practice.

To achieve all this, we draw on our programme of public domain research that highlights 'what works' in education reform, and invest in research and development to create globally leading and innovative methodologies, helping to make government ambitions for better education systems a reality. Please visit **www.edt.org** for more information.

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01 Overview

This study explores the impact of climate change on six counties in Kenya (Turkana, Mombasa, Kilifi, Kwale, Tana River and Nairobi). It explores the impact of climate on schools and learning, and considers how to engage learners and schools in building resilience to climate change in the future. Learners, out-of-school youth (OOSY), headteachers, teachers, community members and representatives of agencies involved in combating climate change participated in interviews and focus group discussions to explore these topics.

The four objectives of the study were to:

- assess the direct and indirect impact of climate shocks on learning from the experiences of learners, out-of-school youth, teachers, community members and other stakeholders
- determine the relevance of climate change information currently being taught to young people in six counties in Kenya
- explore stakeholder knowledge on climate change and its causes
- explore the role of youth and schools in sharing information about climate change with their wider communities, supporting interventions to build resilience to climate change in the future.

The study sought to understand the underlying differential impacts, if any, for girls and boys for each of these questions, and any differences for children with disabilities.

Summary of key findings

The key findings have been separated into three categories: (1) the current state of climate change education and knowledge in the six counties; (2) the direct and indirect impact of climate change on education, and potential mitigating and adaptive actions; and (3) the potential for improving climate change education.

1. **The current state of climate change education in the six counties**

    a. **Knowledge and understanding of climate change is typically strong in all regions** in terms of associating climate change with worsening weather conditions over time (often through observations and personal experiences, though also through knowledge obtained during Social Studies lessons), but interviewees were not always able to identify the cause. Some community members, out-of-school youth (OOSY) and learners in Turkana reported causes related to local stories and beliefs, with these explanations infrequent in other counties. Overall, however, learners showed qualitatively sound knowledge on climate change, and all learners across the six counties had learnt about climate change in Social Studies lessons.

    b. **Curriculum content has not kept pace with climate change in local areas or nationally.** Headteachers, teachers and learners all commented that they do not think the climate change curriculum is relevant enough to their local area, and that the rate of change in the climate outpaces what is covered in textbooks. Headteachers in particular believed there should be more opportunities for learners to take field trips to help them understand wider factors relating to climate change.

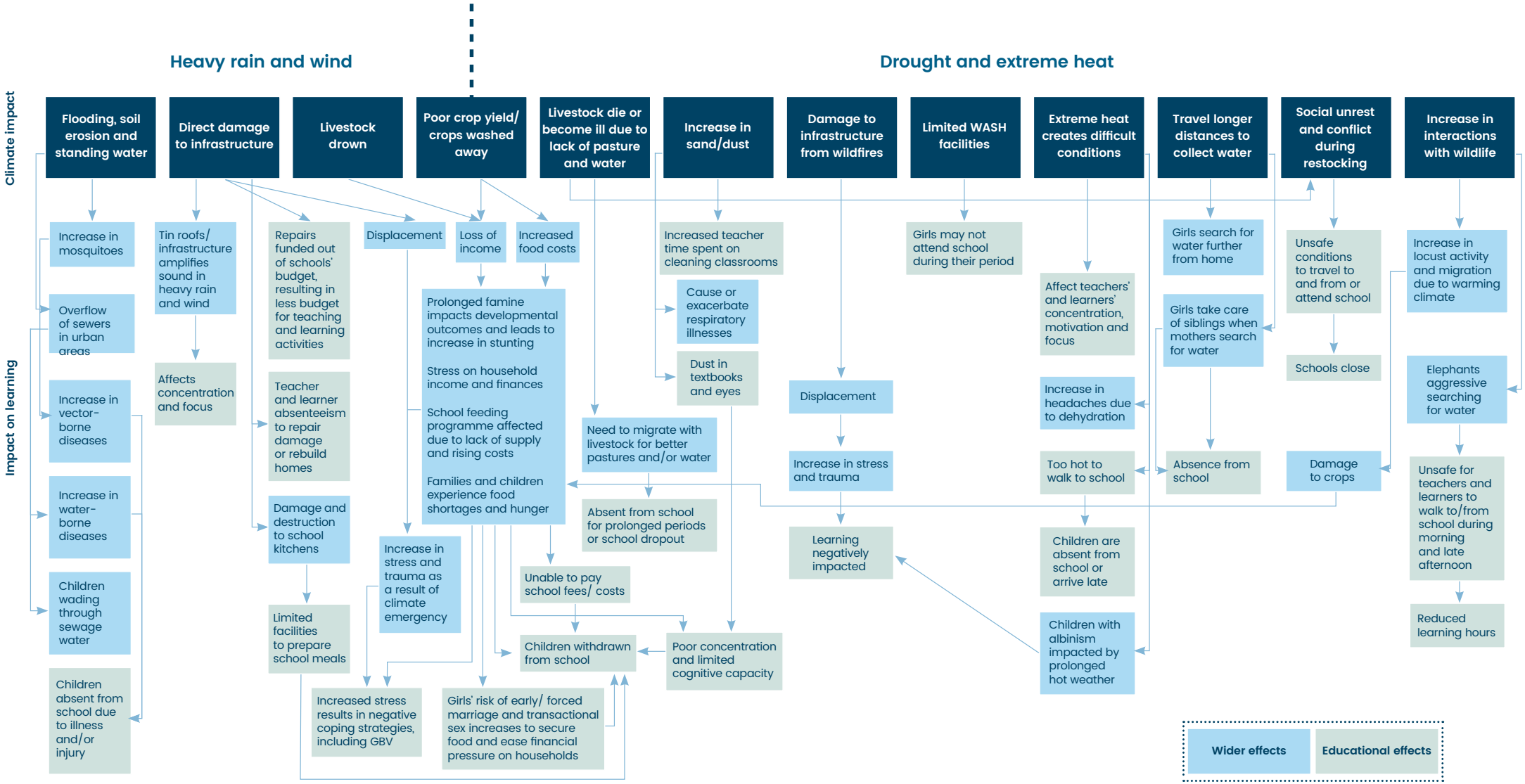
2. **The direct and indirect impact of climate change on education, and potential mitigating and adaptive actions [see Figure 1]**

    a. We asked learners, out-of-school youth, community members and school staff about the impacts of climate change on their lives. The direct and indirect impacts of climate change on education are wide ranging and complex, causing perceived learning loss and disruption to schooling. Effects of climate change on education ranged from indirect impacts such as crop failure leading to hunger and famine, to direct impacts such as damage to school buildings forcing teaching and learning to take place in harsh conditions outdoors. Climate change also reportedly led to conflict among the pastoral communities in Northern Kenya due to competition over water and pasture, particularly during periods of prolonged drought, which in

turn led to school closures. In periods of prolonged drought, parents lose livelihoods and food supplies dwindle, making schooling a luxury many cannot afford. Extreme weather conditions such as heat and flooding also make school attendance difficult, if not impossible. Other indirect impacts, such as drought affecting elephant migration habits, were reportedly causing danger to learners in Kwale, resulting in interrupted school attendance.

b. The proposed adaptive actions require cross-sectoral working to respond to the complexities of the challenge climate change poses to education. Working closely with health, infrastructure, agriculture and social security government departments will be vital to meet the scale of the challenge. There are already positive examples of cross-sectoral working, such as the National Drought Management Authority (NDMA) flag system at schools warning local communities of drought risk. Schools were viewed as key locations in the community that could help alleviate some of the negative effects of climate change. Parents in particular spoke of their dependence on school feeding programmes at times of drought. Other proposed adaptive actions included setting up contingency funds to ensure schools are repaired quickly in the event of damage due to climate events, and improvement of school infrastructure to minimise the likelihood of damage and to make school buildings more appropriate for changing weather conditions. Remote learning options are also considered as an important potential adaptive action to ensure learning can continue when schools are forced to close.

The impact of climate change on education and drivers of vulnerability



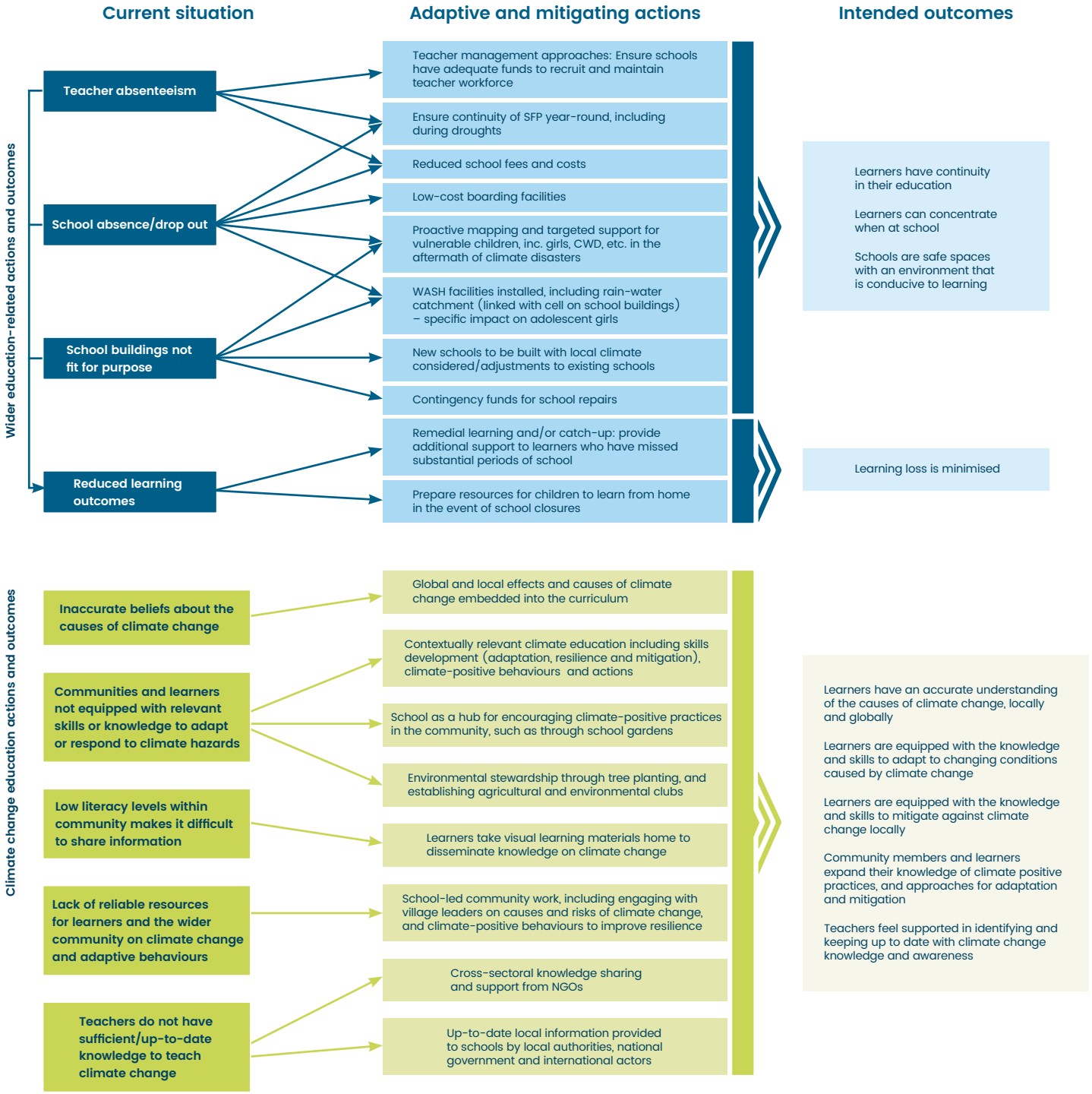
3. **The potential for improving education for climate change (both among young people and outreach in the community) [see Figure 2]**

   a. The climate change curriculum should provide a rounded picture of the causes of climate change, in addition to locally relevant information. All school- and community-level participants held beliefs that local practices were solely to blame for drought conditions. Even when combined with local stories and beliefs, drought was considered a punishment for local deforestation and charcoal burning. This suggests a need for the curriculum to be both more global and more local. Communities need to understand where the accountability lies on a global level, but should also be equipped with the relevant knowledge and skills to adapt at a local level, and should take mitigating and adaptive actions where possible. Communities also need to be informed about the linkages between climate change and environmental degradation resulting from human activities.

   b. **The school is a potential hub for change in the community.** As schools are among institutions that communities trust, they can play an important role in climate education by educating learners on how to be agents for change within their communities. To position schools as hubs for change, they should teach local communities how to live sustainably by developing school gardens that children actively participate in maintaining to gain knowledge and skills they can transfer to their communities. Schools can therefore lead by example and demonstrate practical ways communities can build resilience. Schools can also serve as sites for forums, knowledge sharing and skill development for the local community, promoting learners as a reliable source of knowledge.

   c. Young people (both in-school learners and those out of school) are typically not considered to be reliable sources of information on climate change due to their lack of education. As more educated community members are also more likely to be listened to, it is also important to highlight how vital education is, not just for the learners, but for their wider communities. Headteachers and community members expressed that members of the community are generally more likely to listen to an educated person, regardless of gender. Completion of secondary school was considered to be a prerequisite. However, learners believed if they learnt more practical ways of coping with the effects of climate change that they may be able to speak with female household members in particular to effect change. Schools can also play a role in demonstrating to the community how young people can serve as reliable sources of information on climate change.

Addressing the negative impacts of climate change on education



02 What we already know

Rationale for the study

Education Development Trust has collaborated closely with the Ministry of Education in Kenya to implement the FCDO-funded Girls' Education Challenge Transition project, Wasichana Wetu Wafaulu (WWW) ('let our girls succeed') in the ASALs of Turkana, Samburu, Marsabit, Tana River, Kwale and Kilifi as well as the urban slums of Nairobi and Mombasa. The WWW project witnessed the impacts of climate change first-hand – from drought shocks in Turkana County to flooding in Tana River County. These extreme weather events led to learning disruptions through school absenteeism and loss of learning time, and contributed to school dropouts. Consequently, the WWW project had to adapt its activities to respond to the needs of the most marginalised girls in the face of more challenges brought about by climate change impacts. Drawing on our WWW experience on climate shocks in education, EDT decided to explore the impacts of climate change on communities in more depth to support future programming and policymaking.

2.1 Climate events in the six counties in Kenya

Extreme climate events have long posed a significant risk to regions in Kenya, and they have contributed to making it one of the most disaster-prone countries in the world.[1] It is estimated that over 70% of natural disasters in Kenya are attributable to extreme climate events. Natural disasters are often precipitated by natural hazards, with the effects of these worsened by vulnerability, which is often human-caused. Typically, major droughts occur approximately every ten years, and moderate droughts or floods every three to four years. Repeating patterns of floods and droughts in the country have had large socio-economic impacts and high economic costs. For instance, the Post-Disaster Needs Assessment for the extended 2008–2011 drought estimated the total damage and losses to the Kenyan economy at a staggering US$12.1 billion.[2]

While temperatures vary across Kenya, a distinct warming trend is evident, particularly since the 1960s, with inland areas registering larger increases in minimum and maximum temperatures. During this time the annual mean temperature has risen by approximately 1.0 °C, at an estimated average rate of 0.21 °C per decade. The most significant rise in temperature was observed for the start of the primary rainy and humid spring season (March to May), in the ASAL regions of the country.[3]

[1] World Bank (2022)
[2] Venton (2018)
[3] World Bank (2020)

Temperatures in Kenya are projected to continue rising by a further 1.7 °C by the 2050s and by approximately 3.5 °C at the end of the century.[4] Additionally, the number of hot days and nights will increase, with 'hot days' projected to occur on 19%–45% of days by mid-century. Hot nights are expected to increase more quickly, projected to occur on 45%–75% of nights by mid-century and on 64%–93% of nights by the end of the century.[5] Similarly, precipitation is projected to remain highly variable and uncertain, with average rainfall expected to increase by mid-century, particularly during the 'short rains', which occur between October and December. Extreme rainfall events are also expected to increase in frequency, duration and intensity and the proportion of heavy rainfall that occurs in heavy events will increase.[6]

In 2010, Kenya developed a National Climate Change Response Strategy (NCCRS) which recognised the importance of climate change impacts on the country's development. This was followed in 2012 by the National Climate Change Action Plan (NCCAP), which provided a means for implementing the NCCRS and highlighted agricultural adaptation priorities. Organisations such as the ADA Consortium are attempting to create more localised strategy and resilience measures at more localised, county levels.[7] They have created Ward Count Climate Change Planning Committees composed of 11 locally elected community members, created mechanisms for counties to access climate change funds, developed climate information and resilience planning tools, and are undertaking monitoring and evaluation activities to support adaptation efforts.

Below summarises the key data on how climate change is impacting the six counties investigated in this study.

Turkana

Turkana county has witnessed some of the harshest impacts of climate change in Kenya. Up until the 1990s, rainfall was regular in Turkana, with a long rainy season recording between 750mm and 1000mm of rainfall.[8] By 2013, the county was receiving an average of 180–200mm of rainfall, with this expected to reduce.[9] Average temperatures have a range of 20°C to 41 °C, which is expected to increase through 2040 to 2060. While the average global temperatures are estimated to have increased by 0.8 °C in the past century, in Turkana County minimum and maximum air temperatures have increased between 2 °C and 3 °C between 1967 and 2012.[10] Periods of drought and moisture stress have necessitated irrigation farming. This has resulted in a substantial increase in farming along rivers, leaving farmers who live downstream with little or no water. Periods of water shortage have resulted in changing household roles – for example, men going to look for water or remaining behind to take care of the homestead and feed the children.[11] Threats from climate change have also been exacerbated by human activity beyond Turkana. For example, there have been persistent fears over the relatively new Gilgel Gibe III dam on the Omo River in Ethiopia disrupting the water supply to Lake Turkana.[12]

[4] Ibid.
[5] Ibid.
[6] Ibid.
[7] ADA (2022)
[8] Turkana County Government (2013)
[9] Ibid.
[10] Human Rights Watch (2015)
[11] MoALF (2021)
[12] Ratner (2020)

Mombasa

Mombasa is the second largest city in Kenya, and has a history of extreme climatic events. One notable event was in October 2006, where extreme floods affected approximately 60,000 people and caused damage to essential infrastructure.[13] Mombasa is also dependent on the surrounding areas of Kilifi and Kwale (see below) for food security, and therefore threats to agriculture in these counties will have an indirect impact on the population of Mombasa.

The County Government of Mombasa outlined the key ways that the county is impacted by climate change in the Mombasa County Climate Change Action Plan, 2020–2024.[14] A key area of vulnerability in the plan is rising sea level, with low-lying areas in the county already reportedly experiencing coastal erosion. The projected rate of sea level rise (2mm per year) puts Mombasa under threat: with a 0.3 metre rise in sea level, 17% of Mombasa would be submerged. It is also predicted that there will be large areas of land that will no longer be suitable for agricultural activities due to salt stress from sea water flooding. The report also outlines Mombasa's dependence on trans-basin transfer of water from permanent springs. Prolonged dry spells have placed a strain on household food security and wellbeing. Kebede et al.[15] estimate that by 2080, exposure to coastal flooding could affect 380,000 people and US$15 billion in assets.

Kilifi

Kilifi is characterised by high poverty rates (it is estimated that over 70% of the population are living in poverty), with food insecurity affecting 67% of households.[16] Droughts and flooding compromise agricultural production and create food insecurity within the county, with future projections predicting an increase in drought risk likely to exacerbate the already fragile state of food security. With 50% of the population employed in agricultural production, climate change poses a risk to both food security and income.

Kwale

As with Kilifi, agriculture plays a significant role in employment in Kwale, with subsistence farming accounting for approximately 80% of the average household income.[17] Roughly 70% of households are considered food poor, with 14% reporting not having enough food to meet their needs. MoALF reported that 'Food insecurity is tied to a combination of factors that include extreme weather and climate conditions, resource management, and access to appropriate inputs. Water is a constraining factor that limits productivity for crop and livestock production. About 30% of the households use machinery and equipment on their farms, but only 2.5% use irrigation water. High prices associated with these inputs have been identified as main barriers to adoption.'[18]

Tana River

In Tana River, agriculture and livestock production accounts for approximately 80% of livelihoods.[19] Over the past 40 years, Tana River has witnessed an increase in drought hazards during the first wet season (January to June), with the second wet season (July to December) characterised by heavier and more frequent rainfall. Projections predict that Tana River will continue to face increased drought risk during the first season, and increased flood risks during the second. Climate change is also posing a threat to a multitude of local species. The University of East Anglia conducted a study into the Tana River basin, and found that if global temperatures continue to rise, many species living within the basin will be unable to survive, with birds and plants likely to suffer the greatest impact.[20]

[13] Kebede et al. (2010)
[14] County Government of Mombasa (2020)
[15] Kebede et al. (2010)
[16] MoALF (2016a)
[17] MoALF (2016b)
[18] Ibid. (p. 1)
[19] MoALF (2016c)
[20] Jenkins et al. (2021)

Nairobi

Nairobi's key risks in relation to climate change are due to increased flood risk and food and water insecurity. A study by Abuje et al.[21] identified a 43% increase in rainfall in Nairobi between 1984 and 2016, alongside an increase in urban sprawl of 162%. The expansion of urban areas has increased the risk of surface run-off, exposing the city to higher flood risk, further exacerbated by the increase in rainfall.

2.2 Tackling the impact of climate change through education

Education has the potential to play an important role in tackling the global climate crisis. Increasing environmental awareness and education on climate change can contribute to effective adaptation and mitigation. By providing vulnerable communities with the knowledge and tools to understand climate change and its causes, as well as possible approaches to managing risks associated with climate change, it is possible to empower communities through education and reduce the adverse effects of climate change.[22]

In the UN Framework Convention on Climate Change (UNFCCC) Article 6 on education, training and public awareness, states that countries shall develop and implement educational and public awareness programmes on climate change and its effects.[23] The Paris Climate Agreement Article 12 also reiterates the importance of the role of education in enhancing climate actions.[24] All Member States of the UN have committed to working towards ensuring inclusive, high-quality education and improving education for sustainable development, as well as improving life in cities and tackling climate change through adopting SDG 4 on education, SDG 11 on urban settings and SDG 13 on climate change.[25]

However, while education is key to addressing climate change, the delivery of education is itself vulnerable to climate exposure. All types of extreme weather (drought, flooding or other climate shocks) can result in learners missing school. The education system and the community need resilient strategies to both adapt to and reduce learning disruptions. Solutions may entail building climate-resilient infrastructure, advancing curricula, teacher training on climate disaster risk reduction and/or socio-economic practices that safeguard learning during climate events.

Creating a climate-resilient education system requires collaborative efforts across sectors, agencies and communities. Multisectoral working is a difficult task as most agencies and organisations work in silos. Some critical players such as children and young people are missing out in public awareness and literacy campaigns. This is likely a result of long-held cultural and socio-economic norms which may need to be challenged or dismantled in order to address climate change effectively.

[21] Abuje et al. (2020)
[22] UNICEF (2019)
[23] Ibid.
[24] UNFCCC (2015)
[25] Ibid.

2.2 Kenya's national climate change learning strategy

In 2021, the Kenyan government released the Kenya Climate Change Learning Strategy which set out a ten-year vision for tackling climate change. The strategic objectives encompass knowledge and capacity development across society as a whole, in addition to within education institutions more specifically. The strategy identifies the education sector as being a fundamental player in its actualisation, and in addressing the key environmental and social challenges faced by the country. The overall objective for the education sector is to 'enhance climate change knowledge, interpretation and its applications among learners, teachers, trainers and facilitators by 2030'. The specific actions related to this objective are as follows.

- Integrate climate change curricula at all levels of education and training
- Enhance the capacities of teachers and facilitators to teach and assess climate change at all levels of education and training
- Develop appropriate supporting supplementary teaching and learning climate change materials for all levels of education and training
- Leverage non-formal and informal education to promote climate change learning
- Link research, innovation and academic/research institutions and industry to climate change policy processes for knowledge and evidence generation and provide scientific basis in promotion of climate change learning.

Box 1: Kenyan national policies/strategies that reference climate change

The Climate Change (Amendment) Bill, 2023
Constitution of Kenya 2010
The Big Four Agenda
Kenya Vision 2030
Climate Change Act (No. 11 of 2016)
National Climate Change Framework Policy (2018)
National Climate Finance Policy (2018)
Environmental Management and Coordination Act, Cap. 387
Updated Nationally Determined Contribution (NDC) 2020
National Adaptation Plan (2015–2030)
National Climate Change Action Plan (NCCAP) 2018–2022
County Integrated Developments Plans (CIDPs)

[12] Turkana County Government (2013)
[13] Ministry of Agriculture, Livestock, Fisheries and Cooperatives (2021)
[14] Ibid.
[15] Human Rights Watch (2015)
[16] Ministry of Agriculture, Livestock, Fisheries and Cooperatives (2021)
[17] Ratner (2020)
[18] UNICEF (2019)
[19] Ibid.
[20] UNFCCC (2015)
[21] Ibid.

The strategy also sets out objectives for various government sectors: Environment; Energy; Water, Sanitation and Irrigation; and Agriculture. Crosscutting themes identified include capacity building, gender and youth engagement, and public awareness. The overarching strategic objectives for the three crosscutting themes are outlined in the below table.

Table 1: Strategic objectives for crosscutting themes in Kenya's National Climate Change Learning Strategy[28]

Theme	Strategic objective	Actions
Capacity building	Enhance the capacity of institutions and individuals across sectors and governance levels, including non-state actors, to take effective climate action	1. Build the capacity of county climate change units and ministries, departments and agencies 2. Build stakeholders' capacities including special interest groups to develop bankable climate proposals 3. Build stakeholders' (which stakeholders is unspecified) capacity on climate change impacts in the health sector 4. Build the capacity of land planners in using climate change future scenarios in land use planning
Gender and youth engagement	Strengthen awareness and capacity of youth, women and men for inclusive participation and response to climate change by 2030	1. Build capacity of the private sector and vulnerable groups to promote gender-responsive climate technologies and innovations 2. Build capacity on climate change opportunities including affirmative fund that women and youth can access 3. Build capacity for effective gender integration in NCCAP and NDC implementation
Public awareness	Enhance knowledge of general public on climate change for increased climate action by 2030	1. Enhance the National Climate Change Resource Centre (NCCRC) as a one-stop shop for climate change information relevant to Kenya 2. Set up and operationalise one Community Education, Business and Information Centre 3. Continuous capacity building of media on climate change awareness raising and reporting

[28] Ibid. (p.49)

2.3 Climate change in the Kenyan curriculum

In 2020, the Kenyan Government released a paper on mainstreaming climate change into the curriculum.[29] The document outlines what learners need to understand in relation to climate change and its impacts, and the appropriate knowledge, skills and competencies to respond to climate change. The document also outlines the application of a whole-institution approach to teaching and learning, and promoting global, regional and local climate action plans.

Currently, at primary school level, climate content is taught under Science and Social Studies subjects. At this elementary level (under the 8:4:4 system of education), aspects of weather and climate are taught at all levels from Grade 1 to Grade 8. Content on climate change includes: elements of weather and instruments, regional climates and vegetation types, and the solar system. The science of climate change is only taught in Grade 8 and covers the basic causes of climate change and its effects on human activities.[30]

In 2017, a new competency-based structure of education, the Kenya Competence Based Curriculum (CBC), was introduced and is set to replace the 8:4:4 system of education. Among the key hallmarks of the CBC is the aim to empower learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society for present and future generations. Specifically, the CBC seeks to build capacities in learners that will enable them to be stewards of the earth, and minimise negative environmental impacts, while learning outcomes are linked to meaningful human, safety, educational and environmental needs.[31]

The CBC integrates Pertinent and Contemporary Issues (PCIs) facing society in the curriculum and the curriculum support materials. The PCIs are banded into five categories, namely global citizenship, health education, life skills and values education, education for sustainable development (ESD), learner support programmes, and community service learning/parental engagement. Key issues on climate change addressed under ESD include environmental education and disaster risk reduction. This is in tandem with the Basic Education Act 42(4) which reiterates promotion of environmental protection, especially education for sustainable development as one of the goals for education. The PCIs are integrated in all subjects.

Table 2: Extract from curriculum design[32] with a PCI on climate education

Theme	Strategic objective
PCIs: Promotion of environmental conservation as learners appreciate the natural and built environments in the county.	Values: promotion of patriotism as they appreciate the historic built environments. Promotion of unity, love and respect as learners work together in groups.
Links to other subjects: Language, Music, Art and Craft, Religious Education, Science, and Mathematics.	Suggested Community Service Learning Activities: finding out from their parents and guardians about the location and size of their county and conservation of the main physical features.

[29] Ministry of Environment and Forestry (2020)
[30] Huho (2015)
[31] Nyatuka (2020)
[32] Republic of Kenya (2019)

03 Methodology

Research design and methodology

Data collection was first conducted in Turkana as a pilot, with a preliminary report of those findings previously published.[33] Research was then expanded into a further five counties, with the current report combining findings from Turkana, Kwale, Kilifi, Tana River, Nairobi and Mombasa.

A method combining desk review and empirical data collection was adopted. This approach allows an in-depth, multifaceted exploration of complex issues in real-life settings to explain, describe or explore phenomena in natural settings. Exploring dynamics of climate-change-related shocks in context helps to explain complexities of real-life situations and thus ensure options recommended are evidence based, feasible and sensitive to the study locale.

Fieldwork was led by two qualitative researchers with oversight from a more experienced consultant and the Education Development Trust team. Prior to the data collection activity, a one-day induction workshop was held to prepare the research team for qualitative data collection. The training also covered the process of obtaining informed consent from participants, research ethics, use of mobile technology in collecting voice data and the Education Development Trust safeguarding policy.

Data collection involved both face-to-face and virtual interviews. Phone interviews were conducted for participants who could not be located when the field mission was undertaken. To ensure all views of participants were captured, interview sessions were recorded and used to expand notes. Debrief sessions were held at the end of each day to draw out key learnings, troubleshoot any challenges experienced and finalise plans for subsequent days.

Sample

Primary data collection involved focus group discussions (FGDs) with both boys and girls in upper primary school (Grades 7 and 8), as well as semi-structured interviews with out-of-school youth. In addition, key informant interviews (KIIs) were held with headteachers, teachers, community members and education officials at county and sub-county levels, as well as officials at agencies (both state and non-state) involved in climate change mitigation interventions at the county level. Table 3 presents a summary of the study sample reached in each of the six counties. In counties where headteachers were also serving as Social Studies teachers, no interviews were conducted with additional teachers.

[33] Amenya and Fitzpatrick (2023)

Table 3: Summary of study sample

	Schools	FGDs with learners in Grades 7 and 8 (girls)	FGDs with learners in Grades 7 and 8 (boys)	Out-of-school youth (OOSY)	FGDs with community members (mixed gender)	Headteachers	Teachers	Agencies
Turkana	9	9	9	10	8	8	2	2
Kwale	5	5	5	5	5	5	4	1
Kilifi	5	5	5	1	5	5	0	4
Mombasa	5	5	5	3	5	5	4	1
Tana River	5	5	5	3	5	5	0	1
Nairobi	6	6	6	3	6	6	5	0

Study tools

Six sets of qualitative tools were used to collate the views of participants on the impact of climate shocks on education: FGDs for learners, semi-structured interviews for OOSY and four sets of KII guides for community members, headteachers, teachers, Ministry of Education officials and representatives from agencies involved in combating climate-change-related effects (National Drought Management Authority and SAPCONE).

Data analysis methods

Detailed field notes were taken and later expanded based on the voice recordings. Upon completion of the field work, qualitative data was transcribed, coded, thematically reorganised and keyed in into a data template. Research questions were used in grouping the data for ease of exploring similarities and differences across various respondents. Credibility of the data was established through peer debriefing that was organised at the end of each day to explore inquirer biases and to clarify the meanings and the basis for subsequent interpretations. An analysis workshop was organised with the wider technical team to share early findings from the fieldwork and identify any emerging findings that were unexpected. The workshop also informed follow-up interviews with respondents to fill in data gaps. Data analysis involved collating responses on similar questions to ascertain similarities and differences from various respondents.

Ethical safeguards

Informed consent was obtained from respondents before engaging them in the study. The process of obtaining informed consent included a full disclosure about the objectives of the study and emphasis on the freedom of respondents to withdraw at any stage. Names of respondents were omitted in transcripts to protect their identity. To ensure confidentiality during the process of KIIs and FGDs, interviews were conducted in locations where respondents were comfortable and able to speak freely with no one else able to listen to the discussion. Transcribed data was stored in a restricted Google Drive with access limited to the research team.

04 Findings

4.1 Understanding of climate change and sources of knowledge

We asked all participants (headteachers, teachers, learners, OOSY and community members) about their knowledge and understanding of climate change, including where they acquired their knowledge. There was little difference between the types of knowledge cited by each group, though community members were more likely to draw purely on experiential knowledge, whereas other participants drew on a range of different sources, in addition to their own experiences and observations. All school stakeholders raised obtaining their knowledge from the curriculum, as did many OOSY. One OOSY referred to gaining her information from an initiative of the Catholic church that shares weekly newsletters about climate change via email. Boys were more likely to mention accessing information via smartphones compared with girls, with boys reporting accessing their fathers' phones.

There was an overall strong understanding of climate change and environmental degradation amongst all stakeholders. The majority of participants described climate change based on their own observations in changes in weather patterns. Individuals from all participant groups associated changing weather patterns over time with climate change. However, some respondents used examples of individual weather events, not changes over time, as climate change. Some learners and community members in Turkana also confused weather forecasts with climate change. There was an overall stronger and more consistent understanding of climate change in the other five counties.

> '...climate change is a change of weather factors over a long period of time about 30 to 35 years and has negative effects to our life.' (learner, male, Turkana)

> 'Change of climate of a place after a long time. The main impacts are: prolonged droughts, irregular rainfall patterns, flooding, crop failure due to droughts. It is the changing of the climate for a long period of time.' (learner, male, Kilifi)

> 'Change of the weather conditions over a long period of time. It is changes in the global climate over a period of time and it is marked by changes in temperatures.' (learner, male, Tana River)

A commonality across all groups when asked about the climate was to **draw on their own personal experiences, observations and memories.** All participants described how conditions were getting harsher each year, which mostly related to long periods of drought, but also flooding. The below responses were typical for each participant group interviewed.

> 'Drought, this year and part of last year it has been very dry here compared to when I when I was in Grade 5. I am now in Grade 8. Until when it started raining, late last month, it has been unusually hot.' (learner, male, Kilifi)

In Turkana, two headteachers believed that conditions in the local area have always been challenging, and that people who live in Turkana are used to difficult drought conditions. One headteacher commented that 'there have always been prolonged droughts'. These accounts differed from those of other participants in Turkana, and were not raised by any other participant from the other five counties.

4.2 Understanding the causes of climate change

Participants from all counties typically attributed climate change to human activity, with the majority considering local activity to be the biggest cause. Tree cutting was cited as one of the main causes of climate change locally, particularly in areas where burning of charcoal was routinely practiced as an income-generating activity.

> 'Climate change is caused by human activities such as cutting down of trees, burning of forests.' (learner, male, Kilifi)

> 'It is caused by human activities such as cutting down of trees which lead to deforestation. This leads to soil erosion which causes carrying of the top soil which can be used by farmers to plant crops.' (learner, male, Kilifi)

> 'The causes of climate change are carbon dioxide from industrial waste… excessive use of aerosols… deforestation.' (learner, male, Nairobi)

> 'Human activities that cause climate change such as industrial activities, for example release of industrial chemicals to the environment; clearing of forests in order to find settlement; over-grazing; over-stocking; burning of charcoal; fumes that come from burning of petroleum that destroy ozone layer.' (learner, female, Turkana)

Cutting trees also contribute to soil erosion since the land is left bare and interferes with the water cycle. (learner, female, Mombasa)

One school leader in Kilifi stated that community members in their area believe that climate change is the result of God and not human activity. One OOSY group from Tana River reported that some local community members believe that climate change is punishment from God.

> 'Most believe that the climate is as it is because God is unhappy with them because of their behaviour. Especially here in Hola, there are some women practice prostitution and men have abdicated their responsibilities. So, it is a punishment from God.' (OOSY, male, Tana River)

In Turkana, a small number of learners, OOSY and community members drew on local stories and beliefs to explain the reasons behind climate change taking place. For some learners and OOSY, including for those who demonstrated some basic scientific understanding of weather systems and climate change, this knowledge and understanding was intertwined with local stories that gave non-scientific rationales for changes in weather patterns.

> **Witchcraft: they withhold the rains so that people can beseech them with goats, money, sugar and a kilo of tobacco so that they can release it. It is caused by rainmakers who died; they get annoyed with the community and decide to withhold the rains as a way of punishing the community. The rainmakers get hungry when people eat alone; fail to free their spirits by pouring libation.**
> **– learner, gender not recorded, Turkana**

'We even hear that a long time ago the clouds were closer by, even if you raise a long stick, you could touch them. Short ladies are the ones who pushed away the clouds with sticks, then the clouds started moving away. Because when they were fighting with sticks, and when they were trying to hit each other and the short one could not reach the head of the tall one, so they started pushing the clouds away. The clouds got angry now and moved away till today they cannot be reached. These women are believed to be either co-wives (wangoi) or just having differences. Even if the women stopped their fights the clouds won't come back – the clouds said, "let me go so that these ones break each other's skull!" We believe the things that old people say are true, some are even in books. What makes the season rivers get filled – there are stones of Anam where water comes from to cause flash floods. These stones where the water comes from is on a hill that humans cannot get close to. When you get closer it gets dark – you have to stay far away. If the walls break, that is when the water flow out. They say the water gets full and overflows. Some say there is a gateway which gets opened when the water is full to release some. We do not know who opens the waterway – whether it is God or the Government or Satan.' (OOSY, gender not recorded, Turkana)

In the above description about the stones of Anam and the wall that can cause water to leak, the OOSY was referring to a dam located near their local community. The young person did not understand the function of the dam or who controls it, with this lack of understanding being replaced by local stories and beliefs about its purpose, and uncertainty over whether the dam was a positive or negative presence.

Overall, very few participants expressed a more global understanding of the causes of climate change, or recognition that actions in other countries have implications for the climate in their local area. In Turkana and Kwale in particular, participants typically held beliefs that it was local practices such as deforestation and charcoal burning that were the sole causes of their worsening conditions, sometimes combined with local beliefs and stories.

[26] Muijs (2010)

05 Teaching and learning about climate and environmental change in schools

5.1 Perceptions of the climate change curriculum

There were generally mixed views about how sufficiently climate and environmental change is included in the Kenyan curriculum. Teachers and school leaders gave more comprehensive responses to what content is covered in the curriculum in Kwale, Kilifi, Mombasa, Nairobi and Tana River compared with Turkana, with the new competency-based curriculum (CBC) considered to cover the climate and environment in more depth than the previous curriculum.

> 'We teach causes of climate change; about natural and manmade causes of climate change. We also teach about effects of climate change where we talk about effects of heavy rainfall and also drought like it causes famine.' (teacher, female, Nairobi)

> 'In the CBC they do agriculture and they can do some projects where they are taught and trained on better methods of farming and planting trees as a demonstration as this can help them when they become adults.' (school leader, male, Kilifi)

Participants also mentioned the CBC subject of agriculture as being relevant to learning about adaptation to climate change. It was reported by multiple schools in different counties, however, that they have not had sufficient rain to be able to teach agriculture.

Multiple participants from different counties expressed the need to start teaching content at a much younger age. This was considered important to support children in preparing for and adapting to their changing local climate. Students were overall very interested in climate and environmental change during focus groups, and indicated an interest in learning more. For some students, this was for their own personal desire to adapt – 'it will help me prepare myself for the change.' (learner, Kilifi, male)

Despite the general positivity about the curriculum, there were some areas of challenge. Across all counties, participants reported that even the new curriculum was not considered to have kept pace with the local changes to the climate. Textbooks are printed, and the information contained in them can very quicky become irrelevant or inaccurate due to the fast pace of climate and environmental change in many of the counties.

> 'Based on the challenges of teaching climate change, the gap is in content. It should be revised so that learners can know for example short rains used to start in March but because of change, it can start any other month; it is not obvious it will start in March. For age it is appropriate because it is understandable.' (teacher, female, Nairobi)

> 'Using the current situation it becomes a challenge to compare what you are teaching and what the learners are experiencing as phenomena keep changing.' (headteacher, male, Kwale)

Some schools also reported limited resources to effectively teach the content. This was reported in relation to the number of textbooks available and technology. For example, one school indicated that they do not have sufficient ICT resources to cover all the topics, reporting equipment is required for some topics such as teaching about volcanoes. Teachers and headteachers also reported a desire for more practical learning, such as field trips.

> 'Few challenges like majority of the learners have never travelled to highlands, they have never seen high trees and mountains so making them understand is a challenge. So, this is when teachers will have to go online to search for such features and show the learner. The challenge is if there is no power and maybe the teacher's phone is not charged.' (headteacher, male, Tana River)

There was some progress noted in this area, however, with one headteacher reporting that prior to the CBC, teachers could be reprimanded for using pictures in climate change lessons. Now teachers are permitted to show different resources to learners if they have access.

Teachers and headteachers also felt that the curriculum needed to be more locally relevant. This supports learners' desire to learn more about climate change and how to engage in local adaptation practices.

> 'The climate content is quite broad and often delinked from children's experiences. It is important to link climate to daily experiences. Start with climate of the area, then expand to county, region and finally country.' (teacher, female, Mombasa)

The lack of resources linked directly to the suggestion for field trips. Where schools cannot afford field trips, they report they would benefit from technology at school to be able to show students some of the content they are learning about through videos and pictures.

In Tana River, a further challenge was noted as the language of instruction, with learning materials and teaching staff not using the same language as learners.

> 'We have a problem here because these learners are Cushite, and they mainly communicate in their mother tongue; we have tried to encourage them to use English and Kiswahili at least while in school but they don't. They communicate in their mother tongue and unfortunately all the staff here except one, do not understand the language.' (headteacher, female, Tana River)

Even when the schools had resources on climate change, teachers observed that they were not adapted for learners with disabilities. In Mombasa, teachers interviewed observed that learners with disabilities entirely depend on their teachers for information on climate change as very few materials have been adapted to meet their learning needs.

> 'Children with disabilities struggle to access the information – some find it difficult to understand the concept of climate change.' (teacher, female, Mombasa)

Other areas of suggested improvement included integrating climate change into more subjects and topics in the curriculum, and reducing the content to be taught within the time allocated. The latter was raised by headteachers and teachers in Nairobi and Tana River. It was reported that some of the content that learners are now taught in Grade 6 is covered again in Form 2 (secondary school).

5.2 Teacher knowledge of climate change

Participants were overall positive about the level of teacher knowledge of climate change, with headteachers and teachers reporting having sufficient knowledge to cover the content in the curriculum. Linked to the above section, however, it was reported that teacher knowledge is not keeping pace with the changing climate, and that personal knowledge is inadequate in similar ways to the inadequacies reported about the curriculum. Teachers reported trying to do their own research on climate change to help fill in the gaps, but report this not being sufficient.

> 'There is lack of the updated knowledge because we just rely a lot on the books and sometimes it is shallow. As a teacher I mostly get information from the book references, television, radio and mobile phones. I feel this information is not enough as the meteorologists have information that I believe should be at my disposal. I am not content with the knowledge I have. As my main role is to teach what I learnt in college I end up disseminating exactly that without any additional information.' (teacher, male, Nairobi)

> 'The knowledge that they have is what they learned in school and college, from media and from their individual experience and observation. They may lack up-to-date knowledge.' (headteacher, male, Kilifi)

> 'No [our knowledge is not sufficient], because we sometimes find ourselves wondering why the changes in climate. The information that we have is what we have learned over time from school and college and reading text books as per the curriculum. We also acquire climate change from reading the text books on the topics we teach, from TVs and radio.' (headteacher and teacher, male, Tana River)

Some felt that these challenges in lack of up-to-date knowledge was even greater when teachers are not from the region they teach in, so cannot draw on personal experiences about the climate that are relatable to learners to help make it more relevant.

5.3 Environmental clubs at school

Some felt that these challenges regarding a lack of up-to-date knowledge are even greater when teachers are not from the region they teach in, meaning they cannot draw on personal experiences about the climate that are relatable to learners to help make it more relevant.

Environmental clubs at school or in the community were another element of children officially learning about climate change (beyond their own reading and research). A small number of schools in each of the counties reported running an environmental club, though they were in the minority. The focus of these groups typically involved planting and caring for trees.

'Environmental club. The club engages in planting trees and taking care of them. We also encourage them to use their names to name the trees. So if my name is "Agnes", I will name the tree that I have planted "Agnes". We encourage them to take care of their trees as they take care of them. They also engage in the collection of litters; generally keeping the school compound clean.' (teacher, female, Nairobi)

In addition to clubs being operated by teachers, some schools also reported clubs being operated by local environmental community groups. For example, Solwodi (Solidarity of Women in Distress) in Mombasa reportedly worked with girls by educating them on agriculture and environmental conservation and also giving them a chance to explore and develop skills such as carpentry. Another conservation group in Kwale, which focuses on restoring and preserving the mangroves, also reported working with both schools and local communities. In Kilifi, a local community group reported providing drought-resistant saplings to schools and working with learners on planting and caring for trees.

Environmental clubs were typically reported as easier to run in the Nairobi schools than in more rural counties. This was either due to funding, or difficulty growing trees in local conditions.

> 'We have an environmental club which plants and takes care of trees. The challenge is that most of them dry up during the dry spell after they are mature enough; not at seedling level.' (headteacher, male, Kilifi)

> 'In this school I am the patron of environmental club that we have tried to develop tree nursery to come up with tree seedlings that we use in school and also supplied to other schools. We are advocating for the clubs to be strengthened so that it can continue running.' (teacher, male, Kilifi)

> 'There used to be agricultural clubs but since the drought they are dormant since there is no water to help grow and conserve the environment.' (teacher, male, Kwale)

Schools in multiple counties also reported challenges with a lack of perimeter wall around the school, meaning the schools were open to animal and human interference with the trees planted. One school in Kilifi reported that the local community is unsupportive of any school activity, and when trees were planted with the support of multiple NGOs, they were vandalised. Another school in Kwale reported wildlife had eaten the trees before they had chance to mature.

One school teacher in Mombasa reported that the school previously had a 4k club (Kuungana, Kufanya, Kusaidia Kenya – an agriculture club), but learning loss due to COVID-19 has meant all time previously spent on clubs at school has been diverted to remedial learning.

5.4 The potential role of youth as agents for change

Despite the limitations identified in the current climate change curriculum in Kenya, it is a positive step that this topic has a place in the curriculum at all. One of the core aims of this research was to understand the potential of learners in educating their households on climate change, using the knowledge gained at school. This section explores the perceived influence that learners have in their households, any gendered differences in perceptions, and what types of knowledge would be most beneficial. It is important to note that in order for learners and schools to maximise their ability to mitigate against the impact of climate change, they need to be given the relevant skills and knowledge to do so.

5.5 Learner and youth influence on decision-making at home

There was a general perception that households are more likely to listen to boys, though this was issue dependent. Boys were repeatedly referred to as next in line for becoming head of the household, which meant they had a certain level of influence that girls did not. This level of influence, however, was typically only reported for the eldest son, with younger sons typically reported to have limited influence. Some younger boys reported that they would need to go to their older brother in order to make suggestions to their fathers. In Tana River, the elevated status of boys was also considered to be because boys do not leave their households the way girls do when married.

> 'In this community, boys are not equal to girls although we value them all. But when people think of them in terms of the future, the boys are listened to most because he will never be far away from you; he will be your neighbour. For girls, when they get married, they may go far and may not even come back.' (headteacher, male, Tana River)

> 'Boys because will never leave their parents as girls do when they get married.' (OOSY, male, Tana River)

When female students in all counties expressed their areas of influence in their households, it typically related to domestic duties such as deciding what to cook or when to bathe their younger siblings. A small number of female students in multiple counties mentioned being allowed to decide what to wear, 'as long as it is decent'. Being included in decision-making for girls was therefore typically synonymous with having more responsibility over household chores. Female community members, however, did indicate they may be personally more likely to listen to girls, with one parent in Tana River suggesting that 'girls mature faster than boys'.

The limitations of influence based on gender were typically reported to reduce with increased age and education. In all counties, educated and older individuals were considered as having more influence than younger and/or uneducated individuals. Community and religious leaders were overwhelmingly considered to wield the most influence, followed by people who have attended university, and those who have completed secondary education. For some, young people were generally considered to be unreliable sources of information, regardless of gender. In Kilifi, community members reported a local issue of drug abuse, with some participants generalising this issue, suggesting all young people are untrustworthy.

> 'To some extent. We have a problem with young people in this community because many of them are using drugs which are making them irresponsible but we have a few who can have some influence. A youth who is not responsible cannot be listened to by anybody.' (community member, gender not recorded, Kilifi)

5.6 Beliefs around influencing households on climate change

Building on this understanding of how young people can influence their households, participants were also asked about the extent to which households would be receptive to their children sharing information about climate and environmental change. The general consensus, despite the limitations noted above, was that households would listen to information obtained at school about climate and environmental change, but only if it did not impact their ability to earn money.

> 'Parents can listen but it depends on situation at home. If the situation is compelling them to do some things to earn a living even if detrimental to the environment, they will not listen.' (learner, male, Mombasa)

> '[Learners have] very minimal [household influence on environmental change] – because for example the behaviour of cutting down trees to burn charcoal to get money to buy food, but how will the family survive. In fact, the parents may get mad with them.' (community member, gender not recorded, Kilifi)

Young people reported a certain number of considerations for sharing information in their households, including being polite and respectful, sharing information with parents through older siblings, having teachers call parents beforehand to verify where the information is coming from, and bringing home credible sources of information, such as leaflets and posters from a known authority. Such authorities could be meteorology departments, schools or another government department. OOSY in particular were keen to disseminate information to their communities, but they themselves wanted more education on climate change to do so.

> 'We can't empower others before getting empowered ourselves – we would first need training/ sensitisation for us to be able to influence others.' (OOSY, male, Kwale)

Two girls reported that it would be difficult for them to share information with their fathers and brothers because neither are educated, and they believe girls are 'bragging' about their education if they try to bring information home from school. One female student in Mombasa also commented that 'most people are not ready for this conversation' as there are more pressing immediate issues that concern families. In Kilifi, one community member reported that in village meetings, women and girls are required to sit at the back of the room, with men and boys at the front. They indicated that no one at the back would be able to express their views to the elders, so influence on a community level would not be possible. In Tana River, village elders were considered to 'override' information from all others, even if they were illiterate and were not familiar with the area of discussion.

Complex relationships (in relation to age, gender and status) within households and communities therefore impact the extent to which learners can share information about climate change. What information is brought home, and how, needs to be carefully considered to ensure learners are not put at risk by sharing information that displeases their parents. It was suggested by participants across all counties that schools are a potentially trusted source of information, and any information shared through learners should be clearly linked to the school and authorities as a source. There was one exception to this, where a headteacher in Kilifi reported a very poor relationship with their local community.

06 The direct and indirect impacts of climate change on day-to-day lives and education

Participants were asked about how climate change has impacted their daily lives and education. Climate change was found to have both a direct and indirect impact on education in all six counties, often resulting in social, economic and health challenges. This section will explore these areas individually, though they are interlinked in reality.

6.1 Direct impact – damage to school and local infrastructure due to flooding and strong winds

Participants in all counties cited damage to schools and local infrastructure as a result of extreme weather events such as flooding and high winds. In one school in Turkana, a classroom reportedly collapsed due to heavy rain, and teachers' homes had roofs ripped off. Two schools (in Kwale and Turkana) also reported damage to school kitchens, negatively impacting their ability to provide school meals. In some of these schools, the damage had remained for several years without being repaired.

> 'As you can see, the food is prepared from outside. A class[room] was also destroyed; the roof was blown off and the pupils had to learn from outside and this affects learning outcomes. When a class[room] is destroyed, the affected classes have to be taught from outside and this is not easy for both the teacher and the learner because of many disruptions by wind, sun/rain and noise.' (headteacher, gender not reported, Turkana)

School resources were also reportedly damaged in multiple counties due to flooding and heavy rainfall. Learners in Nairobi and Mombasa, for example, reported their schoolbooks being carried away or damaged during floods and/or heavy rain. In one school in Kwale, the classroom had no furniture (desks or chairs), and children were sitting on a dirt floor with some logs for a bench. It was reported that heavy rain and high winds had destroyed much of the school, but they had not received any funds to repair the damage or purchase furniture for classrooms.

> 'During rainy season, the children's books will get rained on and they are unable to do their assignments thus affecting their performance.' (community member, gender not reported, Nairobi)

> 'Our books get carried away by flooded water.' (learner, female, Nairobi)

6.2 Direct impact – unsafe conditions travelling to and attending school due to flood waters and extreme heat

Damage to local infrastructure making it difficult for teachers and learners to get to school was reported by all participants in all six counties. Heavy rain was the main reason for children and occasionally teachers not being able to reach school safely, with many roads becoming impassable.

> For those who live across the river, when it rains, they cannot come to school because they cannot access it. Even teachers, if it has rained they are not in school.
> – learner, gender not recorded, Turkana

'We cannot go to school [with heavy rain] because roads are impassable.' (learner, male, Kilifi)

'Teachers in this school have gotten used to the climate of this place and the climate change. Whether it is time of drought or rain, our attendance is not affected because we stay in the school. But if for example the river floods when the teacher had maybe travelled to Lokichar or Lodwar, they may not be able to attend school until the water subsides.' (headteacher, male, Turkana)

'We are not able to get to school when it rains heavily.' (learner, male, Tana River)

Floods create a multitude of dangers for learners travelling to school, including the potential of being swept away in flood water, and also potential electrocution from damaged electricity cables hanging in the water. In Nairobi and Mombasa schools reported allowing children to leave school early when heavy rain begins, as they fear for their safety travelling home during flooding.

'If rains come when we are still in school, we are compelled to release them immediately because crossing some roads in Kibera can be dangerous after heavy downpour. We have had cases of learners being swept away by raging floods. To avoid such a situation, I release children early enough.' (teacher, female, Nairobi)

'When there is heavy downpour, we release learners from the school to leave early as the ferry crossing becomes a challenge during rainy season – maybe release them before 3pm.' (headteacher, female, Mombasa)

The health risks posed by flood waters are outlined in a section below.

6.3 Direct impact – extreme temperatures affecting concentration

Extreme heat and colder-than-normal temperatures were both associated with learners struggling to concentrate when at school. Although temperature records do not show colder temperatures than in the past, weather patterns were noted to be more variable, which may make colder periods 'feel' colder when they follow extreme heat. With extreme heat, learners reportedly arrive at school more tired and may fall asleep in class. This is likely due to a combination of inadequate food supply during drought, combined with the high temperatures.

'When it is hot, learners tend to sleep in class; the concentration is low.' (headteacher, male, Kilifi)

'These climatic changes have affected us such that we cannot go to school without sweaters and jackets, as we are unable to concentrate in class due to cold.' (learner, female, Kwale)

In relation to learner difficulties during cold periods, this is typically the result of poverty, with children not able to afford weather-appropriate clothing, and school infrastructure unsuitable for either extreme heat or cold. This will be explored more in later sections.

6.4 Indirect impact – social unrest leads to school closures during droughts

Drought conditions were reported to trigger conflicts among pastoral communities neighbouring Turkana County. Due to the arid nature of Turkana and neighbouring counties, the onset of droughts led to depletion of vegetation and water pans drying up. Whenever this happens, communities move to a relatively less dry area adjacent to permanent rivers where they can find water and pasture for their animals. With many communities converging in an area and grass getting depleted, conflicts often erupt as one community tries to drive out another community, leading to massive loss of lives. Participants reported that security threats have become more pervasive over the past five years, which was largely attributed to a reduction in lands suitable for pasture resulting from drought.

> 'Five years ago a conflict erupted and there was a raid in Kaimo between Kaikomu and Turkana East and it was because of climate change, where there is limited pasture leading to fights among communities. The vulnerable groups were women and girls. Teachers were complaining that children are not learning because of insecurity. The men were not present since they had already gone to seek revenge and to try and bring back the livestock taken by the bandits leaving behind the women and when they come back, they are able to attack again.' (government agency representative)

Although there are many social factors that can lead to conflict, and it is likely that climate change is one exacerbating factor, it is important to note that increasingly long periods of drought were typically cited as being the main cause of conflict. Participants who spoke of insecurity in their local areas directly attributed this to drought conditions, with disruption to income through loss of livestock and limited water supply, which led people to fight over access to boreholes and rivers. Conflict over water rights was taking place at the time researchers were conducting data collection activities, and schools were forced to close due to fighting. Community members commented on violence resulting from a lack of access to water, with reports of one Form 4 boy being killed by rebels the previous year.

Headteachers and government agencies reported that the worst times for insecurity were early in the drought and later when water sources started to replenish. In the early periods of drought, fighting would typically break out over access to water. Towards the end of a period of drought, communities participate in 'restocking', which involves replenishing their livestock numbers to replace those lost due to drought. This reportedly leads to conflict due to high competition for livestock and thieves attempting to steal livestock.

All of the above has indirect impacts on education in multiple ways. Children are unable to safely walk to school during periods of conflict, and schools themselves can become targets and unsafe environments. For this reason, schools within these areas typically close at the first signs of conflict and are unable to reopen until conflict has subsided. This level of social unrest typically results in girls being forced to stay at home and take care of domestic responsibilities, with boys migrating with their fathers to find safe pasture for their remaining livestock. Government agency officials reported that boys would typically carry weapons when moving their livestock.

6.5 Indirect impact – poor health impacts students' ability to study and school attendance

Poor health was reported in association with flooding and drought, though participants were more likely to report poor health during periods of flooding. In relation to drought, increased dust levels were associated with respiratory illness and exacerbation of asthma symptoms.

> 'I am asthmatic and when it so hot, the dust is a lot and this affects me as well as when it is cold. Getting treatment is a problem.' (OOSY, male, Kilifi)

> 'We are also really affected and during the dry season because it becomes very dusty and the wind carries the dust into the class. When we inhale the dust, it gives us chest-related diseases.' (learner, male, Kilifi)

Heat rash is another common complaint in all counties, with all stakeholders reporting children itching their skin and causing it to bleed. Children with albinism were considered to be among those most affected by extreme heat and sunlight, with their eyes affected with intense sunlight. Their skin also reportedly blisters in the sun, which was considered to be more problematic with climate change, as there would be longer and more unpredictable periods of intense sunlight requiring children to stay indoors and repeatedly apply sun screen when outdoors.

> Children with disabilities are affected more compared to other children like the Albinos have a very sensitive skin so when it is so hot, their skin gets affected and they cannot see well when it is sunny. So, during dry spell, because it is normally very hot, they have to stay indoors or under shades if they have to be outside. We actually have a boy in Grade 2 who has a skin condition; his skin is very dry. It cracks and looks ashy. In fact, he has to keep on watering it otherwise, it will start bleeding. – headteacher, male, Kilifi

Drought was also associated with malnutrition in all counties. In Nairobi and Mombasa, this was typically due to increased food prices, with rural counties reporting a mixture of increased food prices and poor crop yield. A lack of income to purchase food due to livestock dying of thirst also exacerbated this in pastoralist communities. In multiple counties, the increasing cost of fertiliser and agricultural equipment was also having a negative impact on the ability of families to engage in agricultural practices.

'The prolonged periods of drought in Kenya causes food shortage which leads to high cost of food and our parents are not able to afford. It is true food from groceries become very expensive and we are forced to fast as our parents are not able to afford food for us.' (learner, male, Nairobi)

'Another problem which we are experiencing so much is lack of food. The children are very hungry, there are extreme needy children and you find that because everything now is scarce because of drought the children are missing school because they have not eaten anything. Sometimes it forces us to buy for them food at least to make sure that they have something in the stomach. Sometimes their parents cannot afford even ten shillings to give them to buy a bite during lunch time so as teachers we have to chip in so that the child can stay in school.' (teacher, female, Nairobi)

'Our children are not able to go to school every day if they have not eaten and it is not that we are lazy, no, it is because we have not had rain in a long time.' (community member, female, Kilifi)

'We are Maasai and depend on livestock for food so when they die, our lives become very difficult.' (learner, male, Kwale)

'There are times when rains come with a lot of cold and people get cold, pneumonia and cholera. During the months when there is drought, we don't get anything to eat and we eat mikoma (berries) and even if they go to school, they do not study well and so they do not do well in their exams.' (learner, female, Turkana)

Learners reported going as long as three days without food during droughts, with one meal per day being commonly reported. Headteachers commented on frequent disruption to school feeding programmes, and that learners will often not come to school until they hear there will be food provided.

Though some school leaders reported girls being more affected by hunger than boys, community members reported hunger affecting everyone equally. The perceived difference between boys and girls was due to boys having more means of obtaining food than girls (e.g., through engaging in casual labour). Younger children were universally considered to be most negatively impacted by food shortages across all counties, as older children have become accustomed to being hungry.

'Younger children are affected more because the older ones can at least endure the hunger more and they have already adapted to not eating.' (headteacher, female, Tana River)

As parents are 'feeding their children to survive, not to be healthy' (school leader, male, Tana River), even when children do have a meal per day, they are reportedly lacking in important nutrition to support healthy development and cognitive function when at school.

The wet season reportedly brings additional and often overlapping challenges. Rainy season was also associated with poor nutrition due to livestock being carried away by flood water and crop failure due to floods. During periods of flooding, waterborne illnesses such as cholera and typhoid were cited as negatively impacting school attendance in all counties. In Nairobi, children 'wading through sewage water' to get to school (community member, female) was cited as a common occurrence during floods.

> 'Waterborne disease during wet seasons such as cholera are common. When someone is having cholera, they have to keep running to the latrine and so one cannot settle in class. This means, they will miss everything the teacher said while I was outside.' (learner, male, Kilifi)

As periods of heavy rain and subsequent flooding can appear immediately after periods of drought where children have experienced malnutrition, they are reportedly in an even more vulnerable position when they contract illnesses such as typhoid and cholera. Community members report this is further exacerbated by limited access to affordable healthcare and medicine.

Stagnant water after flooding was associated with increased mosquito activity and malaria cases across all counties. A headteacher in Kilifi reported that as children do not have adequate footwear for rainy season, they often turn up to school with sores on their toes from their shoes getting wet and rubbing against their toes, and these sores can in turn get infected. The headteacher reported that this causes considerable discomfort and is a big distraction from learning.

As with dust and hot weather, cold temperatures were also associated with respiratory illness in all counties, and exacerbation of asthma. Two community members in Mombasa and Kilifi reported their children who are asthmatic arrive late at school during the cold period as the temperature early in the morning can trigger asthma attacks.

6.6 Indirect impact – increased responsibilities for boys and girls during prolonged droughts

Climate events typically resulted in increased responsibilities for girls around the home. In some instances this involved girls engaging in domestic duties such as fetching water and cleaning for other households in exchange for pay, but the majority of the time it related to girls taking on additional domestic responsibilities within their own homes. Boys were also given additional responsibilities in the form of casual labour or supporting their fathers in moving livestock to find water during droughts. Boys were typically considered at greater risk of dropout due to these responsibilities, with girls experiencing intermittent school attendance.

> 'Girls stay at home to look after their younger siblings as the mother goes to look for food or in the forest to look for fruits for the children. Yes, boys go with their fathers to look for pasture for their goats. Some parents also delay bringing their children to school when there is a drought or heavy rains. Watoto wadogo hawawezi kuvumilia njaa nyingi. Tunakaa nao nyumabani tu ("young children are not able to withstand hunger so we keep them at home")." (community member, female, Turkana)

> 'There is less water at home and we have to walk for long to fetch water.' (learner, female, Kwale)

In Tana River, boys reportedly engage in activities such as sand harvesting at the river and similar work in exchange for money or food. Girls reportedly have very limited options for earning money, with participants from all counties reporting girls engaging in sex for food during periods of drought.

In Kwale county, droughts were reportedly attributed to neighbouring water pans drying up. With more reliable dams always far away from communities, learners were forced to walk long distances to fetch water for household use. Some of the parents interviewed estimated the time taken to fetch water to be three hours per trip and this meant that learners spent their entire after-school time fetching water instead of doing private studying at home.

> Children have a responsibility of fetching water for domestic use. They take too much time covering long distances in search of water – the time that could have been used for private studying is used to fetch water. – learner, female, Kwale

6.7 Indirect impact – loss of income and financial strain impacting school attendance

Community members and learners all reported on climate change impacting their livelihoods. Incomes were equally impacted by flooding as by drought, with both conditions having the potential to destroy crops and kill livestock. However, the effects of drought would typically be more prolonged than flooding. Economic hardship was not solely attributed to climate change, but droughts and flooding were cited as being two of the key factors that led to disrupted income, food shortages and poverty. Each of these factors in turn reportedly led to poor school enrolment and attendance, and dropout amongst both boys and girls, due to an inability of families to pay school fees.

> 'During droughts, the money that could have been used for school fees is diverted to buy food. When we do not produce food in our farm, we are have to buy. This forces me to report to school late.' (learner, male, Mombasa)

> 'On education, previously our children would depend on us for school fees where we would sell two goats at 10,000 and if we sell three, we get 30,000 [KES] then give to the children for school fees or divide the money for school fees and for household management for example for food. But now since the goats are dying it is becoming difficult to even take children to school. Due to this drought, the goats are thinning and its meat is not sweet and it's tough.' (community member, female, Turkana)

Teachers can be financially impacted by climate change, which can in turn impact on their attendance at school. In Kwale, there were several cases where schools mobilised communities to contribute financial resources to recruit teachers on temporal contract terms to plug staffing gaps. During periods of droughts, household income was often redirected to buy food, a choice that communities referred to as 'a decision for survival'. When families were unable to make financial contributions to the school, the salaries of teachers on temporal contracts were effectively stopped. Without salaries, they could only remain for a short time before they eventually ceased employment at the school to find alternate sources of income. This meant some classes were left without teachers for a protracted period until families regained some stability.

> 'On the other hand the teachers who are employed by the school are also affected as they cannot be able to be paid due to lack of finances in the school. But for us teachers on salary are not greatly affected unless if we focus on the workload since without the PTA teachers, we remain very few.' (headteacher, male, Kwale)

During floods, the difficulty experienced by teachers in reaching schools was also reported to have negative financial implications. In Kilifi, for example, teachers may need to take public transport to the school, or taxis, with these services often increasing the price of the journey due to dangers involved and/or travelling longer distances to avoid flood water. Difficulty paying for transport was also reported by learners who travel long distances to reach school. As noted by one learner in Mombasa:

> 'Crops and livestock die. It affects me so much because I fail to get fare to travel to school (I come from Machakos 798 km from Mombasa). I report late and find my colleagues are already ahead.' (learner, male, Mombasa)

Out-of-school youth reported being particularly impacted by climate change due to the casual nature of their employment, which is typically weather dependent. School dropout due to different factors, including climate change, can therefore make young people more vulnerable to the effects of climate change after they leave school.

> 'I work in a hotel, when it rains heavily, the number of customers decline dramatically, and this affects our payment. When there are fewer customers, we don't get paid our usual salary.' (OOSY, female, Mombasa)

> "Climate change is real. Most of us [youth] are casual employees, when we have climate suddenly change like now [raining], getting work becomes very difficult."
> – OOSY, male, Mombasa

6.8 Indirect impact – migration affecting school attendance

Closely linked to a lack of income is migration. When the rivers that are usually relied upon for water for households and livestock run dry, community members report having to move, with the result that they are no longer located near their schools.

> 'The effect is that the Turkanas as a community started dispersing. Others moving close to the permanent rivers like the Turkwel river to try farming. Others moved to the reserves following the mist cover to the mountains in search of pasture for their livestock. There are no jobs or other preoccupations to engage in in order to earn a living.' (community member, male, Turkana)

> 'There is a lot of truancy because this community mainly comprises of pastoralists so if there are no rains they move with their children to search for greener pastures which means the children will not be able to attend school and some of them eventually drops out.' (headteacher, female, Tana River)

> 'Most of our parents move from place to place in search of water and pasture for the animals. When they move, sometimes we are left behind to ensure we continue attending school. I travel to re-join the family every Friday and come back on Monday. I miss coming those two days whenever I have travelled to the rest of the family.' (learner, male, Kwale)

It is important to note that many interlinking factors can affect migration, particularly for pastoralist communities, which are traditionally mobile. Community members in this study, however, greatly attributed migration amongst individuals and families in Turkana, Tana River and Kwale to the lack of water supply and increasingly harsh conditions.

6.9 Indirect Impact – changing behaviour of wildlife

Changes in the behaviour of wildlife was another area that has had an indirect impact on education. In Kwale, drought has reportedly changed the activity of elephants in the nearby Tsavo national park, with elephants entering areas occupied by humans in search of food and water. These elephants pose a safety risk to learners which affects the time periods in which they can safely walk to school. Children reportedly arrive at school at 9am when there is a lot of increased activity from elephants. Teachers also reported being negatively impacted and being forced to arrive at school late and leave early. One school reportedly takes double the time to cover curriculum content compared with expectations due to the disruption.

> 'Children cannot come to school early enough as expected, they report late in the morning and end the afternoon session before time due to threats posed by elephants. The elephants do come to community areas to look for vegetation to eat as prolonged drought has wiped out all vegetation in Tsavo national park. Most children arrive in school at 9am instead of 7:30am. Even teachers are also affected by elephant risks, they also report late and have to leave early in the afternoon. They end up taking two weeks to cover one-week work.' (community member, female, Kwale).

Increased activity amongst insect populations has also reportedly been having an indirect impact on education. As previously mentioned, increased mosquito activity after floods due to increased standing water has in turn increased the risk of children contracting malaria and missing school. In Kilifi, multiple community members reported that an increase in locust activity in recent years has destroyed all their crops, which has impacted food security and ability to pay for school fees.

Box 2: Locust plagues in East Africa

A 2021 study by McCabe et al.[34] identified that changes in climate systems as a result of anthropogenic climate change increase the likelihood of locust plagues in East Africa. The study cites a 2019/20 desert locust plague which was reportedly one of the most devastating of its kind in over 70 years. It was found that the locust plague was exacerbated by changes in rainfall patterns and intensity, in addition to high cyclone activity in late 2019.

6.10 Indirect Impact – teacher motivation

A minority of participants believed that poor attendance and high dropout rates negatively impact teacher motivation. Though this was not raised by many participants, it is an important consideration for the potential knock-on effects that climate change is having on education systems.

> 'Not very much but of course when the temperatures are extreme; the extreme conditions make it difficult for them to carry out their duties. It is also demotivating to for example to go to class and find 20 pupils in a class of 50. One feel wasted to be teaching a class where majority are absent knowing that you may not have time to repeat what one has covered especially now when the school terms have been shortened.' (headteacher, male, Kilifi)

[34] McCabe et al. (2021)

6.11 Direct and indirect impact on the most marginalised

Children with disabilities and girls were repeatedly considered to be the highest-risk groups in relation to climate change. Poverty was a recurrent theme throughout, regardless of gender. Children with disabilities were considered at higher risk, depending on the nature of their disability. During flooding, children with physical disabilities are at greatest immediate risk if they are unable to quickly relocate out of danger. They are reportedly also the most negatively affected by damage to infrastructure, as the accessibility of buildings may be impacted. When schools are forced to relocate, the new location may not be in a location accessible for children with physical disabilities. As previously mentioned, children with albinism are particularly impacted by intense sunlight and heat, with their skin and eyesight being affected.

> 'For children with disabilities, it is even worse compared to other children though it depends on the level and kind of disability. For the severely disabled, they are affected very badly because they may not be able move from where they are on their own to go anywhere. So, if there is no food at home, they just stay hungry.' (headteacher, male, Kilifi)

> 'Learners with disabilities are also affected for example learners with albinism are affected by hot temperatures, it affects their eyesight.' (teacher, male, Kwale)

As previously reported, food insecurity as a result of climate events also poses a multitude of risks to girls. All counties reported girls engaging in sex for food or money during periods of drought. Girls are also at high risk for early marriage when families cannot afford to feed and look after all their children. Limited resources also result in girls not being able to afford sanitary products, which results in them frequently missing school.

> 'Girls don't have many alternatives of getting money like boys because boys can be engaged in various types of work like fishing, farming, motor cycle business but with girls, what many of them think of is engaging with men sexually for money.' (community member, female, Kilifi)

07 Poverty exacerbating the negative effects of climate change and limiting community ability to adapt

A recurrent theme throughout the above sections outlining the vast range of ways climate change impacts education is poverty. Poverty in the communities that participated in this research resulted in a lack of ability to adapt to harsh conditions and a rapidly changing environment.

School infrastructure is an area repeatedly mentioned by all stakeholders as being inadequate for local climates across all six counties. A lack of window panes in the majority of schools visited left classrooms exposed to a wide range of weather hazards, from dust during droughts to rainwater during wet season. Classrooms were also typically made using materials that did not keep learners warm during wet season, and did not keep children cool during high temperatures.

> 'When it rains, water gets to class through the windows; glass needs to be fixed on the windows.' (learner, male, Kilifi)

> 'Because of the drought you can see the field is very dusty so this dust is blown into our classes when it is windy which affects both teachers and learners. Sometimes even when we break for weekend, on Monday we have to wash the class[rooms] again because of the dust.' (teacher, female, Nairobi)

> 'Classes need to be made conducive for learners to learn well. For example, most the windows of most of the class[rooms] are concrete and have many openings for letting air and light in so have no glasses. So when it rains, cold air gets in and when it is windy during dry season, a lot of dust gets into the class[room] and this affects disrupts learning and teaching in class.' (headteacher, male, Kilifi)

> 'Our class[rooms] do not have ceiling, when it rains learning is disrupted.' (learner, female, Mombasa)

In both Turkana and Kwale, researchers visited schools that had encountered weather-related damage years prior to their visit, and the damage was yet to be repaired. Insufficient resource allocation thus further exacerbates the risks communities are facing. In Nairobi, one school reported only having water supplied by the city county two days per week, with the school being forced to purchase water during the remaining three days, using already limited resources.

Adaptive behaviours within the control of learners and their households typically have negative personal consequences. When asked about adaptation, one local authority stakeholder reported that communities have 'adapted to taking little amounts of food and even one meal per day… this is being able to adapt to their local context in reference to climate change'. Other potential forms of adaptation concern the financial resources of many households. For example, where children report being cold and experiencing discomfort due to inadequate footwear, their families do not have the funds to buy them weather-appropriate clothing. Sweaters and gumboots would go a moderate way to solving some of the issues repeatedly outlined by learners in all counties in relation to periods of cold and wet weather.

> 'If it is cold the school should bring a lot of sweaters and reduce the price of selling them. The ones this school have are very expensive, the school sells a piece at 800 Kenyan shillings.' (learner, female, Mombasa)

> 'Most of the measures needed require money which they and even their parents don't have. If for example they need to change from dressing lightly to dressing heavily, where do they get the money to buy the sweaters and the gumboots for instance?' (local authority stakeholder, Kilifi)

Beyond adaptation, mitigation against climate change and ceasing environmentally destructive practices appears to be an unrealistic request for households that are already experiencing extreme poverty. Alternative forms of income generation are urgently needed. Destruction of local resources is an unsustainable livelihood, and local adaptation is required.

> 'Our school-going children are affected since some of their parents could be relying on fishing or charcoal selling from mangrove cutting as their source of livelihood. Destruction of these environmental resources will automatically deplete them and hence they will not be able to meet their children's needs forcing them to drop out of school. This makes us to advise them on the alternative way of getting income.' (community group leader, Kwale)

08 Recommended mitigating actions and adaptations

This section combines participant perceptions, author analysis and relevant literature to identify mitigating and adaptive actions to be taken in response to the climate events identified in the previous section. Although these mitigating actions and adaptations are specific to the negative impacts identified in the six counties included in the study, the learning has broader relevance in contexts facing similar challenges and hazards as a result of climate change. Across the majority of recommendation areas, there is a strong need for multi-sectoral working between a wide range of stakeholders and ministries.

This section builds on the recommendations already generated in our Turkana report.

8.1 Strengthening school feeding programmes (SFP)

Food insecurity was cited as one of the key reasons for poor attendance and poor concentration levels at school. Poor crop yield results in short food supply, driving up the cost of food at a time when families are already facing economic hardship (either due to their reliance on rainfed agriculture or due to loss of livestock). Reinforcing, reinstating or implementing school feeding programmes was raised as a key solution to the challenges raised by participants across all six counties.

The National Drought Management Authority (NDMA) currently works with the Board of Governors to identify vulnerable learners. Once they have been identified, the NDMA buys food for the school which also serves as a fee waiver for vulnerable learners to enable them to continue learning. This scheme is currently operational in secondary schools in Turkana. There is not yet any data on whether this is having a positive impact on learner attendance, and not all community members were aware of it, suggesting the scheme is not yet widespread. It is, however, one positive example of the potential for vulnerable learners to be financially supported and provided with school meals to ensure they are able to come to school and concentrate on lessons.

8.2 Providing low-cost boarding facilities for learners and teachers

Schools that had boarding facilities were often self-reportedly less likely to experience drops in attendance than schools without. Creating boarding facilities was one of the most recommended actions noted by community members, learners and school staff, alongside SFPs, in five counties (Mombasa, Kwale, Kilifi, Tana River and Turkana). It was most frequently mentioned in Turkana.

> ‘Provide the school with dormitories so that those in upper primary can be able to concentrate better.’ (learner, male, Kilifi)

> ‘Schools should expand boarding facilities to accommodate all learners, even those in lower primary, so that when droughts come, children find refuge.’ (Social Studies teacher, gender not recorded, Turkana)

> '...build rooms for the children so that they can be boarders. We can share the cost of boarding for our children because we know they will study better. If our children are staying in school, rains or no rains, their studies will not be affected because of hunger or because the river is full and they cannot cross to get to school.' (community member, female, Turkana)

Boarding facilities, which enable learners to remain within the school compound during periods of heavy rain and flooding, can also potentially protect learners from illness caused by flood waters by reducing their exposure.

Boarding facilities are amongst the more expensive and resource-intensive adaptation measures, but potentially have the greatest social return on investment. With the increasing threat of droughts becoming more prolonged in future years, the risk of learners missing school for greater time periods also increases. Investment in boarding facilities, alongside previously mentioned SFPs, can potentially limit many of the negative impacts climate change has been identified to have on learners. A key consideration for boarding school provision is around safeguarding. Should boarding facilities be put in place as a response to the climate crisis, it is essential that rigorous safeguarding plans and checks are also put in place to protect learners boarding at the schools.

8.3 More resilient infrastructure

Participants reported a need for infrastructure that is more resilient to extreme weather. The weather events that typically affected learning through damage to school infrastructure were high winds, and occasionally flooding, though the majority of schools did not report flooding to be particularly problematic where their schools were located. A lack of windows was also a concern during droughts where dust levels were reportedly higher.

> 'School infrastructure should be weather sensitive. For example, all the class[rooms] should have window that can be opened to allow in fresh air and be closed to prevent dust and cold from getting in.' (teacher, female, Nairobi)

Ensuring the school building creates a suitable learning environment for learners throughout all seasons is also an important consideration in relation to infrastructure. Learners reported being too hot and too cold at different times of year as a problem that negatively impacts their learning levels. Considerations for insulation and protection against extreme heat are important factors.

Participants also raised the need for boreholes on school grounds to ensure a water supply. Boreholes at schools also offer schools the potential to grow their own vegetables to supply to learners and teachers, which teaches learners about different farming techniques. School leaders commented that this would need to be accompanied by perimeter walls to keep goats and other wildlife away from any trees or vegetables planted.

> 'If we had a borehole we will be able to have a kitchen garden where we can plant vegetables. We will also be able to keep our school clean and some diseases will be kept at bay. The sanitation will be clean.' (headteacher, male, Nairobi)

The maintenance, design and location of buildings also needs to take into consideration the specific needs of children with disabilities. Children with physical disabilities may find it most difficult to reach schools affected by floods, and children with albinism will be more affected by schools not having shelter from the sun. Damage to infrastructure is also more likely to negatively impact children with disabilities. These specific needs must be taken into consideration when renovating existing schools and designing new ones.

8.4 Remedial learning options

Some of the effects of climate events, such as conflict and animal migration, are difficult to adapt to and mitigate against in an education setting, as they require wider multi-sectoral solutions. When learners are impacted by school closures, or prolonged periods of absence, remedial learning is an important mechanism for mitigating learning loss. For many learners, technological options would simply not be feasible, and there would be a requirement to offer paper-based resources to learners which could be distributed in advance of school closures after early drought warnings that typically precipitate social unrest and violence. Where safe, and where learners are not required to travel long distances or through conflict, remote peer learning could also take place during periods of school closure, coordinated by community health volunteers (CHVs), teachers or other trusted community members. Ensuring any learning resources are accessible to all children, including those with visual impairments, is an important consideration.

8.5 Providing financial support to families

School fees and insufficient clothing were two of the most cited areas for poor school attendance. Providing students with subsidies or relief in paying school fees, and affordable clothing options, could potentially result in positive education outcomes.

> We can be supported with warm school uniform like sweaters. Shoes because our toes get wounds when it rains because of walking on water without shoes. Food because many children come to school hungry. We can just be given some porridge in the morning and something to eat or lunch. – learner, male, Kilifi

8.6 Multi-sectoral approaches are required

As noted above, for each of the recommendation areas there is a clear requirement for the education sector to work with other sectors and industries in order to tackle the multi-faceted challenges that climate change is posing to education. This can include, but is not limited to:

- Health sector: ensuring children are inoculated against infectious diseases that can spread during floods, such as typhoid; ensuring swift access to medication when sick, particularly children with asthma whose condition is worsened by extreme temperature changes; ensure specialist support for children with disabilities whose complex needs may be exacerbated by climate change
- Agriculture: provision of drought-resistant crops at affordable prices; education in irrigation farming
- Safeguarding: enhanced social safeguarding mechanisms to protect young people from the negative coping strategies adopted during climate events
- Infrastructure: ensure roads to schools are well maintained; ensure schools are built and maintained using sustainable and weather-appropriate materials; ensure sewerage systems are well maintained
- Social and financial support: financial support to households in poverty; subsidised food for households during periods of drought and flooding; financial support to purchase more livestock after deaths; social-emotional support for young people who experience stress and trauma after climate events.

With a reported increase in illness as a result of malnourishment, waterborne diseases and other factors, improved healthcare was repeatedly raised by participants as a key recommendation area. Parents report not being able to afford basic cold medication for their children, with some parents of asthmatic children unable to afford inhalers.

> 'The government should fund the hospitals and ensure that they have medicine that are cheap and affordable health services or to otherwise offer free health services.' (community member, female, Mombasa)

Wider infrastructure within local communities is also important. In Nairobi, for example, many participants reported the need for improved sewage systems to decrease the likelihood of them breaking during flooding. Similarly, improved drainage in areas prone to flooding in all counties was also cited as important in ensuring children can get to school safely. Repairing damage to roads that lead to schools was another frequently mentioned response amongst participants.

Supporting communities in shifting to new forms of income generation, away from unsustainable practices, was another common area cited. Adult education was requested for practices of irrigation farming and pivoting towards drought-resistant crops which may withstand changing conditions better. Financial assistance was also requested to support community members in setting up new businesses in the types of industries that may be more resilient to climate change. Both these activities were considered by participants to increase food security and income generation, which would in turn have a positive impact on school enrolment and attendance.

> 'I think our communities can be taught on irrigation farming and land reclamation practices to ensure continuous food supply and production.' (learner, female, Kwale)

> Support with money to start a business. Support with money to buy fertiliser. The prices have gone up and our parents are not able to buy any. We can also be bought shoes or gumboots, sweaters and rain coats. We can also be given lunch in school.
> – learner, male, Kilifi

Participants from all counties suggested implementing more harsh penalties for individuals who engage in environmentally destructive activities. Given that, within the context of this study, the individuals engaged in such activities are already suffering from poverty, this may create further risk for communities in sending their children to school. There were other more global suggestions for tougher penalties, however. Participants in both Kilifi and Mombasa reported a problem with 'recycling' from 'rich countries' finding its way into landfills in their local community. The community members reporting this suggested there need to be harsher penalties for waste disposal, particularly where the waste is not generated by the local community itself. It was unclear whether the waste is from nearby cities or international, but this was a pervasive issue raised by multiple learners and community members.

8.7 Making learning more contextually relevant and experiential

Participants from all counties suggested that the curriculum be expanded to younger age groups and include locally relevant content on disaster risk reduction. Young children were considered to be at particular risk of climate hazards, and therefore educating them on adaptive and risk reduction practices was considered to be important.

> 'The curriculum should contain topics on climate change that address how to survive in different weather conditions.' (teacher, female, Nairobi)

A common sentiment amongst participants was the view that the curriculum was not contextually relevant enough. From this report, it is suggested that the climate change curriculum needs to be both more contextually relevant and provide more global explanations for the causes of climate change. It is argued that the latter is needed to shift the sense of accountability for droughts from families in economic hardship, to provide a full picture of all the complexities that have led to their worsening conditions, including the locally environmentally destructive activities in addition to the damage caused by industrialised countries. However, learners and their communities also require hope, and need to be given relevant information to help them to make adaptations to cope with the negative effects of climate change.

> 'Teachers should sensitise learners on climate change and go deeper on mitigation strategies necessary to prepare for and cope with effects of climate change to ensure communities are on the safe side.' (teacher, gender not recorded, Turkana)

School leaders, teachers and learners all reported a need for more information that would benefit them and that was related to their local environment. All school stakeholders believed that learners would benefit from field trips and excursions to different locations covered in the syllabus. The cost of this was, however, prohibitive. In place of the ability to go on field trips, teachers believed that better resources, such as being able to show learners videos and other different materials, would help make the content they learn more relatable. Environmental and agricultural clubs already contribute towards making learning more experiential to some extent, but these clubs were run in a minority of schools visited. Where new resources are created, considering accessible options for children with disabilities will be an important consideration.

Given the nature of climate change, and the continual changes taking place, ensuring learning material is up to date, experiential and relevant to the local context is a difficult task for the education sector to undertake alone, especially in a country as ecologically diverse as Kenya. Teachers already report feeling unable to keep pace with new developments and learning on climate change and requiring more training and support. Any changes to the curriculum must therefore be accompanied by training and resources for teachers. Education institutions and local authorities, such as the meteorology department, may alleviate the burden on schools to keep up to date with knowledge and facilitate strengthened community relationships. Community groups are already providing important support to schools and communities. Providing structure and guidance on how schools and their communities can benefit most from community groups, and facilitating connections between schools and groups, may form an important part of expanding learner experiences. In communities prone to climate disasters, connecting schools with groups that specialise in locally relevant disaster risk reduction education may be particularly beneficial.

Box 3: NDMA flag system in Turkana

The NDMA early warning system is a good example of contextually relevant climate change education for communities. Under the early warning programme, the NDMA uses **drought flags**, hoisted to signal a change in the drought phase. There is a distinct colour to represent the four phases: **normal, alert, alarm and emergency**. The flags are raised in some schools, major towns and markets where people can easily see them. The NDMA has sensitised the community on what each colour means through barazas (public meetings) and during community meetings. During talks, they give information and answer questions from the community. The NDMA also uses local radio stations to sensitise the community on weather patterns and what they need to do to prepare for climate shocks.

The NDMA has also integrated a contingency planning process with the early warning system to sensitise communities on what to do during each phase of a drought. For some wards, this has taken place in the form of community-managed disaster risk reduction training. This is a comprehensive programme which trains communities to identify disasters through disaster mapping, identifying resources and capacity assessment. It is followed by training on disaster risk reduction and finally leads to the development of a community action plan.

The NDMA is planning to scale up the early warning flags in schools and this will be accompanied by education via the climate change ambassadors' clubs. Learners will be educated on the effects of climate change, what causes it, and what needs to be done to mitigate the outcomes. Due to funding constraints, the flags are currently only available in a minority of schools, but there are plans to expand this in the future.

Community members holding NDMA flags in Turkana

8.8 Schools encouraging climate-positive practices, with learners as change agents

Schools have the potential to be at the centre of the community in climate change education. The school can act as a disseminator of information, but also as a role model, demonstrating climate-positive practices. Environmental stewardship and tree planting were areas suggested by headteachers as being potential ways in which schools could serve as an example to the local community.

> Schools should be role models to other people in the community by planting trees and helping take care of them. – community member, female, Kilifi

'Maybe they [schools] can be ambassadors of climate change who can be role models in the society, if we see them participate in some activity that could be beneficial to us we will eagerly emulate them with no fail and thus learn and empower each other.' (community member, male, Mombasa)

To plant trees, however, schools need the funds for seedlings, and the resources to care for and protect those trees. Schools with boreholes and water tanks would be better equipped to care for trees and vegetation planted. One school teacher in Nairobi believed that schools should be provided with incentives for being active in the community in adaptive practices for climate change. The teacher felt that even a certificate from the government to show appreciation for efforts would be motivating.

Other mechanisms for engaging with the local community include holding meetings and events at school to share information about climate change. In one school in Nairobi, they held an event for parents where learners sang songs and read poems about climate change. Community members indicated that these types of activities can be particularly impactful. In another school in Mombasa, children performed a school play for parents about climate change, which reportedly shifted perceptions about environmental preservation amongst some community members.

'I have attended parents' meeting in my child's school and the students therein presented a play to us about the changes in our climate, how they affect us and who is responsible for them and as they were ending it they told us to think about if we are being fair to our environment. The play captured everything about our climate and to some level it changed our way of life.' (community member, gender not recorded, Mombasa)

'Our learners can educate us on climate change through reciting poems and drama on matters [of] climate change, which they can present to us during our parents' meeting in their school.' (community member, gender not recorded, Nairobi)

Some community members reported that they do not have an education, and would be open to schools hosting events or sessions where they share locally relevant information. Though this additional workload would likely be too much for headteachers and teachers, it could be possible for school buildings to be used in the evenings and at weekends for adult education in the absence of local adult learning centres.

'They can majorly help in educating as parents since most of us did not get the privilege of going to school and being informed that makes us do some things out of ignorance.' (community member, male, Mombasa)

In addition to providing information for households through learners, headteachers believed that community elders, religious leaders, the school management board, community groups and Community Health Workers can all play an important role. They believe the various community forums that take place with these groups provide the perfect opportunity to impart information about what can be done locally to mitigate against the negative impacts of climate change and to build more resilience in the community.

'I know the National Environmental Management Authority (NEMA) is coordinating with county governments in cleaning the environment. We can collaborate with NEMA and create environmental cleaning days and sensitise parents on environmental conservation.' (teacher, female, Mombasa)

'We can use CHW forums with parents. They normally have meetings with parents… once or even twice per month at community level. The information can also be passed to parents when we have school board of management meetings. The information can also be passed during [the] chief's barazas.' (headteacher, male, Turkana)

'We can make use of community meetings. The community always meets under a tree whenever there is something that needs to be deliberated. Role of children – give them information about climate change so that they cascade the same to parents.' (teacher, male, Turkana)

Linked to the above, this report has also identified the potential for learners to be agents for change in their local communities. Although participants indicated that caregivers are more likely to listen to those who have graduated from secondary school or university, there was an indication that if they were confident the information was from a reliable source, they would listen to learners telling them about climate change. If the above activities were to be implemented, with schools as a hub for teaching the community about climate change, learners could be given a clear role in disseminating information, with school leaders and committees showcasing learners as sources of reliable information. These activities may need to go hand in hand with gender sensitisation training, which would seek to shift perceptions about boys being more reliable sources of information than girls.

Amongst the community members who did suggest that they would listen to their children regarding climate change, there was a belief that presenting more visual materials would be most beneficial, due to the large proportion of adults in the local community who were illiterate or had low literacy levels.

'Use innovative approaches like visualisation – drawings or charts that children can use to explain to the parents because there's a big rift between the parents' and learners' literacy levels.' (community member, gender not reported, Turkana)

09 Final reflections and recommendations

This report has identified a wide range of direct and indirect impacts of climate change on education in Turkana, Kwale, Kilifi, Mombasa and Nairobi. Addressing the challenges identified will require multisectoral work to tackle the poverty and hunger associated with climate shocks, which in turn lead to reduced school attendance and dropouts. Below is a list of the recommendations for different actors to address the challenges identified within Kenya.

Recommendations for the Kenyan government and regional authorities

- Ensure school feeding programme food supply is uninterrupted all year round. This is particularly important during periods of prolonged drought, when children are less likely to have access to food at home.
- Consider the provision of more low-cost boarding facilities in schools within locations particularly affected by climate shocks. This is an area that requires more research; our small sample suggests that boarding schools with good provision of school meals are the least affected by climate shocks, though safeguarding is an important consideration.
- Ensure contingency funds are available for schools to swiftly fix damage to infrastructure, and to ensure schools are more resilient to high winds, hot temperatures and flooding. Repair for infrastructure related to both school and wider community infrastructure such as sewer pipes and roads.
- Invest in early warning systems to allow schools and communities time to prepare for climate shocks.
- Provide training on climate change for teachers, to ensure accurate information is being disseminated to learners and wider communities.
- Education authorities to work closely with other sectors to respond to the complex challenges posed by climate change.

Recommendations at the school level (to be supported by the authorities)

- Consider provision for remote learning that can be initiated in line with early warning systems. This is particularly important for periods of conflict when schools have no option but to close.
- Explore opportunities for schools to serve as hubs for knowledge on climate change, and as role models for engaging in sustainable practices.
- Continue to educate learners on climate change, and hold school events and outreach activities which will raise the profile of learners as reliable sources of knowledge, and which can support mitigation and adaptation efforts.

It is important to note that the responsibility for tackling climate change is a global one, and international actors need to maintain their commitments to carbon reduction to lessen the worsening impact on countries such as Kenya.

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Education Development Trust

Keep in touch

enquiries@edt.org
EDTVoice
Education Development Trust

edt.org

Highbridge House, 16-18 Duke Street, Reading, Berkshire RG1 4RU
T +44 (0) 118 902 1000

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