Water and Electricity Services during Extreme Weather Events: Findings from Accra and Tamale, Ghana

Background and overview of the VEWEC research project

Climate change as indicated by changes in weather patterns, including the predictability and reliability of seasonal rainfall and extreme heat events, threaten progress towards achieving the Sustainable Development Goals (SDGs). The impact of extreme weather events on infrastructure service delivery are more severe in high-density low-income urban settlements, where urban service providers find it more challenging, even during normal weather conditions, to extend services because of high population density, irregular and undefined land tenure and unplanned physical layout (Kayaga, 2013). This short policy brief presents key findings from a research project entitled *Vulnerability to Extreme Weather Events in Cities: Implications for Infrastructure and Livelihoods* (VEWEC), supported by the British Academy. VEWEC, an interdisciplinary study, explored human vulnerability to extreme heat and urban flooding and gathered evidence of coping strategies within low-income communities of Ghana (Gough et al., 2019).

Qualitative and quantitative data were collected on the impact of extreme heat and urban flooding on water, electricity and health services. Fieldwork was undertaken in four communities in Accra (Alajo, Agbogbloshie, Bortianor, Odawna) and four in the northern city of Tamale (Gumani, Kukuo, Lamashegu, Ward K). The work was facilitated by community champions. In all, 21 key informant interviews with representatives of service providers, 124 household interviews and 24 focus group discussions (older male, older female and youth groups) were conducted in the study areas. This brief focuses on: the impact of extreme heat and flooding on the delivery of water and electricity services in low-income urban areas; how these changes affect the livelihoods of the residents; what coping strategies the urban poor devise; and proposes adaptive and mitigating measures policy makers and service providers could adopt.

Service quality during 'normal' weather conditions in low-income settlements

Water services	Electricity services
• Water access in Tamale is either non-existent or intermittent, hence residents predominantly use other water sources, e.g. valley tanks and hand-dug wells, which have high levels of faecal contamination and turbidity. • Water supply in Accra is more accessible and reliable, with a few house connections but most residents use public standpipes. • Households that use storage tanks do not clean them regularly, hence bacteriological quality deteriorates. • Household treatment methods, such as application of alum, are used by some residents.	• In both Accra and Tamale, electricity is stable during 'normal' weather conditions. • Some households do not have accounts with an electricity company. • There are numerous illegal interconnections between households, some of which are made before the meter, which is risky to residents and leads to high energy losses. 

Effects of flooding on water and electricity services in low-income areas

Water and electricity services are intricately connected. During rainstorms and/or flooding, electricity is intentionally disconnected to minimise the risk of short circuits and/or electrocution of residents as a result of electricity poles falling or touching each other. This electricity shutdown may affect the power supply to water treatment plants and booster stations. Demand for water during the rainy season is depressed, mainly due to reduced household usage and harvesting rainwater.

Effects of extreme heat on water and electricity services in low-income areas

In very hot seasons, the demand for water and electricity escalates, amidst reduced yields of raw water resources (e.g. lower levels in the dams) that result in low water supply output and hydro-electric power generation. As a result, service providers ration water supply and electricity. Overloading of the power supply system leads to frequent 'tripping' of the supply network, which in turn affects water pumping, hence, urban residents receive intermittent water/electricity services.

Coping strategies adopted by low-income urban residents during extreme weather events

Accessing water	Accessing electricity
• Many households harvest rainwater during the wet season to reduce their water bills. • Some households install large storage tanks, depending on their ability to pay. • During extreme heat events households with no water draw from those with supply, at an elevated price (7-11 times the official price), or draw water from alternative water sources. • Some use household water treatments to improve the water quality but chemicals are not always properly applied. • Wealthier households purchase more sachet water for cooking, which is normally used only for drinking.	• At night people use solar- and battery-powered touches for lighting and mobile phone charging. • Poorer households use paraffin lanterns. • Wealthier households and small businesses use petrol- or diesel-powered generators. • Some households have their houses well-lit and fully-wired using solar panel electricity.

Implications for policy and practice

Community members requested that in the short term the water company provides them with advance warning regarding an impending water supply shortage so that households can store enough water as a coping strategy. The water company could also provide advice and technical support to community members so that they can carry out regular cleaning of their storage tanks to mitigate against water contamination. Simple water quality testing services could be extended by the water company as part of their corporate social responsibility. In the longer term, the water company should work towards improving water access to low-income urban settlements, for example, by expanding household water connections and promoting an integrated water-use planning strategy. This is especially important because water is also used for productive activities in most low-income areas.

Regarding electricity, the distribution companies need to develop strategies for tracking down illegal connections and provide incentives and mechanisms for legitimising them. The electricity companies should also provide dedicated power lines for essential services, such as water treatment/pumping plants, in order to reduce vulnerability of residents during extreme weather events. In the longer term, the electricity companies should consider investing in alternative and emergency power supply systems, such as solar and thermal energy, in order to minimise impacts during extreme heat events.

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