AVERTED DISASTER AWARD

IMPROVING CLIMATE DATA AND INFORMATION MANAGEMENT, JAMAICA

A Small Island Developing State grappling with the effects of climate change

Jamaica, a large island in the Caribbean Sea home to 2.93 million people, is the third most exposed country globally to multiple natural hazards, which include hurricanes, storm surge, flood, drought, earthquakes, and landslides. Over 96% of the country's GDP and population are at risk from two or more hazards [1]. The impacts from natural hazards in the Caribbean pose a direct threat to development gains by disrupting socio-economic progress. Hurricanes, floods, and droughts have cost Jamaica on average 2% of GDP, every year since 2001. Between 2001 and 2012, nine hurricanes and two storms caused monetary losses of approximately J$122 billion (US$ 1.34 billion) [2]. Non-monetary losses included soil erosion and deterioration, reduced psychological and mental health, and increased violence [3].

Climate change is causing temperatures to rise, and storms to increase in frequency and intensity (Figure 1), with associated extreme wind, storm surge, and torrential rain hazards. **Potential losses of up to 56% of GDP have been forecast by 2025** [4].

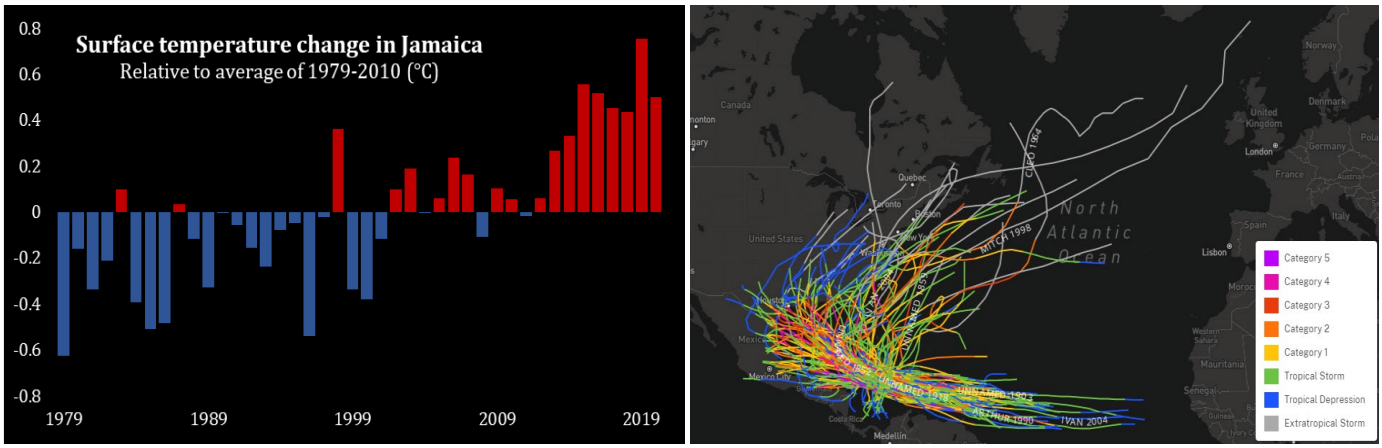

Figure 1: Change in surface temperature (left) between 1979 and 2020, relative to the mean for that period, for the island of Jamaica (created using ERA-5 monthly aggregate data). Historical hurricane tracks across Jamaica (right) between 1985 to 2005 (n=122, created using NOAA Historical Hurricane Tracks)

THE INTERVENTION: A project to Improve Climate Data and Information Management

Given the history of increasing storm losses, and with increasing impacts forecast, there was a clear need to improve Jamaica's capacity to monitor, model, and forecast weather and climate. Prior to the start of the intervention, Jamaica's hydro-meteorological system, along with the capacity of the technical agencies to develop and deliver climate services, was under considerable strain. Limited financial resources prevented equipment being maintained or replaced, hindering further expansion or improvement of the network.

The six-year *Improving Climate Data and Information Management* Project was established in 2016, with funding from Climate Investment Funds. The goal of the project was to enhance the availability and reliability of data for climate change scenario modelling, risk analysis, and warning systems. Before the

project, 74% (17 of 23) of the manual and climatological stations were not functioning, and the country's 20-year old Doppler Weather Radar was obsolete. These were upgraded or replaced to become operational, and new equipment added to expand the network. As a result, flood early warning systems were established, and the Caribbean's first real time weather reporting system created. To improve forecasts, high-resolution climate change scenarios were modelled, and 380 people trained on the development, dissemination, and use of weather, climate, and hydrological data. 130 members of the most vulnerable communities were trained in comprehensive Disaster Risk Management and first aid, with 14 disaster risk management plans prepared in collaboration with vulnerable communities. The project fundamentally improved how meteorological (surface and atmosphere) and hydrological observations are collected and used in Jamaica through ten actions (Figure 2).

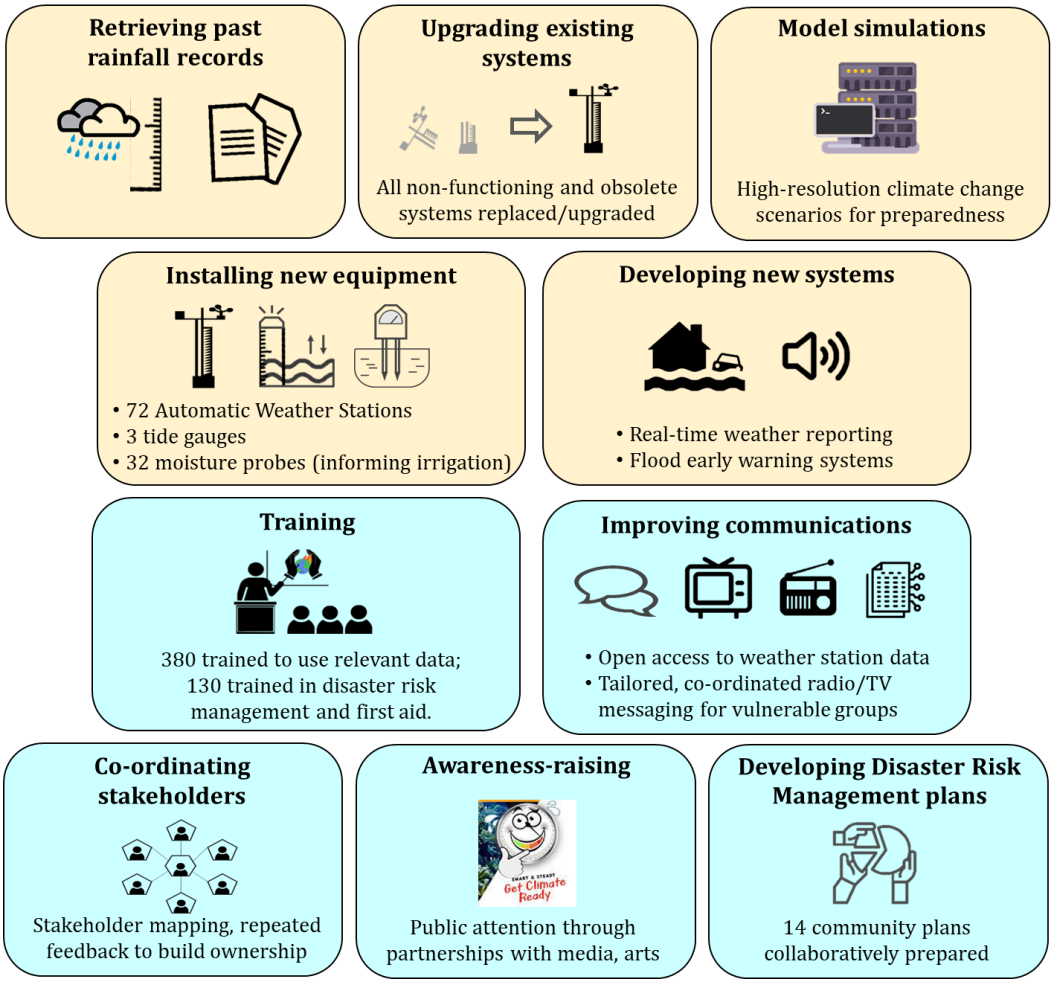

Figure 2: Actions taken to avert potential flood disasters, as part of the Improve Climate Data and Information Management' Project.

The project has served 1.2 million beneficiaries and exceeded Meteorological Service of Jamaica targets for an operational monitoring network by 134%. The improved hydro-meteorological and agro-meteorological data collection and processing makes it easier to forecast when natural hazards will happen, and helps people be better prepared, saving lives, protecting livelihoods, and infrastructure.

COUNTERFACTUAL: Flooding in Jamaica

The Climate Data and Information Management Project, as an intervention, represents a crucial investment in the safety of Jamaica. The number of fatal and damaging flood incidents in Jamaica are reported to have significantly declined as a direct result of Project activities. One of the key interventions was the launch of the Rio Cobre Early Flood Warning System in 2019. The Rio Cobre river runs through Bog Walk Gorge in St. Catherine, and is the historically important site of dramatic and fatal floods with wide-scale damage to housing and infrastructure. The gorge, around 20 km to the northwest of the

capital, Kingston, hosts the main South-North A1 road from Kingston to Ocho Rios, which runs alongside and crosses the Rio Cobre river, making it especially susceptible to flooding.

With this counterfactual, we are considering the effect that the *Improving Climate Data and Information Management* Project has had on reducing the risk of disaster from flood.

As quantitative data on the post-intervention decrease in impacts were not available for this report, we use historical flood impacts to estimate the potential impacts averted. An analysis of flood deaths from 198 events in Jamaica between 1810 and 2010 found an average loss of life of 21 people per event, with an average mortality rate of 0.0021 % per event and a maximum of 0.033 % per event (related to the October 1879 flood that killed 180 people, from a population of 541,000). Analysis of losses during the same time period, found that the average severe flood event cost JM$5.4 billion (US$ 62.1 million), with a maximum of JM$71 billion (US$812 million) or 5.8% of GDP (based on Hurricane Ivan in 2004) [5]. The World Bank has estimated that the return on investments in weather services is at least tenfold [6], suggesting that across Jamaica the intervention has **averted economic losses of ~US$61 million** (nine times the project cost), with **approximately 21 lives and US$ 62.1 million saved** for each severe flood event that is averted. In the absence of an intervention, and with relatively static population growth but increasing GDP, the averaged values for monetary losses saved may be expected to increase [7].

WHAT NEXT?

The project relied on the proactive participation, engagement, and ownership of stakeholders in the project, as well as strong leadership and a very resilient and nimble project implementation unit. Partnerships with other projects was also found to be critical in reaching a wider audience, achieving economies of scale, and avoiding duplication of efforts. These and more lessons learned from the project will be used in implementing further investment projects under Jamaica's Strategic Program for Climate Resilience.

Early warning systems and tailored communication approaches will be expanded so that they can reach larger populations of vulnerable groups. Through the project, technical officers from the Water Resources Authority and Meteorological Service of Jamaica were trained to install and maintain weather stations, and how to read and use the data produced. Their innovative design for secure installation is now being transferred to other Caribbean nations.

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