Education Development Trust

Climate change and education in Turkana, Kenya

Donvan Amenya and Rachael Fitzpatrick

2023

Table of Contents

Education Development Trust is an international not-for-profit organisation working to improve education outcomes, and the transition from education to work, through expert research on what works, and 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 from 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.

01 Overview

Background and research objectives

Communities in Kenya's rural areas, especially pastoralists in Arid and Semi-Arid Lands (ASALs), are amongst those most affected by climate change. ASAL areas are characterised by economic marginalisation with high poverty levels, significant gender disparities and vulnerability to climate disasters caused by extreme weather events. Communities in these areas mainly rely on age-old, climate sensitive livelihood practices, such as livestock keeping. The increasing frequency and severity of extreme weather shocks puts the people in these communities at significant and growing risk.

Among the various demographic groups, rural women, girls and youth are the most vulnerable to climate change shocks.[1] Women and girls have less access to and control over resources, whilst young people are often excluded from decision-making processes, including those relating to their education. Climate change shocks worsen existing systematic gender inequalities that are also manifest in other socio-economic issues including high poverty, low educational attainment, food insecurity and disease burden.[2]

[1] Devonald et al. (2020); Sims (2021)
[2] Ibid.

This study explores the impact of climate change on education in Turkana County, Kenya, as an example of one of the country's ASAL areas. 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 Turkana
» 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.

Summary of key findings

The key findings have been separated into three categories: (1) the current state of climate change education in Turkana County; (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 Turkana County**

    a. **There is varied and often limited understanding of climate change and its causes amongst learners and the wider community.** The majority of learners, OOSY and community members associated climate change with worsening weather conditions over time through their own observations and experiences, but were often unable to accurately identify the cause. Drought conditions were typically solely attributed to local practices of cutting down trees, though some youth and community members also spoke of causes related to local stories and beliefs. There was no difference in understanding of climate change by gender; however, headteachers believed that boys had a better understanding than girls.

    b. **The climate change curriculum is not contextually relevant and does not develop learners' knowledge on the causes of climate change.** Headteachers, teachers and learners all commented that they do not think the climate change curriculum is relevant enough to their local area. 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**

    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.** Impacts 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, 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.

    b. **The key mitigating and adaptive actions identified (to buffer education from climate shocks) centred on the establishment of boarding facilities at schools and school feeding programmes.** 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. Boarding facilities were considered to ease the pressure at home in addition to removing the safety concerns for learners travelling to school (though considerations around boarding facilities should be carefully considered in relation to safeguarding risks). Other 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. Remote learning options are also considered as an important potential adaptive action to ensure learning can continue when schools are forced to close.

Figure 1: Impact of climate change on education with adaptive actions (based on analysis of data from interviews with learners, community members, OOSY, headteachers, teachers and drought management authorities)
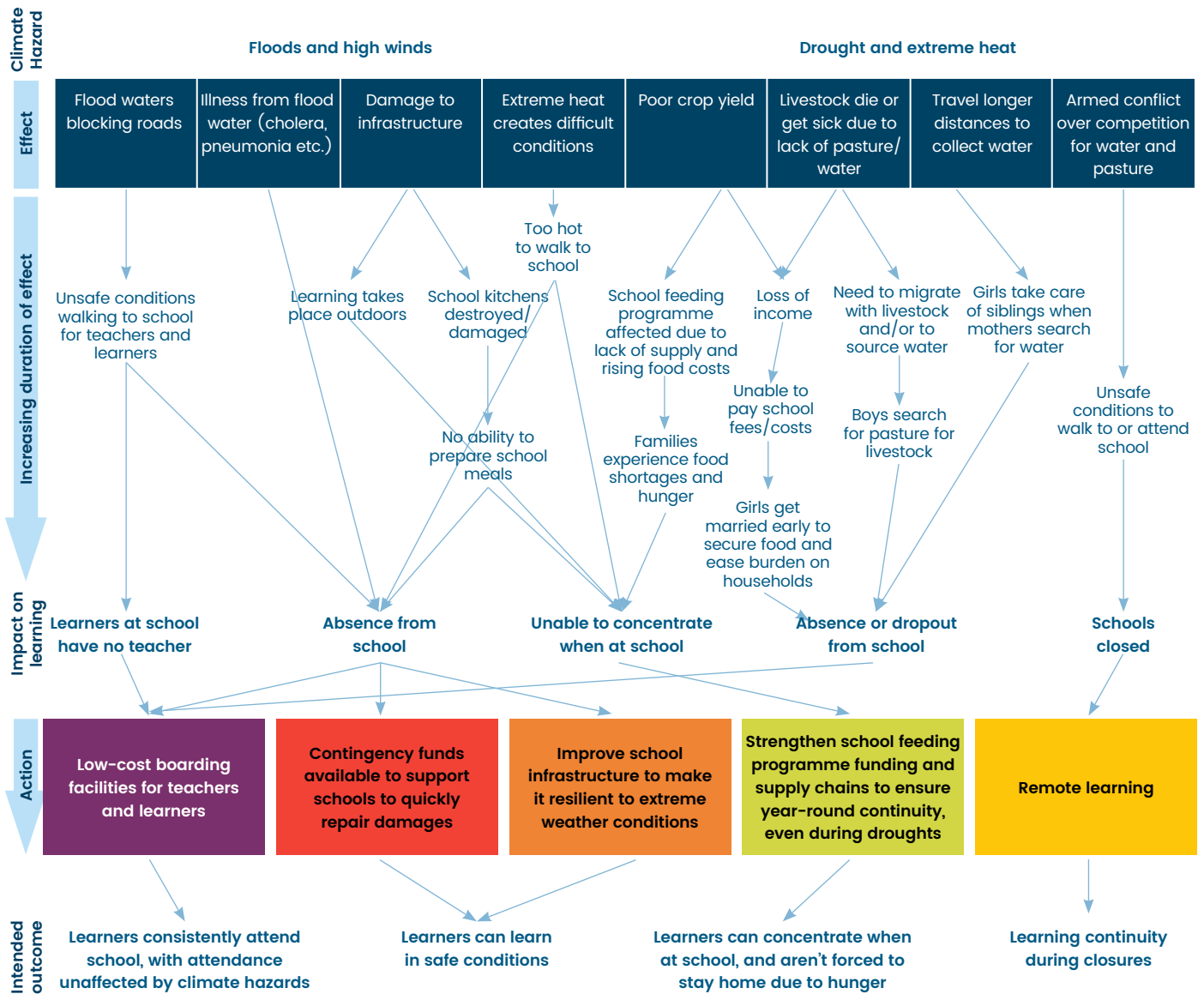
3. **The potential for improving education for climate change (both among young people and outreach in the community)**
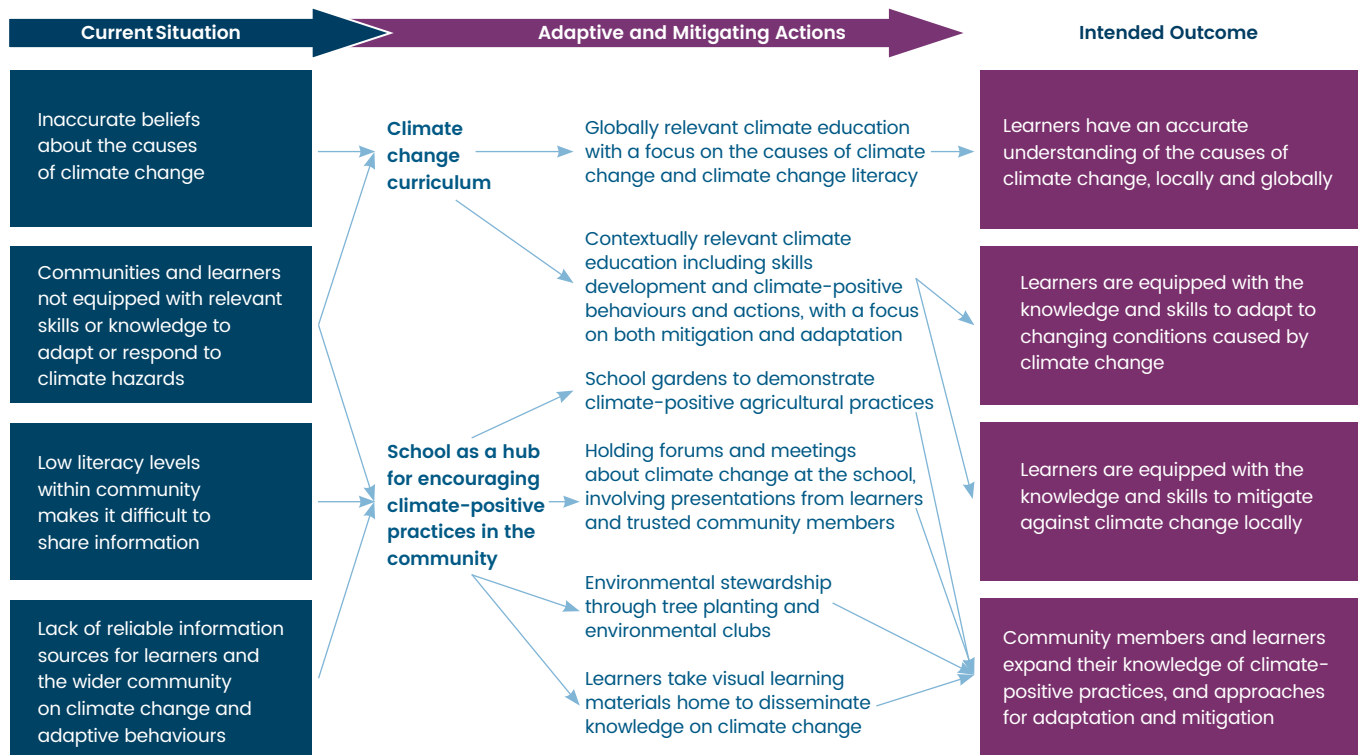
   a. **The climate change curriculum should provide a rounded picture of the causes of climate change, in addition to locally relevant information.** All school- and community-level participants held beliefs that local practices were solely to blame for drought conditions. Even when combined with local 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 also be equipped with the relevant knowledge and skills to adapt at a local level, and take mitigating 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.

Figure 2: Theory of change for the potential role of education in supporting learners and communities to be adaptive to the impacts of climate change.

Current Situation	Adaptive and Mitigating Actions		Intended Outcome
Inaccurate beliefs about the causes of climate change	**Climate change curriculum**	Globally relevant climate education with a focus on the causes of climate change and climate change literacy	Learners have an accurate understanding of the causes of climate change, locally and globally
Communities and learners not equipped with relevant skills or knowledge to adapt or respond to climate hazards		Contextually relevant climate education including skills development and climate-positive behaviours and actions, with a focus on both mitigation and adaptation	Learners are equipped with the knowledge and skills to adapt to changing conditions caused by climate change
Low literacy levels within community makes it difficult to share information	**School as a hub for encouraging climate-positive practices in the community**	School gardens to demonstrate climate-positive agricultural practices	Learners are equipped with the knowledge and skills to mitigate against climate change locally
		Holding forums and meetings about climate change at the school, involving presentations from learners and trusted community members	
Lack of reliable information sources for learners and the wider community on climate change and adaptive behaviours		Environmental stewardship through tree planting and environmental clubs	Community members and learners expand their knowledge of climate-positive practices, and approaches for adaptation and mitigation
		Learners take visual learning materials home to disseminate knowledge on climate change	

Dependencies/ prerequisites	
	1. Gender sensitisation in the local community and schools to promote households listening to girls in the same ways they listen to boys, with a focus on school staff eliminating any bias towards boys' knowledge on climate change
	2. Schools to have access to relevant and reliable information about climate change
	3. Sufficient teacher training in climate change curriculum for Science and Social Studies teachers at minimum

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 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 has witnessed first-hand the impacts of climate change – from drought shocks in Turkana County to flooding in Tana River County. These extreme weather events have caused learning disruptions through school absenteeism and loss of learning time, and have contributed to school dropouts. Consequently, the WWW project has 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. The WWW project team identified a need to understand the impacts of climate change on communities in more depth, and to assess learner and community knowledge. There was also a strong interest in understanding the potential role for learners to act as agents for change, sharing knowledge on climate adaptation and resilience with their households and the wider community.

2.1 Climate shocks in Kenya and in Turkana County

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.[3] 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.[4]

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 ºC, at an estimated average rate of 0.21 ºC 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.[5]

[3] World Bank (2022)
[4] Venton (2018)
[5] World Bank (2020)

Temperatures in Kenya are projected to continue rising by 1.7 °C by the 2050s and by approximately 3.5 °C at the end of the century. 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.[6] 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.[7]

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.[8] 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.

2.1.1 Climate change in Turkana County

Turkana County covers 68,233 km[2] of land and is the second-largest county in Kenya with a population of 926,976 people.[9] The county is mostly arid, with a warm to hot climate. The temperature ranges from 20ºC to 41ºC, with a mean of 30.5ºC.[10] Agriculture is the main livelihood in Turkana County, where it is practiced for both subsistence and commercial purposes by 25% of the population. Livestock farming accounts for 67% of the county's income, with 4% derived from arable/crop farming and 3% from fish farming.[11]

Up until the 1990s, Turkana County rains were regular, and during the long rainy season the county would record between 750 mm and 1000 mm of rainfall. A report by the Turkana Country Government in 2013 reported that the county received an annual average of just 180–200 mm of rainfall, and this is projected to reduce. However, there are other indications that by 2060 rainfall trends will increase for both seasons.

---

[6] World Bank (2020)
[7] Ibid.
[8] ADA (2022)

[9] Infotrak (2022)
[10] Omolo and Mafongoya (2019)
[11] Ibid.

TURKANA FACTS

Turkana Population

926,976

Livelihood

67%
Livestock farming

4%
Crop farming

3%
Fishing

This makes adaptation planning particularly difficult. Alongside the climate becoming very hot and dry for prolonged periods, flooding has become a frequent phenomenon, especially during the short rainy season.[12] Projections also show that the temperature will be on a steady increase through 2040 to 2060.[13]

Analysis of temperature changes in Turkana County since 1985 indicates an increase in heat stress during the long rainy season with a slight increase in average precipitation and a slight decrease in heavy rainfall. Existing data also indicates highly variable levels of moisture stress and a delayed growing season. During the short rainy season, the number of consecutive dry days has significantly decreased. The data also shows increases in flood risk, rainfall and heat stress, and a delayed growing season.[14] Communities in Turkana are therefore faced with a substantial variety of climate-related risks. Whilst the average global temperatures have been 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.[15]

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.[16]

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.[17] Fisherman reported dwindling fish which they directly attribute to the dam, and this is further exacerbated by rising temperatures and drought, which has also had a substantial impact.

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.[18]

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.[19] The Paris Climate Agreement Article 12 also reiterates the importance of the role of education in enhancing climate actions.[20] All Member States of the UN have committed to working towards ensuring nclusive, 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.[21]

[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.

However, whilst 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.

2.2.1 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 in 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'.[22] The specific actions related to this objective are as follows.[23]

Kenyan national policies/strategies that reference climate change

Constitution of Kenya 2010
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 Development Plans (CIDPs)
Sessional Paper No. 5 of 2016 on National Climate Change Framework Policy
National Climate Change Response Strategy
Guidelines for Mainstreaming Climate Change in Curricula at all Levels of Education and Training
Kenya Climate Smart Agriculture Strategy (2017–2026)

» 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.

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 Table 1.

Table 1: Strategic objectives for crosscutting themes in Kenya's National Climate Change Learning Strategy[24]

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

2.2.2 Climate change in the Kenyan curriculum

In 2020, the Kenyan Government released a paper on mainstreaming climate change into the curriculum.[25] 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.[26]

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.[27]

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.

[25] Ministry of Environment and Forestry (2020)
[26] Huho (2015)
[27] Nyatuka (2020)

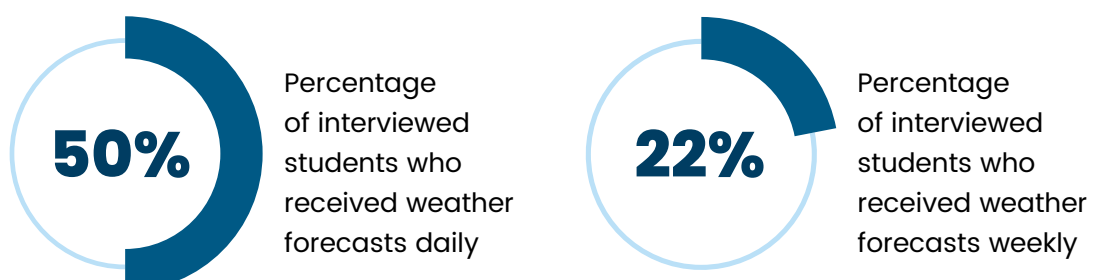*Table 2: Extract from curriculum design[28] with a PCI on climate education*

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.

2.2.3 Climate change knowledge levels among students in Kenya

There are limited studies to date that explore the knowledge and understanding of climate change amongst students in Kenya. Studies that have taken place have typically demonstrated students have limited understanding.

Huho[29] conducted a study to explore the level of knowledge on climate-change-related issues among students drawn from two public universities. While a significant proportion of students acknowledged the importance of climate change on economic development, their understanding was limited, with the only form of climate information accessed being the weather forecast. About 50% of the interviewed students stated that they received information on weather forecasts every day, with 22.2% receiving the information on a weekly basis.

Besides the weather forecast, about 55.5% of the students had knowledge about the existence of historical meteorological data. Only 18.5% of the students were aware of historical rainfall data, with just 14.8% familiar with the existence of both rainfall and temperature historical data. Overall, the study reported that about 90% of the students interviewed had no interest in climate information. This was attributed to the fact that the majority of the students were not familiar with the terminologies used in probabilistic weather forecasting commonly used for seasonal forecasts, such as 'below normal' or 'near normal' rainfall. Climate information was also viewed as only relevant to farmers. While national and international responses to climate change have been widely publicised in both print and electronic media, over 60% of the students had no knowledge of any global, regional, and national responses to climate change. The most common climate change mitigation strategy known by all students was afforestation and reafforestation. About 64.5% of the students had no understanding of the linkages between greenhouse gases and global warming. Terms like carbon sequestration, carbon footprints and carbon trading were unknown to 89.3% of the students.[30]

50% Percentage of interviewed students who received weather forecasts daily

22% Percentage of interviewed students who received weather forecasts weekly

28 Republic of Kenya (2019)
29 Huho (2015)
30 Ibid.

03 Methodology

Research design and methodology

A case study design involving a 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. Turkana county was selected due to the frequency of climate shocks in the area, marked by unpredictable rainfall, extreme rainfall, frequent and prolonged dry spells, and increased daytime temperatures. A combination of extreme weather events and weak coping capacity has led to disruption of livelihoods with far-reaching impacts on education.

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 conducted. 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.

Table 3: Summary of study sample

Schools	FGDs with learners in Grades 7 and 8	Out-of-school youth (OOSY)	Community members	Headteachers	Teachers	Agencies
9	9	10	32	8	2	2

Study tools

Five 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 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 enquirer 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 of the objectives of the study and emphasis on the freedom of respondents to withdraw at any stage. Names of respondents were omitted from transcripts to protect their identities. 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. In convening participants for the KIIs and FGDs, social distancing and wearing of facemasks was observed to minimise risks of exposure to COVID-19.

04 Findings

4.1 Knowledge 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. Figure 3 outlines the sources of knowledge identified by each participant group.

Figure 3: Sources of knowledge on climate change and its causes, by each participant group
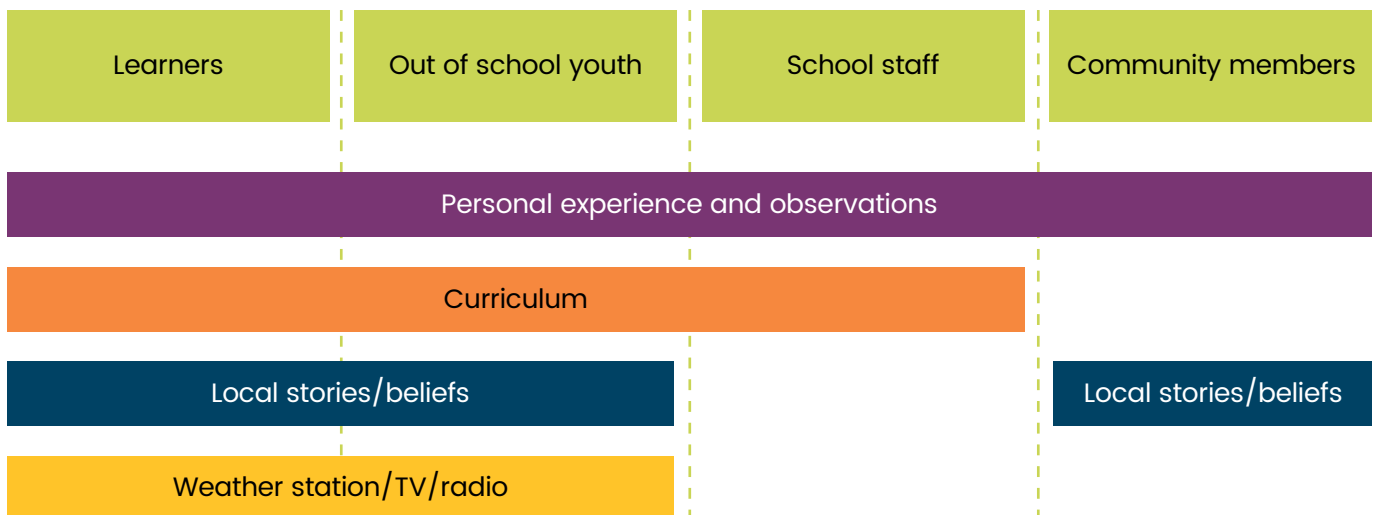
All participants made a connection between human action and climate change, with human action typically being described as the root cause. Other cited causes related to natural occurrences or natural changes in weather patterns, as well as local stories, customs and beliefs. The majority of participants' views, amongst all groups, demonstrated inaccurate knowledge on the causes of climate change, particularly the causes of droughts, with many articulating that deforestation was the sole cause of less rainfall.

4.1.1 Understanding of what climate change is and sources of knowledge

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 also confused weather forecasts with climate change. In-school learners were more likely to use more scientific language in describing weather events, though they did not always demonstrate a good understanding of climate change or the science behind individual weather events. The below quotations from students demonstrate how climate change was conflated with weather conditions.

"It is about the atmosphere and pressure, an increase or decrease in temperature. It is when it rains or remains sunny like there were some showers this month and there are times when it rains heavily." (Learner)

"Changing of weather from sunny to windy to cloudy and to rainy. It is the average weather conditions of a place, daily changes in weather. Having drought; long period of hot sun." (Learner)

"That 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)

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.

"I want to speak about wind. It has become very bad and it is there most evenings heading from east to west. It is different at all times; one might come with rain carrying everything from houses to trees. For example, that tree over there fell because of the harsh winds." (Learner)

"Droughts have become longer. Each year, sometimes you get rain only once or twice. Like last year, we had rain, but very low." (Headteacher)

"Previously, rain would pour after the first three months of the year and that is how our livestock would get pasture. But since some few years ago, around 2007, we receive rain almost after every three years and the rain received is very little that rains at night till the afternoon and at least there is some green pasture for the animals and a plant called yuogoi that both animals and humans can consume and also a tree called ekalale that has some sweet fruits. But these days, we receive rain after two years and even right now we have not received any rain and the only time it rained was in the beginning of January, the second week." (Community member)

> For some years, we have been experiencing weather changes because for example in this place we are either getting little rain or a lot of rain that come to destroy what has been planted and even animals. And this little rain is once in a while because it is sunny most of the time, *hii ndio kawaida huku* (this is what is normal here). It is not very hot now; we are enjoying the sun. There are times it gets so hot that you find us competing for shade with our goats. **(OOSY)**

In contrast to all others interviewed, two headteachers believed conditions in the local area have always been harsh, and that people who live there are used to difficult conditions of drought. One headteacher commented that 'this place is hot and dry and our pupils are used to it because they are residents of it'. Another commented 'there have always been prolonged droughts'. It is important to note that memories can be flawed, and that all the above accounts are perceptions of changes based on memories.

Learners and OOSY cited the widest sources of knowledge for their understanding of climate change, with very few young people only citing one or two sources. One OOSY who had previously been enrolled in school cited Social Studies lessons as being a key source of knowledge. Some learners and OOSY showed misconceptions about climate change, equating it to individual weather events and citing weather forecasts as a source of knowledge on climate change.

> "I learned in school; primary and secondary. We learned about it in Social Studies subject. I have also heard from someone's radio matangazo ya utabiri wa hali ya anga (weather forecast news). I heard about flooding of Kawalasi laga in Lodwar. **(OOSY)**

"We get this information from the life experience and from hearing it from their parents. We also learn of climate change in school as it is a topic in one of the subjects. We only access internet from using a hotel's Wi-Fi in Lochwar where you are only given the password if you take meals from the place. We then Google for entertainment purposes and to get BBC News information for education purposes using few smartphones from our friends." (Learner)

Headteachers were asked where they believe learners source their knowledge on climate change. Most headteachers and Social Studies teachers indicated that learners draw their knowledge from a mixture of personal experience in addition to their Social Studies lessons, with one headteacher suggesting they only draw their knowledge from Social Studies.

"[learners learn about climate change] from teachers when they are teaching Social Studies in Classes 7 and 8. In fact, weather and climate is taught for Class 1 to 8. They understand about the weather being sunny, rain, windy; when we have strong winds. They understand when the weather is cloudy, it is about to rain and this they learn from Grade 1." (Headteacher)

"Learners have information on climate change because in one of the topics on Social Studies we teach about climate and changes in climate. They have that in their mind. Climate is a topic on its own. Sources of information – they get information from the local environment, real-life experiences like drought. They also get information written in books. Sometimes we also use digital devices to access information on climate change." (Social Studies teacher)

4.1.2 Understanding of the causes of climate change

Participants typically attributed climate change to local human action, a natural change in weather conditions, or local beliefs and stories. One of the most commonly held beliefs amongst all participant groups was that local deforestation and burning of charcoal was responsible for the periods of prolonged droughts. No participant had a more global understanding, with the causes of climate change solely attributed to local action.

> "Deforestation which is cutting down of trees. When trees are cut, there is lack of rain." (Learner)

> "According to the locals, initially the area was covered by forest and other vegetation but due to cutting of trees in settlement areas and charcoal to sell, the climate of the area has deteriorated with time causing decreased rainfall and widespread drought." (Headteacher)

One learner was able to provide a comprehensive list of different human actions that result in climate change and climate shocks, though the majority attributed it solely to deforestation. Even for learners who were able to list a wide range of potential activities that could affect the local environment and exacerbate the effects of climate change, they were typically unable to accurately link human actions with the relevant outcomes.

> "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)

Headteachers believed that there was limited understanding of the root causes of climate change amongst their school communities. Some headteachers indicated that people were aware it was raining less and that there were other observable changes in the climate over time, but that there was limited understanding of the reasons behind these changes. 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.

> "Cutting down of trees for charcoal burning. Pollution of gases from the factories and motor vehicles into the air affecting the climate. Ancestors; when they are happy, we get good rains (rain that does not cause destruction) but when they are annoyed with the living, they withhold the rain or release a lot of it to punish us." (Learner)

> "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)**

"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 are on a hill that humans cannot get close. When you get closer it gets dark – you have to stay far. 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)"

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, no 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 Turkana. They 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. All participants in the study showed an awareness of human-caused environmental degradation being in some way connected to climate change, but they were unable to express why or how.

[28] Attias-Delattre (2018)

4.1.3 Gender differences in understanding climate change

There was no notable difference in our analysis between male and female understanding of climate change. Despite this, headteachers typically believed that boys have a better understanding than girls. We asked headteachers to rate learner understanding of climate change on a scale of 'low', 'medium' and 'high' by gender (see Table 4). Headteachers overall considered boys to have a better understanding of climate change than girls, and no headteachers rated learner knowledge as 'high'. This perspective is interesting given that there was no observable difference in learner understanding of climate change by gender based on interviews and focus groups. It is unclear how headteachers came to these judgements in the difference between girls' and boys' knowledge of climate change, as there was no reference to assessing learner comprehension, but it reflects and reinforces gender inequality and perceptions of girls' abilities in STEM subjects.

Table 4: Headteacher ratings on learners' understanding of climate change, impacts and adaptation measures by gender

	Low	Medium	High
Boys	3	4	0
Girls	6	1	0

4.2 Perceptions of the climate change curriculum

Headteachers, teachers and learners all described the curriculum covering climate change as being 'theoretical' and not contextually relevant enough for learners to fully engage and relate to. One headteacher believed that there was a need for more 'practical things learners can connect with'. One Social Studies teacher commented on attempting to make climate change education more practical by visiting a local weather station, and another suggested that class visits to different sites would help bring the subject to life for learners.

> "Teaching climate change – different topics are taught differently. For climate change, most of the time we take them out to a weather station to get first-hand information on weather instruments and also observe weather changes. Then we inform them that through the weather changes over a long period of time, you experience climate change." (Social Studies teacher)

When referring to the climate change curriculum, one headteacher referenced volcanic activity. Although volcanoes contribute to climate change, they are not a human cause, and it is unclear how this topic was referenced in the curriculum. The headteacher believed that teaching about volcanoes would become more interesting and relevant to learners if they could visit local volcanic sites, though resource constraints made this difficult. They reported that teachers found covering topics such as volcanoes challenging because learners did not have first-hand experience of them and were limited to viewing them through pictures in textbooks. Volcanoes in nearby locations such as Lake Turkana have been inactive for over 100 years, and issues such as drought and flooding are more relevant to learners than volcanic activity.

Limitations of the curriculum were mentioned by all headteachers and teachers, who believed there were more relevant local examples of climate change that could be used to help learners relate to the topic.

> **"Teaching about climate change of other regions is difficult for them because it includes talking about the vegetation of those areas which they cannot comprehend even if we use the photos provided in the textbooks. They understand better climate change in desert areas, because it is familiar to them. Teaching desert and semi-desert climate is easy but not about tropical climate. So, teaching about climate change in other regions is difficult for them to understand. (Headteacher)"**

As mentioned in the previous section, no participant mentioned the global causes of climate change when discussing their knowledge and beliefs, or in relation to the curriculum. Topics such as volcanoes or tropical environments were not considered to be contextually relevant to learners. No headteacher, teacher or learner referenced a more global understanding of climate change and its causes. As many learners and the wider community have inaccurate beliefs about the causes of climate change, and place disproportionate emphasis on their own actions, it is arguably even more important that global factors should also be taught, to help put local actions in broader perspective.

4.3 Learner and youth influence on decision-making

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 the potential for the role of 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. The study finds finds that although most participants believe that households would listen to learners about climate change, certain preconditions need to be met. For example, households reported being more likely to listen to older learners compared with those of primary school age, with many also suggesting households will listen to boys more than girls. The perceived importance of gender reduced with more educated individuals. Community members also indicated that they would need to be sure learners had accurate information and knowledge from school before listening to any information or advice.

4.3.1 Learner and youth influence on decision-making at home

There were mixed views about the influence of learners on the people in their household. Some learners reported that, regardless of gender, there is a pervasive perception that children know less than adults and therefore are not reliable sources of information. One learner commented that if they try and influence parental behaviours their parents will 'think we are joking', with another responding 'zero extent, we have no influence at all'. However, there was a perception that this changed as learners got older, with children in high school perceived to 'have a little effect on some decisions in their homes' (Learner). Other learners believed they have influence over some matters but not others. One girl commented that she is able to make decisions about 'small matters' such as 'what to eat' but that she could not influence her mother in other areas. One learner commented that pregnant girls are the least likely to be listened to.

Learners typically reported that fathers make the decisions in the household, unless they are in single-parent homes. One girl commented that 'even a mother cannot make a decision as long as the husband is there'. Overall decision-making in the home is largely gendered, with fathers making all decisions considered to be of importance. OOSY indicated that boys were more likely to be listened to than girls, and also confirmed that as children get older they potentially have more influence.

However, some headteachers believed that as the majority of caregivers in their local community were illiterate, many did listen to their children who attended school. The more academically capable the learner, the more likely caregivers would be to listen.

4.3.2 Beliefs around influencing households on climate change

In exploring learner influence on household and community decisions, headteachers were asked to share their views on the extent to which parents listen and act on information received from their children (see Table 5). Out of the nine headteachers interviewed, four were likely to agree with the statement, 'yes, they listen and act on information received from learners'. Only one parent stated that parents will not listen to learners and attributed this to high levels of illiteracy.

Table 5: Do parents listen and act based on information received from learners? (headteacher responses)

Yes, they listen and act on information received from learners	4
Only a few parents will listen and act on information received from learners	2
They will not listen or act on information received from learners	1

Girls were more likely to report talking about climate change with their mothers and grandmothers than boys were with either parent. However, learners also reported that it is often not possible for parents to change ecologically damaging behaviours due to the risk of loss of income.

> "I talked to my mother about planting neem trees at home and she accepted. I talked to my grandmother about the importance of stopping charcoal burning because she is destroying trees and there will be no rain. She still burning charcoal because she told me to tell her where she will be getting money for buying food from if she doesn't burn charcoal. **(Learner)**

Boys were more likely to suggest they would share information with their fathers whilst tending to livestock, though they were less likely to report having done so in the past compared with the girls interviewed. Even amongst boys, however, most participants believed they would have more influence over their mothers and would be more likely to share their knowledge with mothers, compared with their fathers.

"We would with our mothers because they may listen to us and they are the ones at home with us most of the time. For us boys we can also share with our fathers when we are taking care of the goats." (Learner)

"Mother and friends because it is easier to tell them what we think. In this community, boys will be listened to more than girls because they are more involved in community matters. Like they discuss about where they can get pasture and water for our animals, who and how they will go to survey for pasture. Older children will be listened more than the younger ones." (Learner)

"My dad who is a village elder so that he can talk to the community because people would listen to him. The community will listen to boys more than to the girls. They think girls are not wise. They feel girls do not know anything. If you did something good as a girl, like you perform well in class, they will doubt but will finally believe." (Learner)

Not all learners believed they had the relevant knowledge to share but would be willing to do so if they did. Caregivers also suggested that learners had not shared information with them as they do not hold the knowledge themselves.

"I have not heard any young person telling me about climate change. They have to be taught first so that they can have something to tell us." (Community member)

"They need to be taught about climate change because they do not know. Once they have learned, they can share with those they meet with when taking care of livestock in the bushes." (Community member)

Headteachers did not typically believe that parents would listen to their children in relation to climate change, or other subject matters. They did however believe that parents would listen to other well-educated members of the community and did not believe that gender was a factor when someone is well educated.

"I know these parents; they will not listen, but a few may listen like the chairman of this school. Mature men in the community and people in authority like the chief may be listened to. Like sometimes back I remember the chief said no cutting of trees and I saw a reduction in tree cutting compared to the previous years. Parents may listen to their children about climate change; they are not likely to act because they will not take them seriously. They will also listen to someone who is educated whether it is a woman or a man because this community respects a lot someone who is educated. If you are from this locality and you are not learned they will not listen to you. They will also listen [to] anybody from the government." (Headteacher)

This view was shared by OOSY and caregivers who suggested that community members are more likely to listen to educated individuals, regardless of gender.

"If a female is educated and may be employed or is working for the government, she will be listened to more than an uneducated man. People here respect the educated people." (OOSY)

"Primary school [children] cannot be trusted because will doubt if they really [know] anything because of their age. We would like to listen to those who have completed their secondary school." (Community member)

As with learners, headteachers believed that if parents did listen to their children, they were more likely to listen to older children or boys.

"The boys would have a major impact as they are considered to have a greater role in their families by speaking to their mothers on the effects of their action. Some girls can talk to their mothers on other ways of getting income instead of burning charcoals and how they can participate in this income-generating methods." (Headteacher)

"In our community, the community can listen better to the boy child because the girl child tends to be shy… Overall, parents can listen more to those in secondary as they are considered more mature compared to their counterparts in primary." (Headteacher)

Community members believed that information should be provided to women first as they are more likely to respond compared with men.

"It would be best if it goes to both or the women first since they would react immediately." (Community member)

However, one headteacher suggested that when parents are illiterate, they are more likely to listen to their children who attend school. Some community members suggested learners might engage with their parents by showing visualisations of climate change in order to overcome communication barriers due to literacy levels.

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

Participants were asked about how climate change impacted their daily lives, in addition to education. Climate change was found to have a direct and indirect impact on education, often presenting social, economic and health challenges faced by learners and the wider community. Although this section will explore each area individually, it is important to note the interrelatedness of these impacts. This section provides an outline of all the direct and indirect impacts of climate change on education in Turkana. Figure 4 outlines the different ways in which climate events such as droughts and flooding impact learners.

Figure 4: Sources of knowledge on climate change and its causes, by each participant group
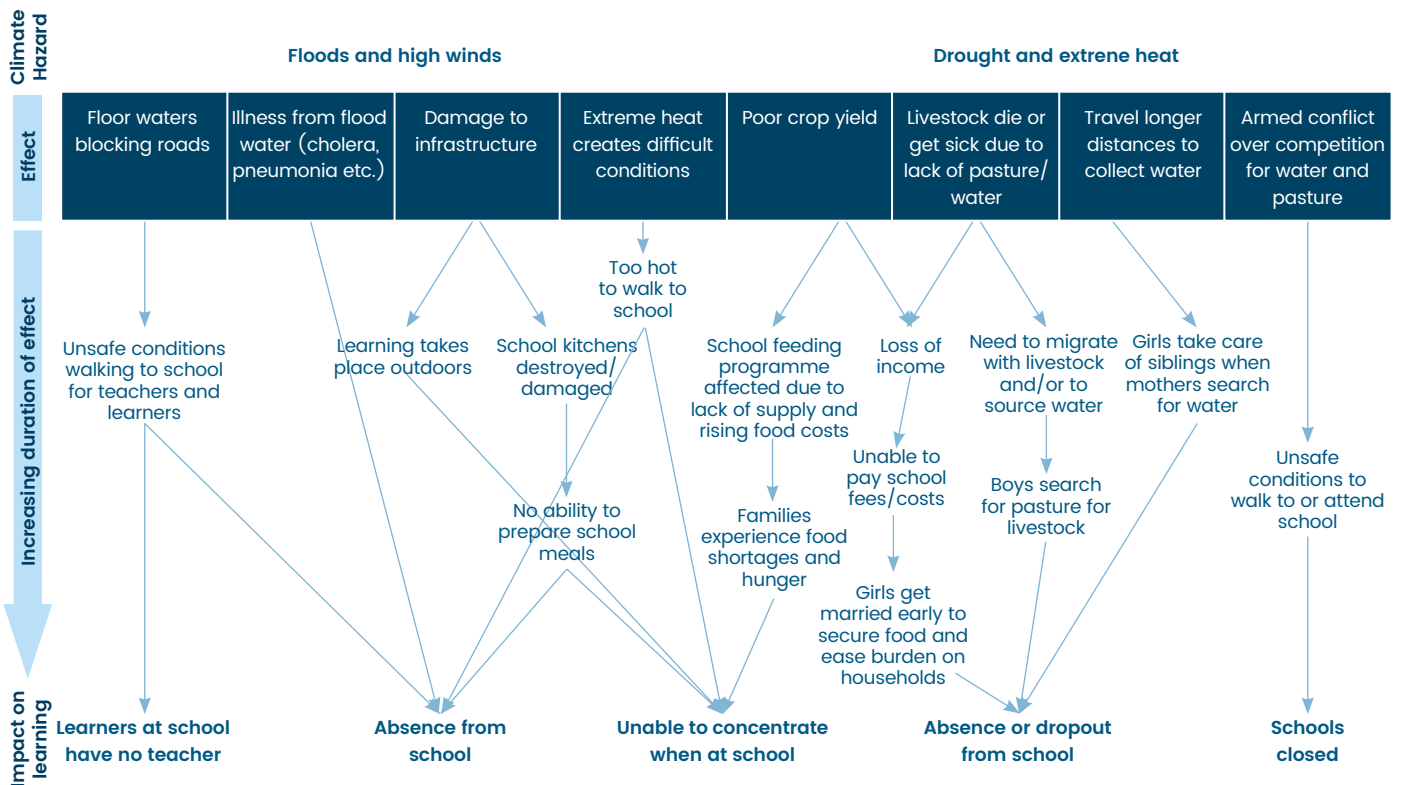
4.4.1 Direct impact – damage to school and local infrastructure due to flooding and high winds

All participants cited damage to local infrastructure and schools as being factors inhibiting school attendance. In one school, a classroom reportedly collapsed due to heavy rains, and teachers' houses had roofs ripped off. For this particular school, headteachers and the community reported learners having to learn outdoors until the classroom was fixed, which made it difficult to concentrate, particularly as the winds were still high.

> "When a class[room] is destroyed like that one (points at the muddy classroom destroyed by rain and strong wind), learning is affected because they have to learn from outside which is not easy and sometimes, they have to stay at home." (Community member)

> "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 outcome. 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)

"We learn from outside and it rains, we cannot continue. When it is windy, sand gets into our eyes, and we cannot write well because our books are blown away by wind." (Learner)

One school had its kitchen destroyed due to high winds and flooding in previous years. The school did not have the funds to replace the kitchen, so it has been without a facility to prepare school meals for an extended period of time.

"Heavy rains destroy infrastructure if they are not well built or if they are old. Our kitchen was destroyed by heavy rains and strong winds [learner points to the remains of the kitchen structure]." (Learner)

Other schools noted damage to school infrastructure that was repaired and therefore did not cause long-term disruption. However, without sufficient resources, the impacts of damage to school infrastructure are potentially prolonged.

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

All participants raised unsafe conditions during extreme weather events as a reason for poor school attendance and enrolment. There were no gender differences noted in this area. Flood waters can lead to damage to roads, making schools inaccessible for both learners and teachers.

"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)

"If it rains two to three days, pupils from across the river will not come to school. Then those who come from this place decide to remain at home because they are not used to cold mornings. They are used to hot weather. The river is flooded but not necessarily by rain from this area but other areas because the river may flood yet it has not rained here." (Headteacher)

Teachers can be just as much affected by drought and flooding as learners. Flooding in particular was noted to have a negative impact on teacher attendance, particularly if teachers live in different counties and are unable to travel in due to unsafe conditions or damaged infrastructure.

"Even teachers, if it has rained they are not in school." (Learner)

"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)

Schools where teachers lived on the school grounds, they reported not being as negatively impacted by climate hazards as schools where teachers were required to travel to the school each day.

"The attendance of teachers is very good because all teachers reside in the compound. All of them come from outside the county except the head teacher so they just have to be around." (Headteacher)

"Teachers are present because they stay here [reside at the school]." (Learner)

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

Drought conditions were reported to bring about social instability and conflict. 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.

4.4.4 Indirect impact – illness from flood water impacts students' ability to study

Though poor health outcomes can also be associated with drought, participants were more likely to associate ill health with periods of flooding and colder temperatures. Flood waters can increase learners' chances of becoming ill with cholera and tuberculosis. It was also reported that the stagnant water after floods can also boost mosquito populations, leading to higher rates of malaria. Learners reported contracting respiratory and other infections during flooding seasons, in addition to struggling to concentrate in school due to the cold. It is important to note that cold weather conditions are part of normal seasonal variations in temperature as opposed to being the result of climate change. However, cold conditions have been included here as this was an issue raised by all students, as they reported cold weather was becoming more prolonged.

> "When the rain is heavy and there is water all over, people get diseases like bilharzia, common cold, cholera and cough. When we get sick, we are sometimes not able to come to school. If one is having a cold and is coughing, it is not easy to concentrate in class." (learner)

> "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)

This links to the need for improved infrastructure at the school level to ensure schools are suitable learning environments all year round in different conditions.

4.4.5 Indirect impact – hunger due to food and water scarcity lowers concentration levels and results in absence from school

During food and water scarcity due to drought, all learners reported struggling to concentrate due to hunger, and being unable to walk to school due to extreme heat and lack of energy. Students were also required to walk longer distances to find drinking water.

> "We experience serious drought that causes lack of food for human beings and animals. People die due to hunger as well as animals. In 2019, for example, we missed school for many days because there was no food at home and in school. We used to spend most of the time looking for the wild fruits (makoma) and sometimes the fruits would affect us; we would have stomachache and diarrhoea blood. If one eats many of them without water or milk, it does not get digested." (learner)

> "There are days I did not also come to school because I had not eaten lunch, then there was no supper and, in the morning, there was no breakfast. Many people here do not come to school when they miss lunch and supper because they know they will not get anything in class. Instead, we go to look for KDF (makoma; wild fruits)." (learner)

Headteachers and learners all reported that school feeding programmes were impacted by drought due to a dependence on local food sources, which had a negative impact on learner attendance. Headteachers reported some children attending school in the morning but going home for lunch and not returning in the afternoons. Others reported a large proportion of both boys and girls not attending when there was no food from school feeding programmes.

> " Due to hunger, some children especially in the lower classes are too weak to sit throughout the lessons. Sometimes if there is no feeding programme and they go home for lunch, some children do not come back for afternoon lessons, up to ten children in class sometimes do not get back. "
> (headteacher)

"The school has 275 pupils. However, when there are no school meals, the enrolment drops to about 180 as most of them stay at home preferring to work on plots of land to fend for themselves." (headteacher)

"Whenever we have such droughts and there is no food in the school, learners don't come to school. But once food has been availed even when climate is harsh, learners always come. Girls are affected more." (Social Studies teacher)

When schools had feeding programmes that were unaffected by local food supply chains that could continue during periods of drought, they did not report any negative impact on learner attendance or concentration when at school.

"It was a problem before the Missions of Hope came here but today, the Mission takes care of those children who appear to be malnourished and with stunted growth. There were many especially in lower classes. We still have a few of them and they have been put on a special food called 'pluppy' for three weeks after which they start being fed on ordinary food served to other learners. Boys are more malnourished compared to girls. Teachers are taken care of by Mission for Hope, too. We are given meals here starting with porridge for breakfast – what the pupils eat – and we are also given food to cook in our houses. We therefore do not feel the impact of prolonged drought for example." (headteacher)

This particular headteacher believed that boys were more affected by malnourishment than girls, which differed from the views and observations of teachers and headteachers in other schools. This may be due to boys being required to travel long distances with their fathers to find pasture for livestock, but the reasoning is unclear.

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

Although hunger affects all learners, there were other notable differences in poor attendance amongst boys and girls during periods of drought. Boys typically reported having to care for livestock during drought or to find paid employment to redress their caregivers' loss of income.

> "Boys are asked to go look for pasture and sometimes they go far and eventually drop out of school or come back when the others are in the next class." (learner)

Climate shocks typically result in increased responsibilities for girls around the home. One learner also reported that girls may not be able to come to school when there were opportunities to collect water after periods of drought as they would be required to prioritise water collection over school attendance. Another learner reported that girls are typically given the responsibility of clearing water from the home after flooding. Girls also reported that parents may spend prolonged periods away from home in search of water for livestock. Their absence can result in greater at-home responsibilities for girls, which in turn impacts on school attendance.

> "We (girls) also stay at home to take care of other children when our mothers have gone to look for food." (learner)

One headteacher reported that girls are more likely to stop attending school during periods of drought, suggesting it was due to girls being 'more delicate' than boys. Reports from girls themselves, and other headteachers, indicates that during drought girls take on a disproportionate amount of responsibilities around the household.

> "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)

As with droughts, girls would typically be given a greater role in household responsibility during flooding. One headteacher reported that it is common for girls to live with guardians throughout the school year rather than their families, with the guardians wanting girls to stay at home to complete chores. The reasons for living with guardians was not elaborated on.

> "They are living with guardians. This community prefer living with children who are not their own and especially girls and they like involving them with a lot in house chores. So, when it rains, their guardians are even happier to get a reason to tell them to stay at home and work. Again, they like staying with them so that when they finish school and are getting married, they will be given a share of the dowry as they will have acted as parent to the girls as is the culture to share the dowry with the girls' relatives." (learner)

4.4.7 Indirect impact – loss of income prevents payment of school fees

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 higher rates of dropout amongst both boys and girls, due to an inability of families to pay school fees.

> "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)

One gendered impact of loss of income was reported to be early marriage amongst girls. Again, it is important to note that there are many interlinking factors causing early marriage to be pervasive. However, it is clear from interviews with community members, out-of-school youth and learners that climate shocks exacerbate the problem and enhance the conditions likely to result in early marriage.

> "Talking about the girl child, if she finds that her needs are not met at home, because [her] parent does not have food and other basic needs including soap, sanitary towels, some decide they'd better get married to a person they feel is better off in the community because that home can afford lunch. That is how dropout occurs." (Community member)

> "It has affected education in that there are no school fees or uniform for the children and at times due to hunger children do not go to school. For some girls when they lack these school fees they opt to get married and they end up getting pregnant and due to poverty, they go back to their home since they are still young." (Community member)

4.4.8 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 not 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)

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 to the lack of water supply and increasingly harsh conditions.

05 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 Turkana, the learning has broader relevance in contexts facing similar challenges and hazards as a result of climate change.

The first four recommendations focus on improving access, safety, learning conditions and learner readiness to learn. The final two recommendations focus on the role of schools as agents for change in mitigating against climate change through education and adaptive skills to build resilience.

5.1 Strengthening school feeding programmes
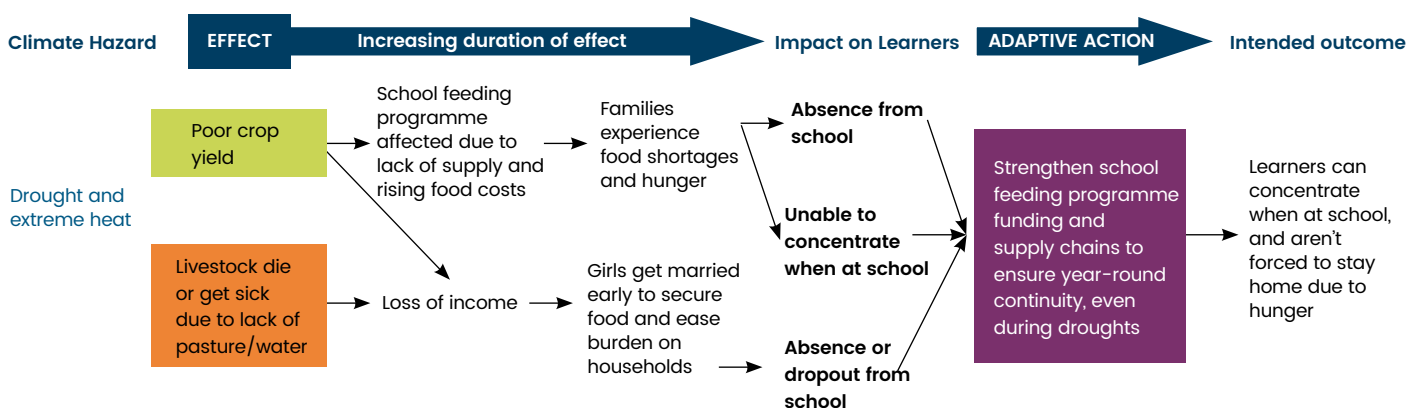
A lack of food during drought season was one of the most pervasive reasons for learners missing school. Poor crop yield results in reduced food supply, driving up the cost of food at a time when families are already facing economic hardship (either due to their reliance on rainfed agriculture or due to loss of livestock). As reported in the previous section, a lack of food affects concentration at school and was one of the most pervasive reasons for learner absence. Lack of food at home also had an indirect impact on girls, with community members reporting that when resources were limited, girls may marry early, resulting in school absences or dropout.

Though there are many complex social and contextual factors at play, one of the more basic adaptations that can be made during drought relates to ensuring continuity or establishment of school feeding programmes (SFPs) which are not reliant on local food sources. This is not to suggest that SFPs will prevent early marriage, but when early marriage is due to limited resources at home, including lack of food, SFPs have the potential to remove one contributing factor that may lead to early or forced marriage. The one school in our sample which reported droughts having no impact on learning levels, concentration or attendance for girls or boys reported having a consistent SFP provided by an NGO. It is important to note that this school also had boarding facilities, highlighting the need for a multi-pronged approach.

The provision of SFPs was amongst the most popular adaptation approaches proposed by all participants.

> "Support the school with a feeding programme because as long as there is food in school, children will come to school and they will learn well. If there is no food in school and at home they will do anything to get something to eat and this is how we have lost many girls into pregnancy." (community member)

> "The county government should provide food to schools to buffer them from shocks triggered by climate changes." (headteacher)

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.

5.2 Providing low-cost boarding facilities for learners and teachers
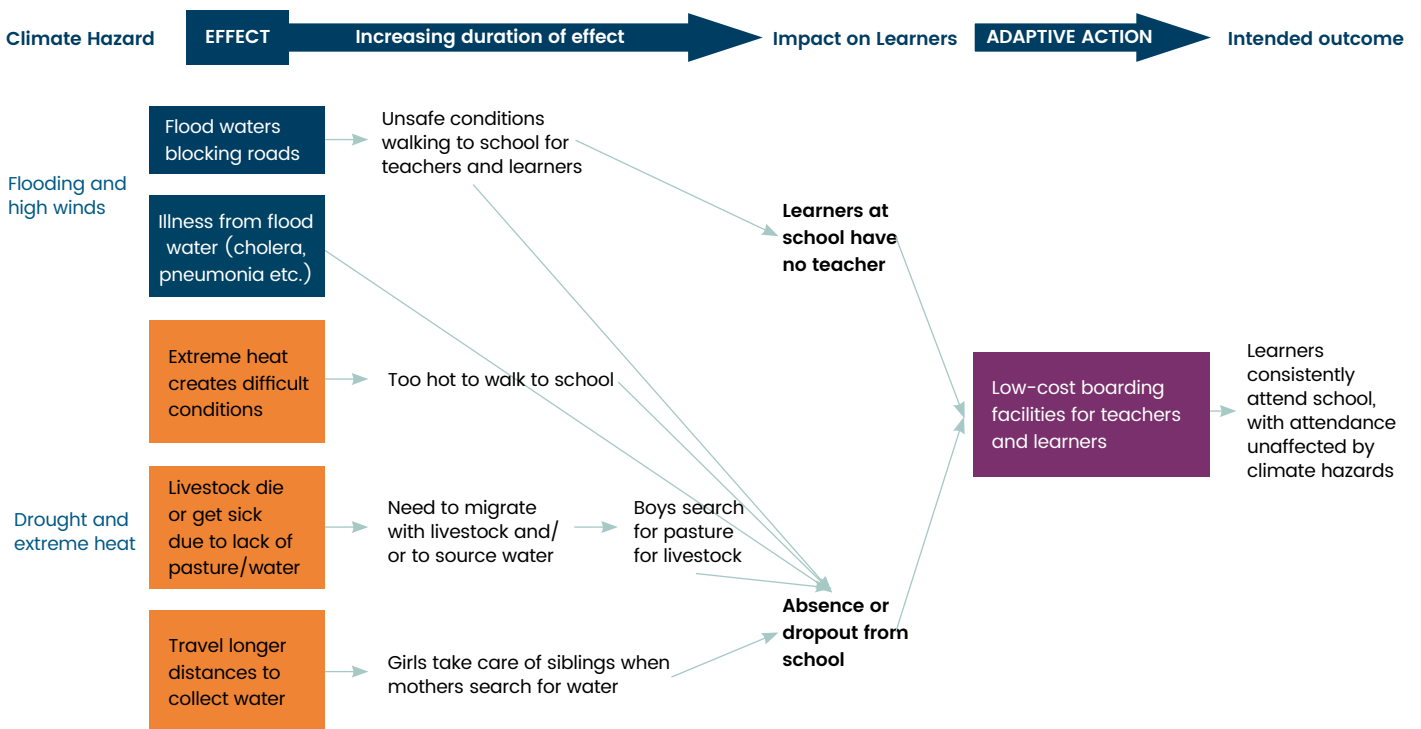
All types of climate hazards mentioned by community members, learners and school staff were reported to affect both learners' and teachers' ability to safely travel to school. This may be due to extreme heat making it difficult for learners to walk, or flash floods blocking roads. The one school in our sample that had boarding facilities did not report being affected by flooding or extreme heat. The provision of low-cost boarding facilities removed multiple barriers to accessing school for both learners and teachers. Creating boarding facilities was one of the most recommended actions noted by community members, learners and school staff, alongside SFPs.

"Build a dormitory so that all of us can remain in school." (Learner)

"School admin should put houses for teachers around the school to minimise their movement in harsh weather/heat." (Headteacher)

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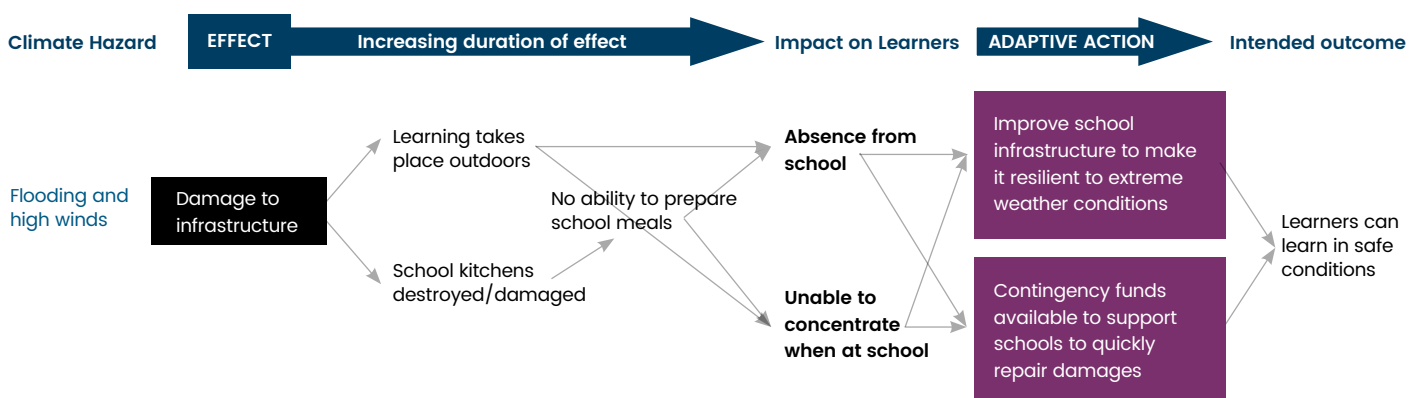
"…build rooms for the children so that they can be boarders. We can share the cost of boarding for our children because we know they will study better. If our children are staying in school, rains or no rains, their studies will not be affected because of hunger or because the river is full and they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

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. The school in our sample which did have boarding facilities also did not report absences due to increased responsibilities at home or work (for girls or boys), suggesting boarding facilities can potentially protect learners from being diverted away from education into domestic and other types of labour.

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 in Turkana.

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.

5.3 More resilient school infrastructure

| Climate Hazard | EFFECT | Increasing duration of effect | Impact on Learners | ADAPTIVE ACTION | Intended outcome |

Flooding and high winds → Damage to infrastructure → Learning takes place outdoors / School kitchens destroyed/damaged → No ability to prepare school meals → Absence from school / Unable to concentrate when at school → Improve school infrastructure to make it resilient to extreme weather conditions / Contingency funds available to support schools to quickly repair damages → Learners can learn in safe conditions
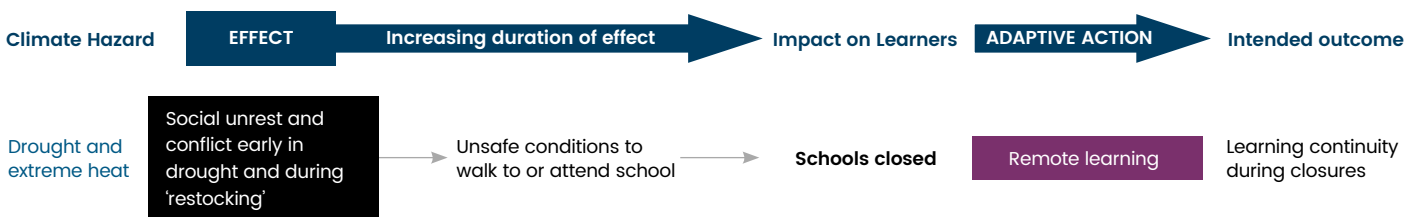
Participants reported a need for infrastructure that is more resilient to extreme weather. The weather events that typically affected learning through damage to school infrastructure were high winds, and occasionally flooding, though the majority of schools did not report flooding to be particularly problematic where their schools were located.

> "Construct permanent classes and good latrines so that they are not destroyed by rains or strong winds." (Learner)

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.
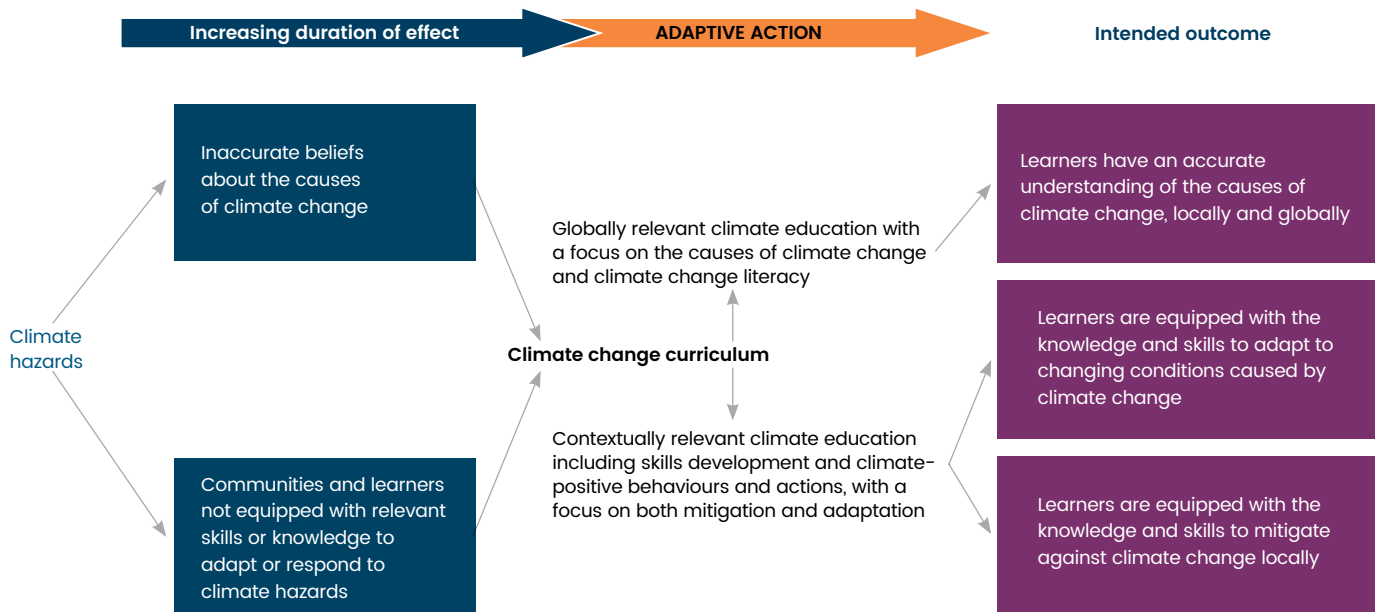
> "Our school is next to a seasonal river so when it is about to go dry, the students boycott classes so that they can go and fetch water. In this school, we have not had a lot of problems with water because of the river plus we have a borehole which has water where after like three days, the water gets pumped." (Community member)

5.4 Remote learning options as backup for when schools close due to conflict

Climate Hazard	EFFECT	Increasing duration of effect	Impact on Learners	ADAPTIVE ACTION	Intended outcome
Drought and extreme heat	Social unrest and conflict early in drought and during 'restocking'	Unsafe conditions to walk to or attend school	Schools closed	Remote learning	Learning continuity during closures

There are certain effects of climate events, such as conflict, that are difficult to adapt to and mitigate against in an education setting, with school closures often being the only viable option. In the locations where conflict is anticipated and there is historical precedent for school closures due to conflict, remote learning options are one mechanism to ensure continuity of learning. This is particularly challenging in resource-limited environments such as Turkana, and is an area that would require investment. For many learners, tech options would simply not be feasible, and there would be a requirement to offer paper-based resources to learners that 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.

5.5 Greater balance in the curriculum to be contextually relevant whilst covering global issues

Increasing duration of effect → **ADAPTIVE ACTION** → **Intended outcome**

Climate hazards

Inaccurate beliefs about the causes of climate change

Communities and learners not equipped with relevant skills or knowledge to adapt or respond to climate hazards

Globally relevant climate education with a focus on the causes of climate change and climate change literacy

Climate change curriculum

Contextually relevant climate education including skills development and climate-positive behaviours and actions, with a focus on both mitigation and adaptation

Learners have an accurate understanding of the causes of climate change, locally and globally

Learners are equipped with the knowledge and skills to adapt to changing conditions caused by climate change

Learners are equipped with the knowledge and skills to mitigate against climate change locally

A common sentiment amongst participants was the view that the curriculum was not contextually relevant enough. However, it was also observed from analysis of interviews that school staff and learners had limited knowledge of the causes of climate change, and often inaccurately attributed their own local practices, such as cutting down trees, to worsening drought conditions. No participant provided a more global explanation for climate change. Limited learner knowledge and the desire for climate change education to provide more practical solutions raises questions around the purpose of climate change education. 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 inaccurate 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 damage caused by industrialised countries. However, learners and their communities also require hope, and need to be given relevant information to help them mitigate against climate change where they can, and 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." (Social Studies teacher)

Headteachers noted that any changes to the curriculum would also need to be accompanied by teacher training.

> "Teachers would need a refresher training on climate change also and how to make the topic practical/learner-centred. They should then repeat same training at school level." (Headteacher)

Headteachers also suggested that information about weather patterns and climate change is often outdated in textbooks and the curriculum. For example, one headteacher commented on how the curriculum states rains are expected between March and August, but there is no mention of how rainfall patterns are now changing and how this is connected to climate change. With increasing change in weather patterns as a result of climate change, it is important to consider how textbooks and learning materials can remain relevant and up to date in a context of limited resources.
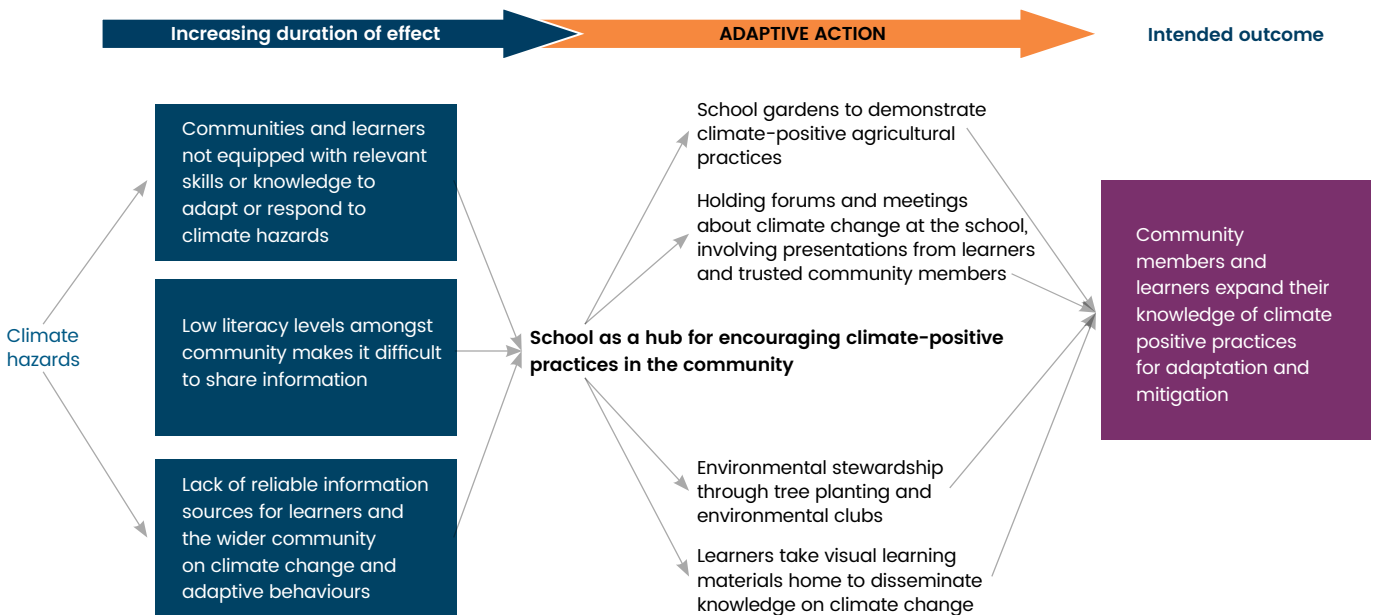
NDMA flag system

The NDMA early warning system is a good example of contextually relevant climate change education for communities. Under the early warning program, 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.

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

Increasing duration of effect	ADAPTIVE ACTION	Intended outcome

Climate hazards

Communities and learners not equipped with relevant skills or knowledge to adapt or respond to climate hazards

Low literacy levels amongst community makes it difficult to share information

Lack of reliable information sources for learners and the wider community on climate change and adaptive behaviours

School gardens to demonstrate climate-positive agricultural practices

Holding forums and meetings about climate change at the school, involving presentations from learners and trusted community members

School as a hub for encouraging climate-positive practices in the community

Environmental stewardship through tree planting and environmental clubs

Learners take visual learning materials home to disseminate knowledge on climate change

Community members and learners expand their knowledge of climate positive practices for adaptation and mitigation

Dependencies/ prerequisites

1. Gender sensitisation in the local community to promote households listening to girls in the same ways they listen to boys

2. Schools to have access to relevant and reliable information about climate change that is contextually relevant (see section 5.5 on climate change curriculum)

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.

"As a school community they should plant trees and plants and water them." (Headteacher)

"Plant more trees. Start a club where learners will be learning and doing things that can protect the environment. It can be called Environmental Club. Members can be planting trees and encouraging other pupils to do them same. Each member can have some trees to plant and take care of. They can also be encouraged to go do the same at home and also sensitise their parents on the importance of conserving the environment by not cutting down trees." (Headteacher)

One headteacher expressed a desire to work with local NGOs to help sensitise the community to positive environmental practices. Although tree planting was typically used as an example by participants, there are other potential ways that schools could serve as positive role models and sites of learning for the local community which were suggested by participants. For example, schools could promote climate-positive practices through climate-smart vegetable gardens that serve a dual purpose of supplying food to the school, in addition to teaching learners and the community about climate-smart practices. One headteacher believed that schools could become 'demonstration grounds' for the local community to learn about climate-positive agricultural practices.

Schools can also serve as potential sites for upskilling and educating the local community about climate change more broadly. All participants commented on schools being trusted places within communities, so any information shared by a school is considered reliable. Headteachers suggested that schools could assist in disseminating information about climate change, with leaflets suitable for caregivers with low literacy levels. Another headteacher suggested that schools could be locations for forums on climate change to be held, enabling teachers and learners to inform the local community about climate change. Learners themselves believed they had a role to play in educating their local community, particularly their parents, on the impact of climate change. There was a desire amongst learners to take the knowledge gained from school and apply it to their own lives.

> "If we have forums at school and have learners sensitise parents on climate change, it can be more effective. Learners can be good ambassadors. Chiefs should also be involved to amplify messages on climate change during their barazas." (Headteacher)

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.

> "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)

> "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." (Social Studies teacher)

> **The school's board of management can be used to speak to parents and also some teachers talk about this climate change. In church congregation, effects of this climate change are discussed and also in barazas information on climate change is passed. (Headteacher)**

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. Our earlier results demonstrating headteacher views that boys have higher levels of knowledge about climate change than girls highlights that these perceptions do not just need to be challenged in the community, but also within the school.

Amongst the community members who did suggest that they would listen to their children regarding climate change, they believed 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)**

Final reflections and recommendations

This report has identified a wide range of direct and indirect impacts of climate change on education in Turkana. Addressing the challenges identified will require multisectoral working 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.

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.

» Ensure contingency funds are available for schools to swiftly fix damage to infrastructure, and to ensure schools are more resilient to high winds and flooding.

» 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.

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 events and outreach activities from the school which will raise the profile of learners as reliable sources of knowledge that can support mitigation and adaptation efforts.

References

ADA. (2022). *ADA Consortium*. National Drought Management Authority, Kenya. [Available online: https://www.adaconsortium.org/ – accessed 1 February 2023].

Devonald, M., Jones, N. and Yadete, W. (2020). *'The first thing that I fear for my future is the lack of rain and drought': climate change and its impact on adolescent capabilities in low- and middle-income countries*. London: Gender and Adolescence: Global Evidence.

Government of Kenya. (2021). *Kenya Climate Change Learning Strategy*. Ministry of Environment and Forestry, Nairobi, Kenya.

Huho, J. (2015). 'Climate change knowledge gap in education system in Kenya', International Journal of Innovation and Research in Educational Sciences, 2 (3): 2349–5219.

Human Rights Watch. (2015). *'There is no time left': Climate change, environmental threats, and human rights in Turkana County, Kenya*. New York: Human Rights Watch. [Available online: https://www.hrw.org/world-report/2016/country-chapters/global – accessed 9 August 2022].

Infotrak. (2022). *Turkana County stats*. [Available online: http://countytrak.infotrakresearch.com/turkana- county/ – accessed 1 February 2023].

Ministry of Environment and Forestry. (2020). *Background report on National Climate Change Priorities and Relevant Capacity Development Goals and Initiatives in Kenya*. Nairobi: Government printer.

Ministry of Agriculture, Livestock, Fisheries, and Cooperatives. (2021). *Agricultural policy – 2021: Food – Our health, wealth, and security*. Nairobi: Government printer.

Nyatuka, B. O. (2020). 'Education for Sustainable Development in Kenya: Rhetoric and Reality in Basic Education', Global Journal of Transformative Education, 2 (1): 86–98.

Omolo, N. and Mafongoya, P. (2019). 'Gender, social capital and adaptive capacity to climate variability: a case of pastoralists in arid and semi-arid regions in Kenya', International Journal of Climate Change Strategies and Management, 11 (5): 744–758.

Ratner, B. (2020). *Kenya fisherman say they are squeezed by Ethiopian mega dam*. Reuters. [Available online: https://www.reuters.com/article/us-kenya-environment-lake-turkana-idUSKCN24L0S1 – accessed 9 August 2022].

Republic of Kenya. (2019). *Upper primary level designs, grade four. Social Studies, Art and Craft, Christian Religious Education, Islamic Religious Education and Hindu Religious Education*. Nairobi: Kenya Institute of Curriculum Development (KICD).

Sims, K. (2021). *Education, Girls' Education and Climate Change*. K4D Emerging Issues Report 29. Institute of Development Studies. DOI: 10.19088/K4D.2021.044

Turkana County Government. (2013). *Turkana County Integrated Development Plan 2013–2017*. Nairobi, Kenya: Government of Kenya.

UNFCCC. (2016). *The Paris Agreement*. [Available online: The United Nations. https://unfccc.int/sites/default/files/ resource/parisagreement_publication.pdf – accessed 1 February 2023].

UN Women, UN DESA, UNFCCC. (2015). *Implementation of Gender-Responsive Climate Action in the Context of Sustainable Development*. New York: UN Women.

UNICEF. (2019). *It is getting hot: Call for education systems to respond to the climate crisis*. New York: UNICEF.

Venton, C. C. (2018). *Economics of resilience to droughts: Kenya analysis*. Washington DC: USAID.

World Bank. (2020). *Climate Risk Profile: Kenya*. Washington: World Bank Group.

World Bank. (2022). *Kenya climate vulnerability*. World Bank Climate Change Knowledge Portal. [Available online: https://climateknowledgeportal.worldbank.org/country/kenya/vulnerability – accessed 1 February 2023].