Climate, environment and schools in Tanzania

October 2023

Research objectives
Generate proof-of-concept for classroom conditions in the Tanzanian context

Evidence on linkages

Using geospatial data and publicly available test score data to generate evidence on the potential links between classroom conditions and learning outcomes.

School infrastructure

Draw insights on how temperature, light and sound conditions link with school-level infrastructure (e.g. the size and layout of classrooms, availability of windows, the building materials etc.) and administrative data

Enhance conditions

Articulate concrete recommendations on how modifications to the classroom environment can enhance learning outcomes

Update so far
What we have done

- Secondary data analysis of Heat and Learning Outcomes complete; responding to feedback

- First wave of primary data collection done
  - Including installing sensors

- Initial data analysis on temperature and primary data completed

- Second wave of data collection next week – building on primary data findings.

Recall – secondary data analysis

We used publicly available satellite and PSLE data

- Heat is correlated with learning outcomes - school FE estimates tell us.

  - 1 degree average on school year increase lowers learning by 1.1 marks (out of 100);
  - the last terms 1 degree leads to 1.2 marks
  - 1 degree on exam day lowers by 0.4 marks.

- So direct heat stress (exam day) matters; but so does the heat over the year

- But – this is inconsistent across agricultural zones; and seems to be driven by the top-performing schools.

Primary data collection - location of the Schools
Three different regions selected for climatic variation

48 schools sampled in Pwani, Mara and Dodoma regions
Two districts per region were purposively sampled for logistical feasibility. Eight schools were randomly selected per district
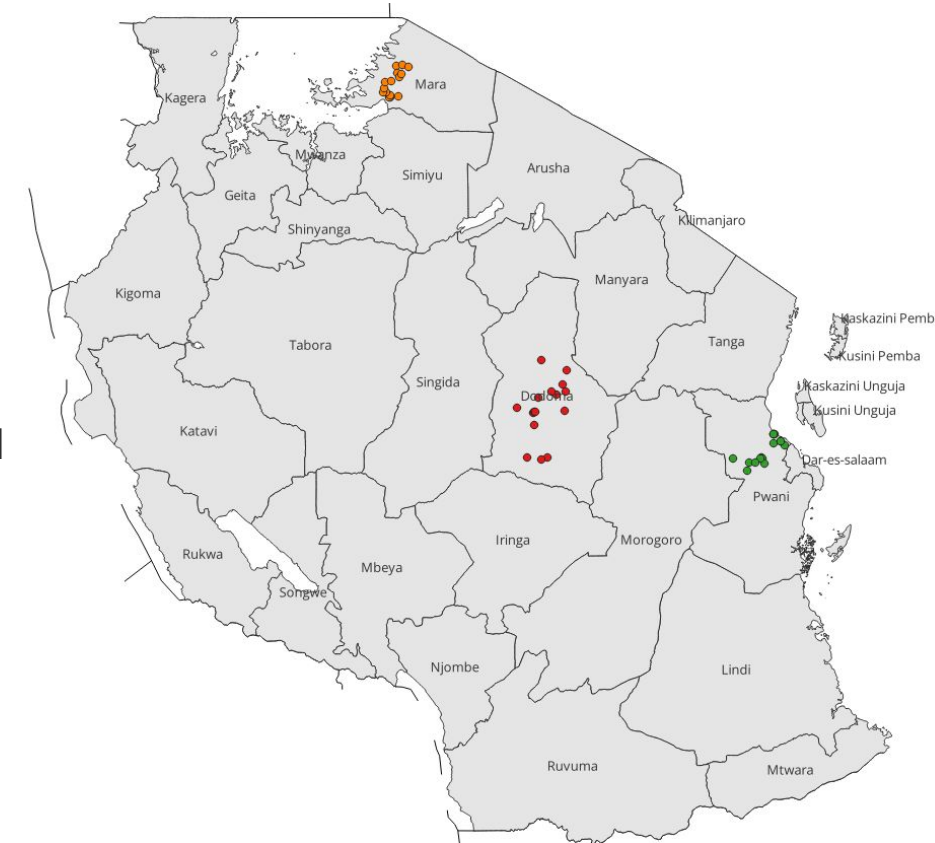
48 headteachers interviewed
Headteachers were interviewed to collect administrative, school-level infrastructure, and climate change perceptions data

48 classroom observations
One grade 3 classroom was randomly selected by the enumerator to observe the classroom infrastructure and building materials, and mount a remote temperature sensor
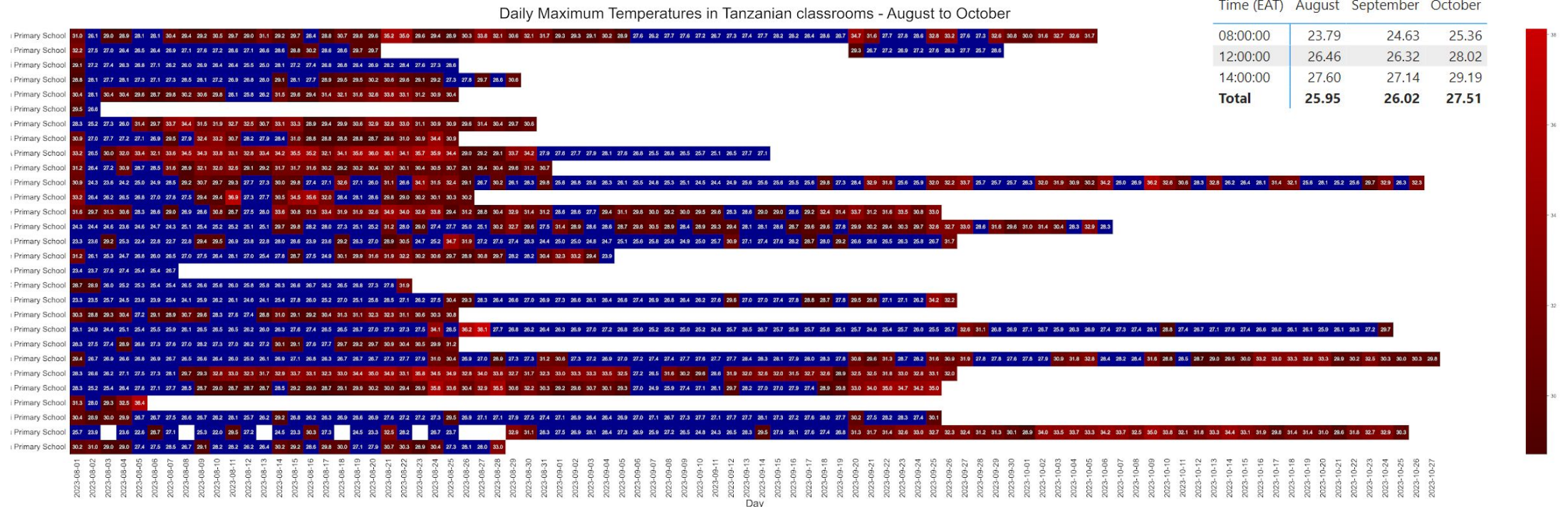
# Initial findings

Classrooms are hot and getting hotter

Red is where the max (school time) temp is above 28.7c

Daily Maximum Temperatures in Tanzanian classrooms - August to October

Time (EAT)	August	September	October
08:00:00	23.79	24.63	25.36
12:00:00	26.46	26.32	28.02
14:00:00	27.60	27.14	29.19
Total	**25.95**	**26.02**	**27.51**

Nb. Data are missing are schools haven't uploaded – we are collecting all the data next week for Aug-Nov.

Some schools heat quicker than others

Avg. Temperature in September
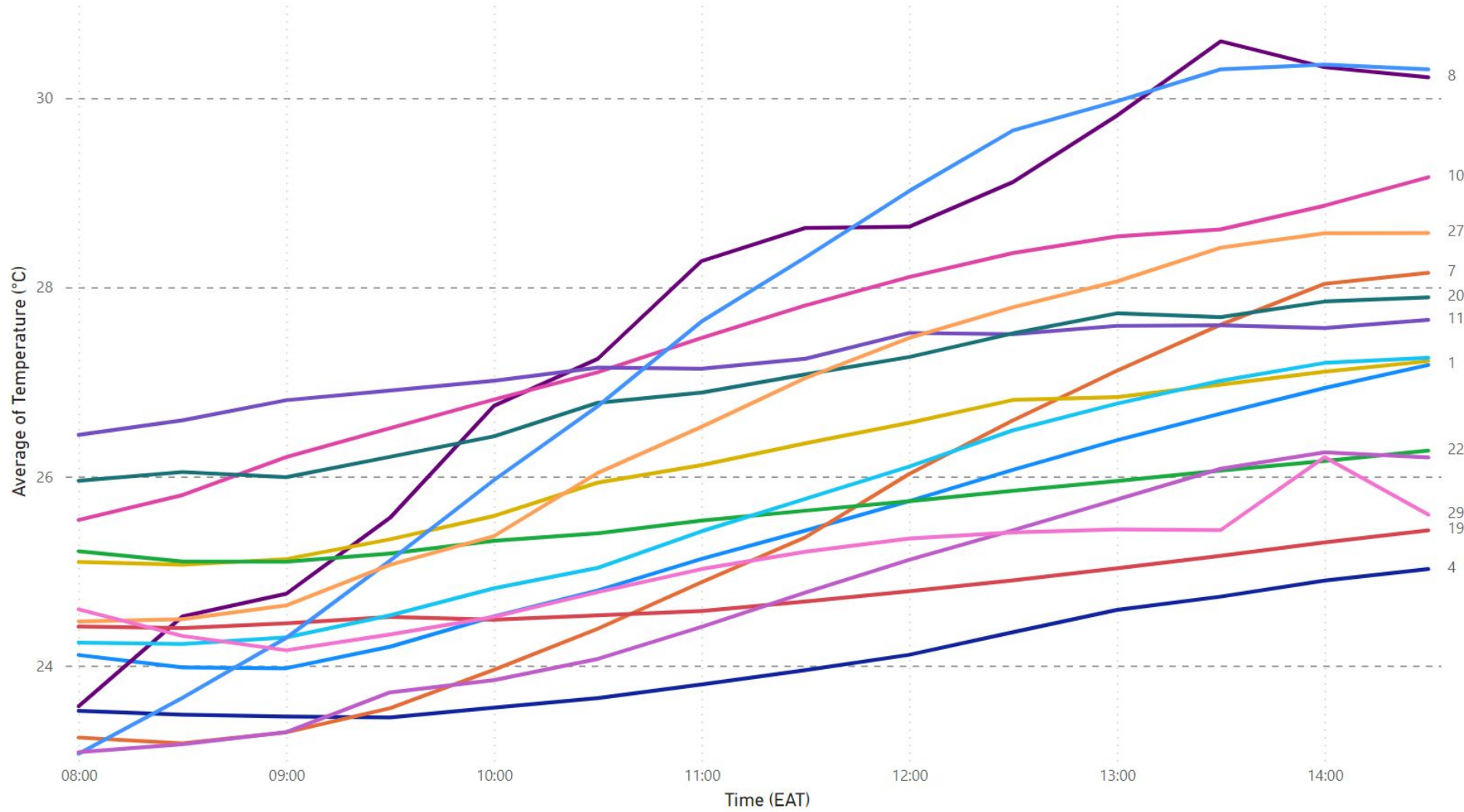
Have begun preliminary modelling of in vs out

Sensors and Satellite temperature data comparisons

Need to understand more about the buildings

Most classroom walls are built with cement or bricks and painted white in the interior; windows are at the front and back but lots don't open.

Wall materials vary across regions

- In Dodoma all walls are made of cement or mud, and unburnt bricks
- In Pwani all walls are made of cement block
- In Mara the majority of walls are made of cement and burned bricks or cement and unburnt bricks

Use of light colors for interior color of walls

- In Dodoma the majority of classrooms are painted beige or white
- In Mara the majority of classrooms are painted yellow or white
- In Pwani the majority of classrooms are painted white or blue

Unpainted walls or light colors for the exterior walls

- In Dodoma and Pwani the majority of classrooms are gray (not painted)
- In Mara the majority of classrooms are painted beige

Headteacher's Perception of Climate Change

Although most teachers believe that climate change negatively impacts the school, climate change is not considered a main concern

- More than half of the interviewed headteachers (58%) believe that climate change negatively impacts the schools either through extreme heat (41%), increased rainfall (57%), or increased flooding (18%).

- However, only one teacher considered climate change as a main concern. Other issues such as student´s nutrition, school budget, and school infrastructure were considered more important concerns.

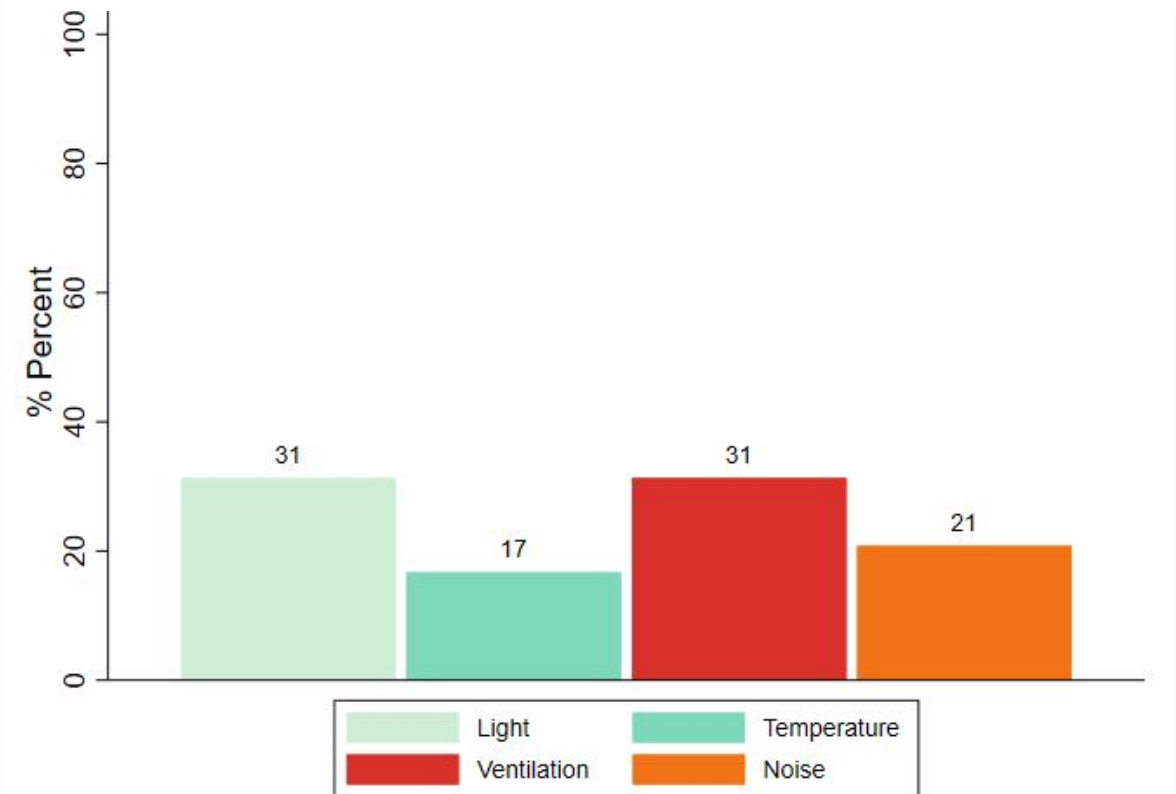**Percentage of Headteachers who Think Climate Change Negatively Impacts the School**
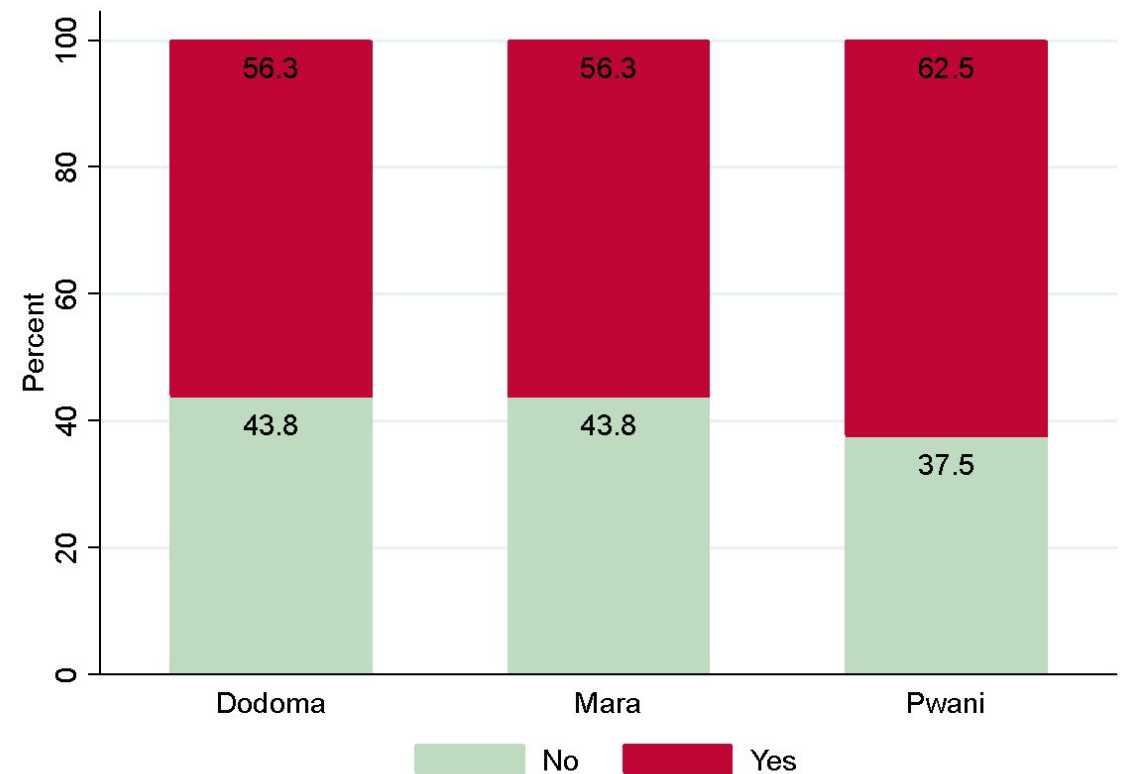
School infrastructure and learning impacts

What teachers thought was the priority to improve
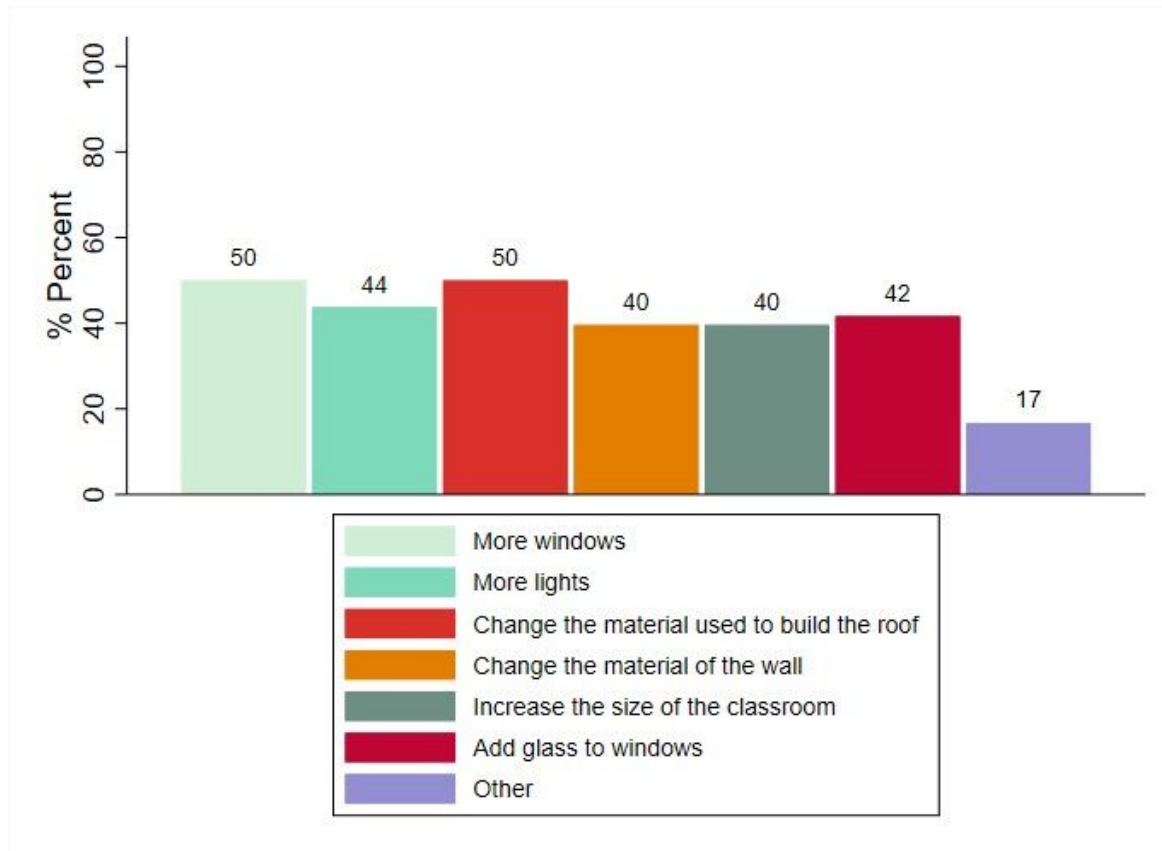
How teachers ranked light, temperature, ventilation and noise in terms of most important factor
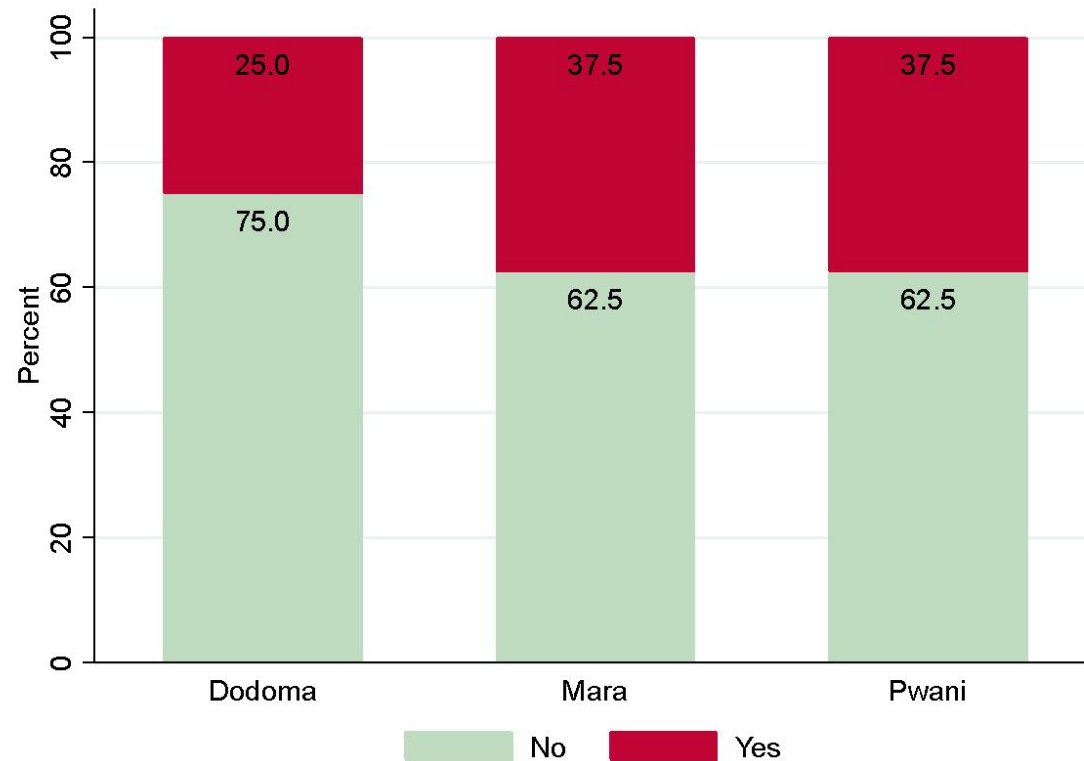
A high share of schools reported flooding during the rainy season

But crucially all continued learning

Percentage of schools that experience flooding during rainy season

N = 16 per region

Key findings

On average, about one-third (33%) of classrooms experienced flooding during the rainy season. However, headteachers reported few classrooms become unusable due to flooding.

This requires further exploration to understand "how" schools continue to function despite flooding.

Flooding and traveling to/from school

A significant number of students and staff have access issues during the rainy season

**Percentage of students that have difficulty getting to and from school during rainy season**
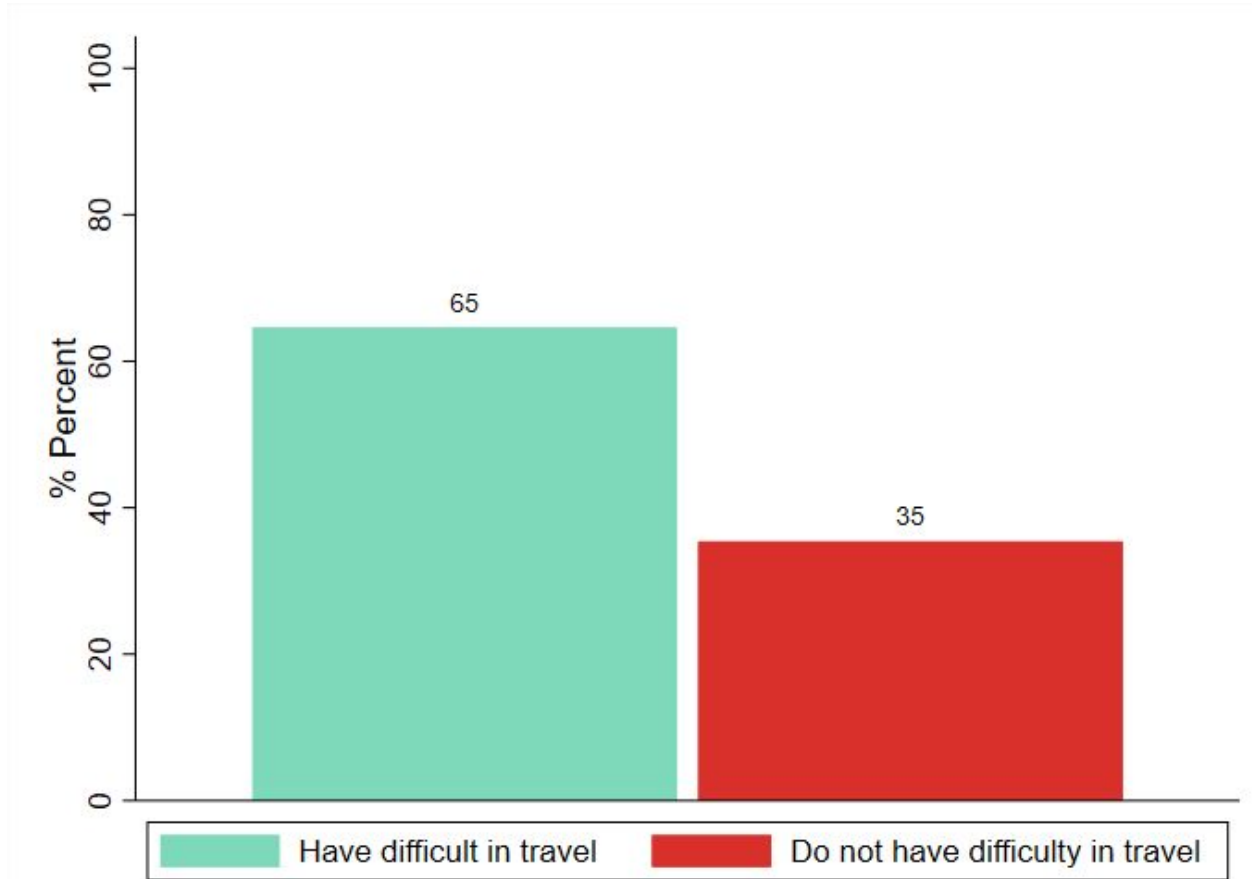
Key findings

About two-thirds (65%) of schools say that students and staff have difficulty travelling to and from school during the rainy season.
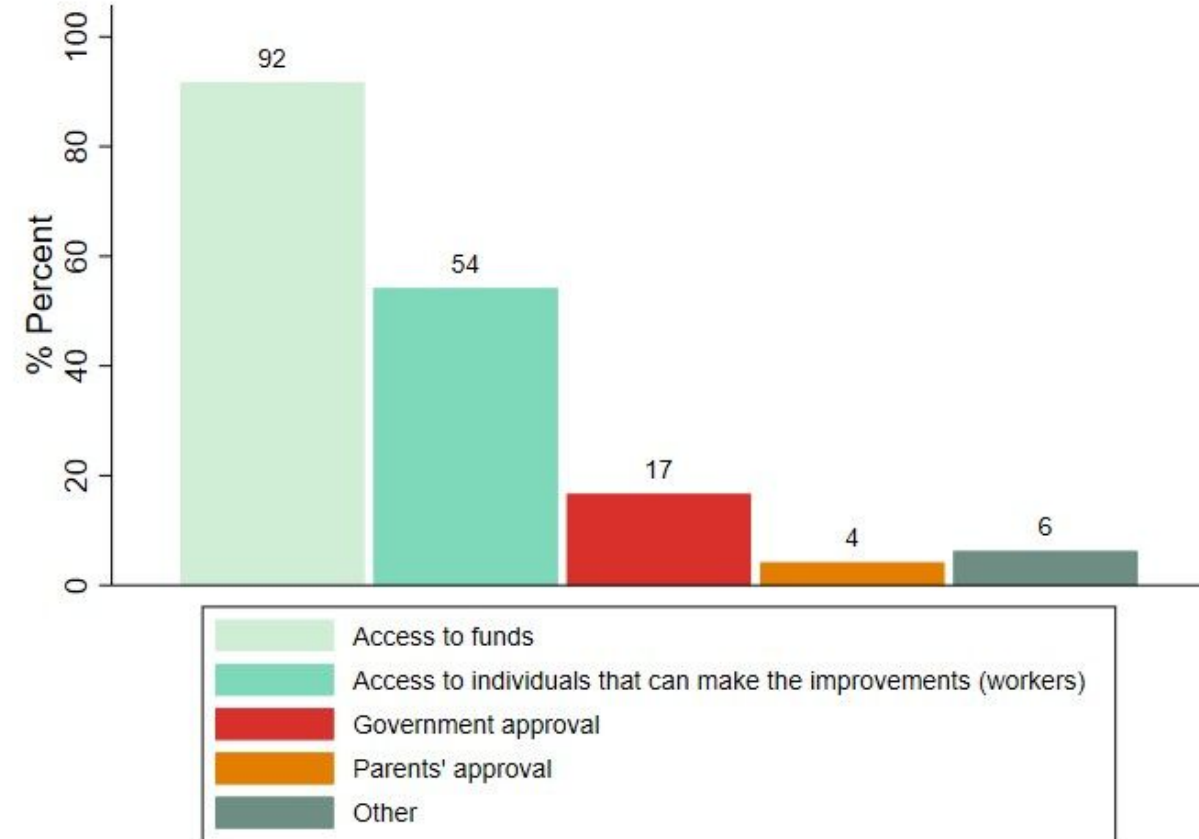
This has implications for impacts on learning, student wellbeing and safety.

What is needed to improve learning and adapt to climate change

What do you need to ensure that your school can adapt to the impacts of climate change?
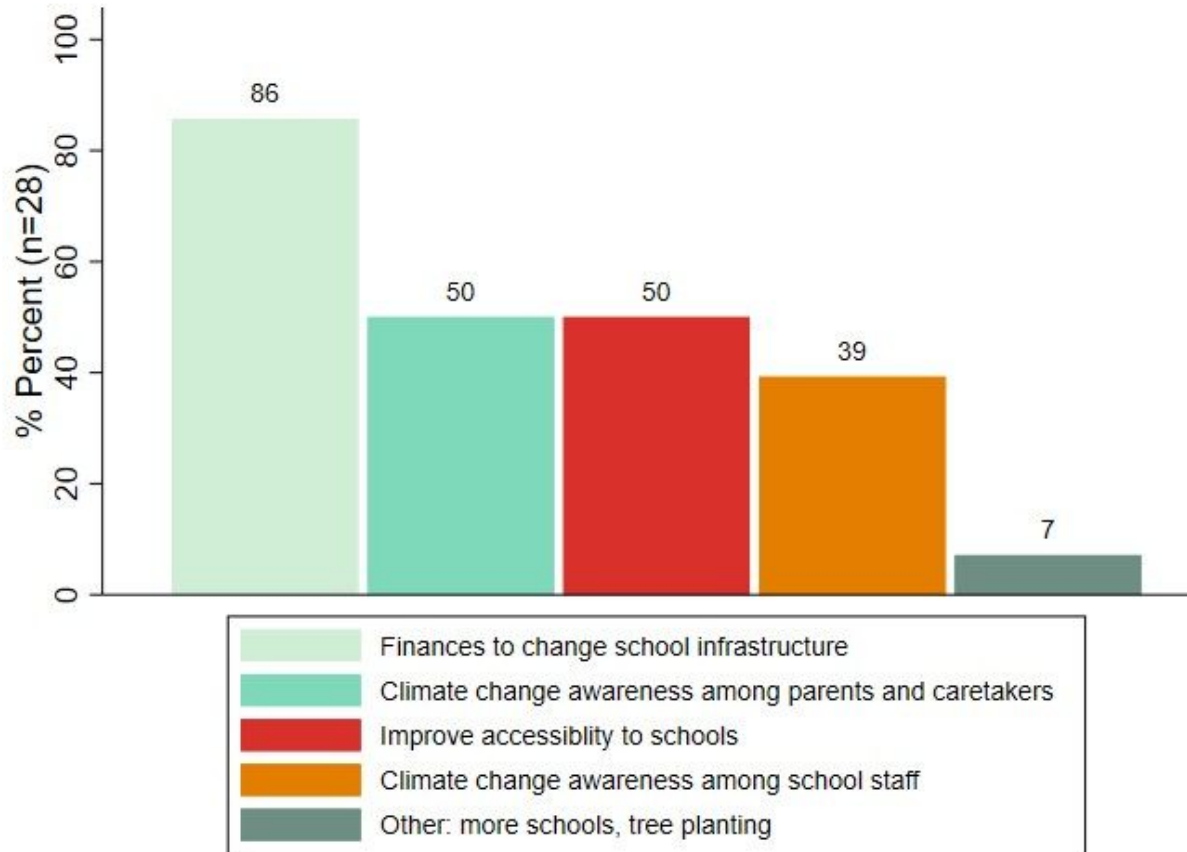
What is most needed to make improvements to learning conditions?

Second data collection
Updates based on phase one

- We updated the questions to dig deeper into

  ▸ Why are schools not closing even when flooded?

  ▸ How do teachers continue lessons during heavy rain?

  ▸ What strategies do they employ to minimise the impacts of extreme weather?

  ▸ What impact does flood road access have on children's safety and learning?

Next steps and timelines

Expected outputs

1. Secondary report - draft submitted and in review. **Finalize by January 2024**
2. Primary data - descriptive statistics. **December 2023**
3. Primary data - analysis with temperature data - **February/March 2024**
4. Blog – "The data collection approach and its links to climate-smart decision-making – **December 2023**

Ongoing research

1. Analysis of sensor data
2. Survey 2 and sensor data collection – **27th November-4th December**
3. Primary data survey 1 and 2 analysis
4. Potential analysis of classroom infrastructure observations in the context of climate-smart infrastructure