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# Climate Change Open Data for Sustainable Development: Case Studies From Tanzania and Sierra Leone

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# INTRODUCTION

In Tanzania, the effects of climate change are already being felt. There is an acute awareness of the vulnerability of Tanzania's agriculture sector to the variabilities of changing weather patterns, rainfall intensity, and drought. The adverse impacts of climate change in agriculture sectors with changes in seasonal rainfall patterns have already been documented as shifting agricultural production and productivity and damaging crops. According to the UK Department for International Development (DFID) figures, there is an estimated need of between U.S. \$100 million and \$150 million per year in order to build adaptive capacity and enhance resilience against future climate change to address potential threats to coastlines (from sea level rise), energy supply and demand, health, water supply, agriculture, and infrastructure.<sup>1</sup>

Mainstreaming climate change considerations across the whole of government will be dependent on having appropriate strategies to address climate change, as well as strong implementation agencies working in a coordinated manner with a data-driven approach to ensure monitoring, reporting, and verification.

In 2016, Tanzania passed the Access to Information law<sup>i</sup>, which provides citizens the right to make a request for information—including climate data—from government agencies, however, many stakeholders seem unaware of its provisions and utility. The Government of Tanzania's exit from the Open Government Partnership in 2017, and the discontinuation of efforts to create an open data policy<sup>ii</sup> has created great concern for future open data efforts and other widespread open government reforms.

Interviews and surveys suggest a continued high interest in climate change data and reforms, especially in relation to adaptation. Still, capacity to address government agencies' climate-relevant data collection needs are lacking, as is a harmonized policy approach to open data. Additionally, support for data users to monitor SDG 13 on climate action have not been implemented.

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<sup>1</sup>DFID. 2011. "The Economics of Climate Change in the United Republic of Tanzania."

<https://www.gov.uk/dfid-research-outputs/the-economics-of-climate-change-in-the-united-republic-of-tanzania>

In Sierra Leone, extreme rainfall events, flooding, and the deadly mudslide of August 2017 have intensified national conversations on climate vulnerability and resilience and the role of timely and effective sharing of climate information and data. A rapidly expanding capital city, impoverished informal settlements, deforestation, poor infrastructure, and geographical features have all contributed to these disasters, highlighting the critical importance of integrating climate-relevant data into the larger sustainable development data activities.

Sierra Leone has the highest average annual rainfall of any African country<sup>iii</sup> and is exposed to sea level rise and extreme temperatures. It has made remarkable strides in peacebuilding since the decade-long civil war of the 1990s, which killed over 50,000 people and displaced 2 million.<sup>iv</sup> However, the impact of the conflict is apparent in the residual damage to its infrastructure, the resettlement of populations in unplanned urban areas, and the impact on education and literacy levels, all of which contribute to climate vulnerability and data needs today.

While Sierra Leone has made visible high-level political commitments to open data and transparency through new laws<sup>2</sup> and participation in international fora such as the Open Government Partnership, this case study reaffirms recent research that capacities and commitment to implement these reforms from responsible authorities is limited.<sup>v</sup> Interviews and surveys suggest that progress has been slow towards fully realizing a system of open<sup>3</sup>, high-priority data to inform climate responses.

Government agencies, civil society organizations (CSOs), and the private sector need access to timely, relevant data in usable formats to address the drivers and impacts of climate change and to track progress towards meeting their commitments under the United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement and the Sustainable Development Goals (SDGs). However, climate-relevant data in many countries is often incomplete or irregularly collected, fragmented across agencies, or not made available in interoperable and accessible formats. In less developed countries, this is likely due in part to budget shortfalls and a lack of technical capacity. New channels of finance and capacity building, such as the Capacity Building Initiative for Transparency (CBIT)<sup>vi</sup>, are intended to help address these gaps.

Beyond technical capacity, experts have also noted the need in many countries for greater institutional coordination and coherence between the implementation of the SDGs and the Paris Agreement, to maximize synergies and minimize trade-offs.<sup>4</sup> Both require data-driven approaches, the participation of broad cross sections of society (to “leave no one behind”), as well as capacity building, domestic and international finance, and technology transfer.

Sierra Leone and Tanzania are in the process of assessing progress in the generation and release of environmental data needed for the implementation of the SDGs, but these case studies suggest that more can be done to link these efforts to climate-relevant open data to ensure their long-term viability. The case studies presented below assess (i) whether existing climate initiatives have a robust open data focus, (ii) the types of data sets collected and released, (iii) how a variety of stakeholders are making use of available climate-relevant data, and (iv) the perspective of key stakeholders on the implementation of rules and norms around sharing, publication, and use of climate-relevant data.

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<sup>2</sup> Such as Sierra Leone’s 2013 Right to Access Information Act

<sup>3</sup> Open data refers to data that anyone can freely access, use, and share, without restrictions from copyrights and patents

<sup>4</sup> For example, by developing fossil fuel power plants to meet electrification goals but which lock in a higher carbon trajectory, or by implementing a low-carbon transport plan that does not consider how women and men use transport differently, reinforcing gender inequalities





# TANZANIA: SUMMARY OF FINDINGS

- Tanzania has established a National Technical Working Group on Environment Statistics, coordinated by the National Bureau of Statistics, and has contributed to the UN Expert Group on Environment Statistics as a pilot country in assessing climate-related statistics. Tanzania's Meteorological Agency also produces an annual publication on climate change as an initial effort in the compilation of climate-related data.
- Processes to ensure the inclusion of stakeholders in a dialogue on the needs and use of climate-relevant data are currently weak, and more efforts need to be made to solicit the needs of the community of users to ensure an articulation of prioritization for collection, use, and delivery of the data to meet national and international commitments.
- Based on interviews and survey results, there is a limited understanding by most stakeholders of legislations or rules regarding data release, including Tanzania's new Access to Information law.
- The UN Statistical Division has supported the government of Tanzania to undertake a baseline assessment (based on systematically developed international standards for environmental statistics) of the status of collection of climate-relevant data.
- Government stakeholders recognize the need to address fragmentation of climate-relevant data, including metadata.
- The Government of Tanzania has discontinued efforts to release the country's first open data policy following the government's formal withdrawal from the Open Government Partnership. Moreover, many stakeholders still don't fully understand open data and how it may allow shared approaches to addressing climate change impacts.
- Most survey respondents identified unpredictable weather (including droughts and floods) and deforestation as the most pressing climate issues. The most cited data gaps were access to time series and historical weather data, as well as water access data (quality and quantity). Reasons given were costs of the data, collection deficiencies, and the lack of coordination and release of relevant data sets from ministries and agencies.
- Among environmental, climate, and open data experts in the country, there is a lack of cataloguing and sharing of innovative open data practices to ensure learning and deepening engagement in use of data for impact.
- There are no current efforts to develop climate change legislation; the focus for reform efforts currently is the Environmental Management Act. A regulatory framework is needed to provide important coordination and policy leverage for efforts at the national level on climate change, implementation of the SDGs, and international climate change commitments.
- Most survey respondents—who were mostly from government agencies—felt that an adequate policy framework for climate-relevant data collection and release is currently lacking.
- There is significant need for categorizing and overlaying different types of climate-relevant data for easier analysis, as well as agreeing to schedules for its systematic release to the public in order to have a clear understanding of where climate data fits into a framework of the overall types and uses of sustainable development data.



## SIERRA LEONE: SUMMARY OF FINDINGS

- Based on interviews and surveys with several high-ranking agency officials in charge of managing climate-relevant data, there is a very low level of awareness of Sierra Leone's legal requirement to proactively release data as part of the 2013 Right to Access Information Act.
- The lack of a highly functioning early warning system for extreme weather events was named by several respondents as a contributing factor to the mortality levels from recent flooding and mudslide events. It should be noted that relevant early warning systems were coming online around this time but either had not been officially launched or stakeholder awareness of their existence was low.<sup>5</sup>
- Most survey respondents identified flooding risk and deforestation as the two most pressing climate issues. Relatedly, the availability of up-to-date weather forecasts and rainfall and humidity data were cited as data gaps, largely attributed to insufficient collecting facilities; on the other hand, respondents were evenly split on whether technical resources existed for the government to collect and disseminate climate-relevant data.
- The capacity—including knowledge and software—to interpret certain climate data types, particularly in relation to greenhouse gas (GHG) emissions, was also cited as a need.
- Survey respondents placed just as high a priority on GHG emissions data relevant to mitigation—and in some cases, more—than they did on data relevant to adaptation.
- Despite the existence of an open data portal and a commitment through the Open Government Partnership to share climate data<sup>vii</sup>, most of the uploads in the portal are in PDF format, and many are policy documents, as opposed to data<sup>6</sup>.
- The only data type that most survey respondents marked as low priority was sex-disaggregated demographic data. Statistics Sierra Leone (SSL) does gather this data through the census (most recently in 2015), but it is only made available in PDF form.
- Most survey respondents—who were mostly from government agencies—felt that an adequate policy framework for climate-relevant data collection and release is currently lacking.
- Efforts to strengthen institutions are under way. The Meteorological Department was promoted to an agency, a climate change coordinating committee is headed by the Environment Protection Agency, and multiple agencies are collaborating with international partners to address technical and capacity gaps.

<sup>5</sup> An early warning system (discussed below) was launched shortly after the case study research was conducted

<sup>6</sup> One notable exception is a data set on vegetation and arable land



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# METHODOLOGY

The methodology for these case studies included a desk review of policy documents and other literature, semi-structured interviews with government agencies, civil society, and multilaterals, and surveys that occurred during country visits in October and November 2017. The purpose of the case studies is to explore five central research questions in Tanzania and Sierra Leone in relation to open climate data:

- Is there an adequate legal and policy framework for supporting the collection and release of climate-relevant data?
- What climate-relevant data has been prioritized for collection and release as defined by a variety of in-country stakeholders?
- Do existing in-country climate initiatives have a robust open data focus and what types of innovations can be identified?
- What is the status of implementation of open data rules and norms that can facilitate the sharing, publication, and use of climate-relevant data?
- What are the main capacity gaps and challenges related to the collection, release, and use of climate-relevant data?

Climate-relevant data refers to data sets relevant to either mitigation or adaptation, including emissions, climate, and weather data along with risk scenarios, socioeconomic and other data relevant to resilience, and data tracking the progress of climate policies and plans. The availability of climate data was assessed on official open data portals, and deliberative discussions were held on priorities for the collection and release of open data and current capacity gaps that exist. Interviews with key stakeholders from government, civil society, and international institutions captured experiences from these different perspectives. Each country's Nationally Determined Contribution (NDC) was reviewed, and an electronic survey (found in Annex I) was issued to participants in a national workshop to assess needs and uses for climate data.

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# LIMITATIONS

This research was limited by the availability of online documents and interviews and surveys that took place during three or four-day visits to each country. Survey sample sizes are not large enough for inference, but rather provide insights from practitioners, policymakers, academics, and advocates. In the case of Sierra Leone, survey respondents were predominantly from the public sector. Due to limitations in time, resources, and availability, not all relevant agencies could be reached for input.







# TANZANIA

In Tanzania, the effects of climate change are already being felt due to the variabilities of changing weather patterns, rainfall intensity, and drought. Agriculture is a key driver of Tanzania's economic growth <sup>viii</sup>, contributing 30 percent of GDP and employing over 65 percent of the labor force. Tanzanian stakeholders have consequently identified this sector as one of the most critical for adaptation. Other priority climate change issues include deforestation; water resource depletion and scarcity; and variations and unpredictability in rainfall patterns and dry and rainy seasons, including drought and extreme flooding.

Mainstreaming climate change considerations across the Tanzanian government will require institutions with a clear policy and legal framework to collect and release climate-relevant data related to monitoring, reporting, and verification of climate change commitments. Continued coordination among government institutions, academics, and civil society stakeholders in discussion of systems to prioritize the collection, harmonization, and release of climate-relevant open data is necessary to meet climate change policy goals relevant to the implementation of the SDGs.



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## Policy Considerations for Open Data: Is there an adequate legal and policy framework for supporting the collection and release of climate data?

Climate change considerations are reflected in Tanzania's overall development plans, and there is an acute awareness of the need to increase the capacity to access, analyze, and use climate-relevant data. Tanzania's NDC to the Paris Agreement includes a focus on adaptation and resilience, specifically to address flooding, drought, and sea level rise. Key sectors outlined include agriculture, livestock, forestry, energy, coastal and marine resources, water, tourism, human settlements, and health.

As in many countries, the question of leadership on promoting the collection, disclosure, and use of climate data across a range of topics is a cross-agency responsibility. The National Bureau of Statistics has a newly constituted institutional mandate for the production, coordination, supervision, and dissemination of official statistics, including environmental and climate-relevant statistics within the National Statistics System. The National Bureau of Statistics also hosts the National Technical Working Group on Environment Statistics. The Division of Environment in the Vice President's Office provides coordination support for efforts on climate change and has developed both a technical and a steering committee to coordinate efforts to ensure implementation of [Tanzania's Climate Change Strategy 2012](#).

Two of the objectives of this strategy are specific to information access:

- To enhance public awareness on climate change
- To enhance information management on climate change

While the strategy outlines these objectives, it touches only briefly on changes to information management and disclosure. In addition to the climate strategy, a revised Environmental Management Act is being created to provide a framework for action on the environment. Substantive changes to provisions on climate are not expected in this law, nor is there any current effort to draft a climate change law. The government is currently developing a comprehensive National Adaptation and Health Plan.

International donors are playing a significant role in supporting institutions to collect and use climate-relevant data in decision-making. Academic institutions have research programs that generate an array of data sets, some of which are shared for public consumption. Some of the academic institutions that have played a major role in sharing climate change-relevant information and data include the [Center for Climate Studies at the University of Dar es Salaam](#), the Tanzania [Data Lab project at the College of Information Technologies of University of Dar es Salaam \(water data\)](#), and the [Sokoine University of Agriculture National Carbon Monitoring Centre](#).

In 2015, the government passed a statistics act that provides guidelines to the production, coordination, supervision, and dissemination of official statistics. The act includes rules requiring authorization to produce official statistics as well as penalties for those who abuse and misuse official statistics. There is demand from civil society and non-state actors for the development of easy-to-follow guides for producing and disseminating official statistics, in order to address the implications of how they collect data relevant for development.<sup>ix</sup>

In addition to this development, a new Access to Information law was passed in 2016 that provides a framework for both proactive disclosure of data from the government and reactive requests by members of the public. Unfortunately, the proactive disclosure requirements are quite weak in the obligations provided and make no mention of specific sector-relevant data to be released.

In addition, implementing regulations have still not been passed nor an implementation schedule and plan prepared. Civil society have also criticized the act for failing to provide an independent appeals mechanism and mandatory provisions to promote training of public sector officers as well as increased public awareness of citizens' rights under the new law.<sup>x</sup>

An Open Data Readiness Assessment of the Tanzania government has been prepared under the auspices of the World Bank. The Draft Open Data Policy included a definition of what open data means and set institutional mandates for operationalizing open data, acceptable formats for data/metadata, requirements for a government-wide open data portal, and identification of licenses that government will use for its open data approach. As this policy remains in draft, this is likely to have an impact on the release of climate-relevant data because of the broad scope of data needed for climate change policy and decision-making.

The release of climate data is also likely hampered by these factors:

- There is no mandatory requirement for agencies to share their data with the National Bureau of Statistics.
- While quality standards for collection of environmental information have been established, they do not specifically address climate-relevant data in enough detail that would support requirements for monitoring and verification that are adequate for meeting national or international commitments.
- Sharing climate-relevant data across agencies requires coordination and medium-term technical and institutional capacity improvement in a variety of agencies holding different climate-relevant data sets.

Interviews and surveys indicated that many agencies have not conducted a complete assessment of their catalogues and data sets and thus are not able to make decisions on sharing and release. There is also a clear gap in strategy on how to engage stakeholders outside of government in a dialogue on this issue.

The Bureau of Statistics is in the process of developing guides for government and civil society to collect statistics and develop a master plan on environmental and geospatial statistics, including templates for the collection of survey data. The bureau will also lead discussion on how to use, upload, and release data sets. Discussions on the aggregation of data to support development priorities are aligning with and contributing to the development of a sustainable development road map, which is expected to evolve further as part of the National Reporting Platforms work and the next Tanzania strategy for development of statistics. An open data policy framework would assist in this regard, but this effort has not been continued.

Tanzania therefore provides an important test case on open climate data, as there have been significant first steps taken in providing academic institutions with the capacity to collect and use climate data. Based on interviews and surveys, civil society is eager to request and use climate-relevant data from the government. There are data entrepreneurs, with open data hubs and a data lab at the University of Dar es Salaam, that are experimenting with the use and visualization of data, and government institutions—particularly the National Bureau of Statistics—have already begun identifying key data sets and assessing production and use.



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## Data Types: What climate-relevant data sets have been prioritized for collection and release addressing climate changes as defined by a variety of in-country stakeholders?

There are many views on the need for prioritization of collection of climate change-relevant data in Tanzania when discussing the Sustainable Development Goals. There is clarity that climate-relevant data extends well beyond Goal 13 (Climate action) and Goal 7 (Affordable and clean energy). It is also recognized that there is potential alignment between 154 of the 169 SDG targets that may be relevant for the implementation of its NDC under the Paris Agreement.

In other words, climate change data includes data from a vast array of different sector areas such as energy, transport, emission, land use, and others. This makes the issue of releasing open data for climate change a difficult concept for many stakeholders to understand (in terms of expectations of how to track and use this data both in scale and scope) and reduces clarity on which ministries and agencies have new initiatives to collect and release climate change data to the public.

The Tanzania National Bureau of Statistics has begun to coordinate the collection of environmental statistics, which is still in an early stage of development. With help from the [UN Statistical Commission](#), it has implemented a questionnaire to determine a baseline assessment of the types of climate data collected by agencies across government.

The questionnaire collects data on (i) climate drivers, (ii) climate change evidence, (iii) climate change impacts and vulnerability, and (iv) mitigation and adaptation. Although the baseline does not identify release of data or the form that the data is currently held in, it is a first step in the process of prioritization of data. While results are yet to be officially released, there is a clear indication of the need for increased data collection across all categories.

A related work component involves assessing data availability for reporting on Tanzania's National Five-Year Development Plan (2016/17-2020/21), and mapping these with the SDGs to report on over 200 indicators. The National Bureau of Statistics has a commitment to coordinate with ministries and agencies through a National Technical Working Group on Environmental Statistics. Key capacity gaps include collecting of environmental statistics and metadata, coordination of collection efforts across agencies, enforcing delivery of data to the bureau, technical expertise in collecting the data, timeliness of data, and ascertaining data producers within agencies. The question of opening the data for public use also needs to be addressed at this stage of the effort.

### KEY INITIATIVES

A baseline assessment was carried out for all line ministries evaluating the status of collection of climate data in Tanzania, based on UN statistical agency guidance.

## Data Types: What are some specific data types and data sets that you have found to be especially important in addressing climate change?

Both government and civil society use climate-relevant data in their work, and the demand for further expansion and release of data is significant, based on the interviews conducted. In-country stakeholders from both government and civil society defined a variety of priorities for the collection and release of open climate-relevant data within the context outlined in Figure 1:

*Figure 1: Climate-relevant data sharing priorities in Tanzania*

<b>Categories of data used by stakeholders</b>	<b>USES OF DATA</b>
<b>FOOD SECURITY</b>	CLIMATE DATA TO INTERPRET FOOD SECURITY RESULTS
<b>METEOROLOGICAL DATA</b>	AS AN EARLY WARNING SYSTEM FOR PORTS AND VESSEL CHANGES IN WEATHER PATTERN FOR FARMERS RAINFALL ATTENUATION (SEASONAL)
<b>ENERGY</b>	COOK STOVE USE DATA AND HOUSEHOLD USE HYDROPOWER DATA AND IMPACT OF CLIMATE CHANGE
<b>AGRICULTURE</b>	PREDICTION OF AGRICULTURAL PRODUCTION AND FORECASTING OF PRICES, CROP WATER REQUIREMENTS, PASTURE PATTERNS
<b>INFRASTRUCTURE DESIGN</b>	RISK TO INFRASTRUCTURE FROM RAINFALL, TEMPERATURE, OIL AND GAS EXPLORATION/ PIPELINE
<b>WATER</b>	WATER TARIFF SETTING/ USE OF WATER /AVAILABILITY OF WATER SERVICES
<b>WILDLIFE/BIODIVERSITY/ FORESTS</b>	DEFORESTATION/REFORESTATION/TREE PLANTING, PLANNING FOR PLANTING, AND HARVESTING TREES
<b>CONFLICT</b>	DATA ON CONFLICTS OVER PASTURE LAND, WATER USE
<b>VULNERABILITY</b>	LOCAL COMMUNITIES' VULNERABILITY (LIVELIHOODS AND IMPACT OF CLIMATE CHANGE)
<b>SEA LEVEL RISE</b>	IMPACT OF SEA LEVEL RISE, OCEAN IMPACT ON LAND
<b>BUDGET</b>	BUDGET PLANNING AND EXPENDITURE
<b>VERIFICATION DATA</b>	DATA TO VERIFY PROGRESS ON NDC AND SDG GOALS IS LIMITED



Survey and interview respondents indicated that a potential data user's perspective is one that is central to any prioritization effort. Stakeholders found it difficult to set overall priorities across all sectors; however, there was a strong consensus that increasing open access to meteorological data should be made a priority by government. Stakeholders are interested in statistical data that speaks to performance and real-time data relevant to climate and climate risk scenarios as a priority. This also includes access to data on service delivery and data that is geocoded to present situations in regions or lower geographical and administrative units.

Most stakeholders recognized that it is a challenge to make climate-relevant data and information useful to communities in terms of policy-related data, technical data, and budget data. There are few studies that identify how open climate data is collected, used, or analyzed for insights.<sup>7</sup>

Based on interviews, while both civil society and government collect and publish climate-relevant data for use by citizens, their use of this data to address specific needs is not clear, nor is there clarity on how to create an external demand for data. Analytics on the use of the e-government portal and the open data portal are not available online.

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## Climate Open Data: Do existing in-country initiatives have a climate and open data focus?

There are several initiatives of government and civil society that stand out as having potential for sharing climate open data.

### Meteorological Data:

The Tanzanian Meteorological Agency has made strides in data sharing despite capacity constraints. Its website has a data analysis tool called MAPROOM <http://maproom.meteo.go.tz/maproom/> with meteorological data, and it has created new programs using SMS text messages to get its data into the hands of agricultural users. Information is shared on an online platform and through SMS services on all the meteorological parameters available and useful to registered local stakeholders.

As there are 180 districts it is difficult to provide information to all of them, especially in relation to the agriculture sector in each district. Meteorological data is the most in-demand by stakeholders because of past droughts in Tanzania but it is also the most difficult to obtain due to some limitations on obtaining time series data over many years.

### Flooding and Resilience:

Civil society organizations and communities, through a project led by Humanitarian OpenStreetMap (HOTOSM), are collecting flood-related open data across Dar es Salaam, recording areas that are historically prone to floods, areas with solid waste dumping which may result in floods, and capturing data to save people's lives. They are mapping the city as part of a flood resilience program. Because much of Dar es Salaam is part of a floodplain and the city is growing at a very fast pace, with unplanned settlements in swamp areas with lots of new infrastructure, this increases its flood risk. The city mapping will include drains in the city and areas of risk, all mapped by students and residents using a mobile Android interface.

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<sup>7</sup>One example of an analysis of climate change-relevant data is the work of ForumCC on climate finance tracking <http://forumcc.or.tz/publications/4-climate-finance-tracking-for-agriculture-and-livestock-sector-ministries-in-tanzania.html>

**REDD +:**

The Sokoine University of Agriculture has been designated as a REDD National Carbon Monitoring Centre. The center was launched in 2014 and includes pilot projects that collect data on carbon emissions from deforestation and land degradation as part of the measurement, recording, and verification (MRV) process to enable results-based payments through REDD+. Data from the center has been used in public reports submitted to the UNFCCC climate change convention.

The center continues to produce and release data—through maps showing carbon emissions from different sources. Data is shared with government agencies, although a long-term dissemination strategy has yet to be put in place. Users need capacity-building support to use the data for decision-making and follow up, including through the national REDD strategy and implementation plan.

**Tanzania Data Lab:**

The University of Dar es Salaam Data Lab's (dLab) mission is to develop skills that will support data analysis and use of open data in Tanzania to improve people's lives. The dLab specifically supports monitoring progress to meet the SDGs. While climate data has not been a stated priority for the dLab, its work on gender empowerment and water are important contributions to support understanding of data and its potential use as a tool to address climate risks and adaptation.

**Climate Risk Scenarios:**

In 2016, the University of Dar es Salaam's Institute of Resource Assessment created a decision support tool for the Rufiji Basin that allows the user to review various climate scenarios. Its purpose is to guide decision-making around adaptation and sustainable natural resources in the basin. It includes data on climate, rainfall, and water use. As of publication, it had yet to be piloted in Tanzania.

**World Bank Country Environmental Analysis:**

The World Bank is developing a Country Environmental Analysis in order to take stock of the most important environmental issues facing Tanzania and to understand the risks these issues pose to the economy. It will assess which data types are collected—while also assessing stakeholders' priorities for specific data and information on deforestation, water quality, biodiversity loss, land degradation, mining, pesticides, urban risks, waste streams, and air pollution. Climate change is considered cross-cutting, though this effort will assess the quality and quantity of data that exists and whether any of it is open and relevant for sharing. It will develop conclusions on key issues that are priority for additional data analysis and how the data may be useful for decision-making.

**Tanzania Knowledge Network (TAKNET):**

[TAKNET](#) is an online portal of the Economic and Social Research Foundation (ESRF) that helps bring together academic and other researchers to share the latest information on economic growth and development. Although data is not shared in open data formats, the network has become a platform for sharing information on climate change adaptation between researchers.

**ForumCC Climate Open Budget Analysis:**

[ForumCC](#), a civil society coalition working on climate change advocacy, has used open data to initiate climate finance tracking analysis of the budget for the agriculture sector and livestock sector in Tanzania. ForumCC has a focus on information awareness and dissemination and is an active promoter of increased access to climate data.



## Data Sharing and Coordination: Through what means are government institutions sharing climate data?

In 2015, Tanzania signed an Open Government and Public Financial Management (OGPFM) credit with the World Bank Group to support work on open budgeting and opening data sets related to education, water, and health. Support was provided to the National Bureau of Statistics, the e-Government Agency, and other ministries to supply such data and create an open data portal. The World Bank conducted an Open Data Readiness Assessment, which supported a draft open data policy. Unfortunately, development of the policy has been stalled since reprioritization of other efforts by the new government in 2016-17.

Tanzania is one of the first African countries that committed to facilitate open data under the Open Government Partnership (OGP). Tanzania's [open data portal](#) is a direct result of the country joining the OGP and a commitment through their National OGP Action Plan 2012-13 and Action Plan II 2014-16 to "promote increased access to information about government operations and publish data on the prioritized sectors of health, education, and water." This work, supported by the World Bank and other donors, has been managed by the National Bureau of Statistics (NBS) with support from the Ministry of Finance, e-Government Agency, and National Archive Department under the President's Office Public Services Management and Good Governance group.

The open data portal contains more than 160 data sets, 21 of which are on water. Some of the water sector data sets are likely very useful to address climate change adaptation, including infrastructure dam development, rural access to water, number of boreholes, water points, water sources, and community-owned water supply data.

Although there are no specific data sets related to climate on the portal, its structure allows expansion to include additional data sets. A policy process to expand the number and type of data sets on the platform is required for further investment in the portal. Uncertainty remains as to the long-term existence of the portal due to curtailed development of an open data policy that followed Tanzania's recent withdrawal from the OGP.

*The Tanzania Meteorological Agency has begun to package its data so it can be used by different user groups and is not limited to researchers.*

*It shares data with farmers in local areas through SMS messaging systems to support decisions on farming practices.*



There have also been separate efforts to create a website dedicated to climate change data by the government. Civil society representatives indicate there had been targeted action to share climate data sets on this website but the portal was not maintained and finally was removed within a year of being developed. There is currently no central platform for the sharing of climate relevant geo-referenced data in Tanzania.

## TANZANIA'S OPEN DATA PORTAL INCLUDES **21** DATA SETS ON WATER RELEVANT TO CLIMATE CHANGE.

There are a few government agencies that publish climate-relevant data on portals; however, the initiatives/efforts are fragmented across a multiplicity of different agencies and not all published data is in open data formats. A general e-government portal also exists for data across all government that was part of the OGP efforts in Tanzania but does not contain climate data sets. (<https://tanzania.go.tz/>).

Key challenges to the release of open climate data include the following:

- ☒ Declining political support for open data and transparency
- ☒ Lack of prominent focus on coordination mechanisms
  - to ensure the involvement of external stakeholders
  - to ensure their understanding of plans for agencies to collect and release climate-relevant data

The withdrawal of Tanzania from the Open Government Partnership is viewed by many stakeholders as likely to have long-term consequences on the future of open data efforts.





# Capacity: What capacity gaps exist for the collection and release of more climate data in Tanzania?

The survey results indicate that the majority of respondents (68 percent) do not believe that the existing policy framework for the collection and release of climate-relevant data is adequate. The surveys and interviews helped to identify capacity gaps that exist to address the collection and release of climate data. Financial capacity gaps as well as technical needs were identified that could be supported by international partners. The table below provides a summary.

*Figure 2: Capacity needs in Tanzania*

<b>Capacity gaps in relation to the release of climate data</b>	<b>Actions Needed</b>
<b>Quality of specific data sets (historical and real-time data), frequency, consistency</b>	Policy framework for sharing data and capturing data needed, as well as tools and capacity
<b>Availability</b>	Civil society not using Access to Information law to access data
<b>Availability—when available, data is not open or free or publicized</b>	Advocacy and awareness of open data needs to be increased internally and externally in government
<b>Cost of data acquisition</b>	Fee policy to be reviewed by stakeholders, especially for non-commercial use
<b>Complexity of data that is available</b>	Visualization and sharing of data in forms that can be understood
<b>Data not in open formats and not included on open data portal as a mandatory requirement across agencies</b>	Data portal needs to be referenced in a policy mechanism for sharing data, and data sets need to be shared by various governments based on needs assessment
<b>Coverage or comprehensiveness of data</b>	Data collection policy needed on key climate data sets
<b>Awareness of CSOs of open data and its use</b>	Partnerships between Tanzania Data Lab and environmental/ climate CSOs to analyze and use climate data
<b>Limited availability of geolocation or high-resolution data</b>	Assessment of use of international tools and international partnerships to address this shortcoming
<b>Weak coordination across government, academic, and civil society stakeholders on climate and open data needs and requirements</b>	Collaboration processes with clear institutional leads for climate technical group and civil society
<b>Lack of data granularity</b>	Metadata standards
<b>Outdated or partial data or lack of timely data</b>	Financing for data collection and proactive release standards
<b>Priority data sets not collected by government, only academia</b>	Data collection standards



## SIERRA LEONE

Sierra Leone's pathway towards sustainable development has been stymied by a decade-long civil war, the 2014 Ebola outbreak, a plunge in mining revenues on which it is reliant, and multiple disastrous floods. These events have taken lives, displaced communities, destroyed infrastructure, strained institutions, and delayed developmental gains.

Over half the population lives on less than \$1.90 a day<sup>xi</sup>, and gender inequality is manifested in the literacy rate—with men at 59 percent literate and women at 44 percent.<sup>xii</sup> Sixty percent of the population is employed in the agricultural sector, which is predominantly rain-fed. The conversion of forest to farmland, along with a high dependence on fuelwood, contribute to deforestation, accounting for more than half of Sierra Leone's carbon emissions.<sup>xii</sup> Sierra Leone receives the most annual rainfall of any African country, and this, combined with deforestation, poor housing and drainage infrastructure, and unplanned settlements means the country is particularly vulnerable to flooding and mudslides.

To address these challenges, decision-makers need free and easy access to data that they can use to inform their policies, plans, budgets, and emergency responses. The private sector—which often produces climate data as well—needs access to climate-relevant data to guide investment decisions. Finally, civil society and the public need access to data to understand and communicate risks to those who are not data literate, to monitor progress, and to advocate for government or corporate action.



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# Policy Framework

## Policy Considerations for Open Data:

### Is there an adequate legal and policy framework for supporting the collection and release of climate data?

Sierra Leone currently lacks a framework climate change law and while it apparently completed its National Climate Change Policy in 2017, that policy has not been made available online. Sierra Leone's Intended Nationally Determined Contribution (INDC)—submitted to the UNFCCC ahead of the Paris Agreement—identifies data collection, processing, and communication as a capacity building need, but does not indicate expectations for these responsibilities across national agencies. Sierra Leone's latest development plan—the 2013-2018 Agenda for Prosperity<sup>8</sup>—alludes only briefly to climate change and does not set any expectations for using climate data in development planning.

Sierra Leone's 2013 Right to Access Information Act<sup>xiv</sup> establishes the right for every person to access information held by public authorities, defined to include data. Section 8 of the act requires public authorities to proactively publish information that they hold, as well as procedures, plans, responsibilities, and other relevant information. Based on these provisions, public authorities are required to publish any climate-relevant data they hold. Of the 10 respondents (the majority from government) who indicated that they had requested data, fewer than half had received the data they requested.

However, survey responses from several lead agencies, including the Meteorological Agency, the Environment Protection Agency, the Ministry of Energy, Statistics Sierra Leone, the National Telecommunications Commission, and the National Protected Area Agency suggest a very low level of awareness of this mandate, as not a single respondent was aware of rules requiring the publication of climate data or publicizing data in open formats.

Sierra Leone joined the Open Government Partnership in 2014 and in its 2016 National Action Plan committed to "Providing user-friendly data and information on climate change action" for "empowering the citizen with climate change information in an open data format and [also tracking] the policy implementation on gas targets, renewable energy, and forest restoration, clean mobility, green buildings, and other policy goals and targets".<sup>xv</sup> OGP commitments are not legally binding, but in the best case can indicate high-level political support. In late 2017, the government issued a progress report stating that the commitment had been successfully implemented. However, the description of the results suggests that the final scope for the commitment was scaled back from what was originally envisioned:

Description of commitment results<sup>xvi</sup>:

- Training workshop and consultation meeting on the monitoring, reporting, and verification systems has been conducted for relevant ministries, departments, and agencies (MDAs), CSOs, and local councils.
- MOU has been drafted between the Environment Protection Agency (EPA) and the Ministry of Energy on energy data.
- Training workshop was conducted that looked at the different measurable indicators and information flow from key expected sectors.
- Intergovernmental Panel on Climate Change brochure and brochure on the mandate on climate change Secretariat have been developed and circulated.
- The climate change policy has been simplified. The strategy and action plan have been developed and submitted to board members. Newsletters have been developed but not on quarterly basis.
- Monthly radio and quarterly TV programs on climate change-related issues have been conducted.

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<sup>8</sup> As of January 2018, this was the most recently released development plan

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## Coordinating Committees

Interagency committees are widely viewed as good practice to promote coordination, data and information sharing, knowledge exchange, and peer monitoring to ensure key agencies are following through with their responsibilities. However, the effectiveness of such bodies often depends on the incentives and capacity of members to participate and the authority of the lead body to compel or promote accountability.

Sierra Leone has recently formed a National Climate Change Coordinating Committee, headed by the EPA. Participating MDAs include Agriculture, Energy, Transport, Water, Meteorological, Finance, and Land Country Planning. Also included in the coordinating committee is a (sole) representative from civil society, the Women's Network for Environmental Sustainability. Notably absent is Statistics Sierra Leone, even though the agency has an environment division and plays a key role in developing data capacity to meet the Sustainable Development Goals.

According to the EPA, the committee is focused on implementing a vertical approach to building climate resilience, involving communities in decision-making and developing mainstreaming guidelines for agencies to access climate change finance. As of November 2017, the committee had met three times, according to the EPA. When discussing the committee, one participating agency highlighted challenges, such as the limited capacity of the EPA, the lack of a mechanism to enforce information sharing, and other coordinating functions. However, this same respondent noted the presence of institutional desire to coordinate more effectively.

In 2015, the government of Sierra Leone created an interagency Open Data Council, but as of 2017, there was no membership overlap with the National Climate Change Committee, possibly explaining the low levels of awareness of open data rules among climate change data holders.<sup>9</sup>

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## Priority Data Sets

### **Data Types: Which climate-relevant data sets have been prioritized for collection and release to address climate change as defined by a variety of in-country stakeholders?**

While Sierra Leone has made a negligible historical global contribution to climate change, it is vulnerable to its impacts, both from exposure to extreme weather, sea level rise, and disease vectors, as well as limited adaptive capacity from being a poor nation. As the country grapples with implementing policies and actions that support sustainable development through low-carbon pathways while simultaneously building climate resilience, data producers need to make resource allocation decisions to collect and disclose data sets that are high priority. High priority may mean that there are identified users of the data, that the data directly informs policies or practice, or that the data is reported to the UNFCCC and made transparent to other parties.

Sierra Leone's INDC identifies the need to produce an updated greenhouse gas inventory, which has not been produced since 2000, and projections for the future emissions have not been produced. Sierra Leone has not yet produced a National Adaptation Plan, so the most comprehensive publicly available national document is its Second National Communications to the UNFCCC.

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<sup>9</sup> The World Bank Group and OpenAid Partnership. 2016.

"Open Data Readiness Assessment: Prepared for the Government of Sierra Leone."









As mentioned, Sierra Leone’s population is highly dependent on agriculture for its livelihoods, which are in turn vulnerable to the timing and duration of rainfall and heat waves. Due in part to destruction during the civil war, Sierra Leone is still rebuilding its capacity to collect granular data on weather patterns to provide farmers and communities with up-to-date and useful forecasts. Sierra Leone also lacks radar to provide more accurate forecasts of Atlantic storm systems. Several interviewees noted this need and suggested it contributed to the poor preparation during flooding events. However, some interviewees expressed doubt that holders of relevant climate and weather data were making data that been collected readily accessible for others to use.

In the surveys, the most commonly cited climate change problems were deforestation, extreme rainfall, flooding, and landslides (all interlinked issues). Mentioned to a lesser degree were heat waves, waterborne illnesses, and changes in the timing and duration of rainfall. Sea level rise was mentioned once. When respondents were asked to indicate which data sets they considered high priority, the most highly prioritized data sets for climate adaptation and resilience were data on percentage of the population with access to a disease vector early warning system, data on populations living in areas vulnerable to storm surge or flooding, and data on major crop yields under different warming scenarios.

Respondents were also invited to suggest other data types; multiple respondents suggested data on natural capital stocks—such as fisheries, minerals, and ecosystem services. The only data type that most respondents indicated as low priority was sex-disaggregated demographic data. While it’s well established that climate change has gendered impacts, and Sierra Leone clearly has gender disparities in development indicators, it’s possible that this data is perceived as already collected and communicated effectively.

Perhaps surprisingly, mitigation-relevant data—such as total emissions, emission drivers, land conversation rates, and energy consumption, were regarded as high priority by just as many—and in some cases, more—respondents as adaptation-related data. One exception is emissions from agricultural data, which a slight majority of respondents indicated was low priority.

Table 1: Prevalence of climate change impacts and problems in survey responses

Climate Change Problem (Driver or Impact)	Frequency of Mention in Survey Responses	
Extreme rainfall		Frequent
Deforestation		Frequent
Flooding		Frequent
Landslides		Frequent
Heat waves		Sometimes
Waterborne illnesses		Sometimes
Rainfall variability		Sometimes
Sea level rise		Rarely



*Table 2: Prioritized data types in Sierra Leone*

<b>Data Type</b>	<b>Data Use</b>
<b>Meteorological data (temperature, rainfall, storm systems)</b>	<ul style="list-style-type: none"> <li>• As an early warning system for coastal and agricultural communities</li> <li>• Changes in weather pattern for farmers</li> <li>• Changes in the national cropping calendar</li> <li>• Timing and duration of rainfall</li> </ul>
<b>Energy consumption type, aggregated and disaggregated</b>	<ul style="list-style-type: none"> <li>• Household dependence on fuelwood and charcoal</li> <li>• Geospatial data for renewable energy citing</li> <li>• Renewable energy share as portion of total consumption</li> </ul>
<b>Agriculture</b>	<ul style="list-style-type: none"> <li>• Projected crop yields under different warming scenarios</li> <li>• Climate change impact on crop pest populations</li> <li>• Climate-resistant crop varieties and cropping pattern.</li> </ul>
<b>Natural resource extraction</b>	<ul style="list-style-type: none"> <li>• Data on stocks of mineral, fisheries, ecosystem services</li> <li>• Environmental impact of mining activities on water and soil quality</li> <li>• Emissions data for mining sector</li> </ul>
<b>Water resources</b>	<ul style="list-style-type: none"> <li>• Stream and river levels and quality</li> <li>• Condition of water point sources (wells and taps)</li> <li>• Types of irrigation facilities</li> </ul>
<b>Forests and land use</b>	<ul style="list-style-type: none"> <li>• Deforestation rates</li> <li>• Geospatial data on forest use</li> <li>• Land use change emissions</li> <li>• Alternative livelihoods to reduce pressure on forest exploitation</li> </ul>
<b>Vulnerability</b>	<ul style="list-style-type: none"> <li>• Demographic and geospatial data overlays to understand vulnerability to flooding, storm surge, and other climate risks</li> </ul>
<b>Budget</b>	<ul style="list-style-type: none"> <li>• Expenditures marked for adaptation and mitigation activities</li> </ul>

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## Climate Open Data Initiatives

Sierra Leone's open data initiatives—such as Open Data Sierra Leone, Open Data Council of Sierra Leone, and the virtual Open Data Collaboratives—as well as other ongoing efforts by MDAs with climate prerogatives seem at this juncture to be developing independently. In other words, MDAs producing and using climate-relevant data are not using Open Data Sierra Leone to disseminate their data, but rather are developing their own portals and platforms, often in collaboration with international partners. While it may be more functional to have separate sites for separate purposes, there is currently no website that directs the user to the relevant portal, repository, or map to find whichever type of climate-relevant data that one seeks.

Arguably more important is that Sierra Leonean climate data producers and users be aware of one another's efforts and can avoid replication and develop synergies around data sharing and platform use. Two recent examples of collaborative innovations have come online in 2017 and are described below.

### Salone Water Security Website and Data Portal

Sierra Leone's Ministry of Water Resources recently launched the [www.salonewatersecurity.com](http://www.salonewatersecurity.com) website to serve as a focal point for national policies, strategies, legislation, and regulation on water resources management and security. In itself, this is useful, and unusual in the Sierra Leone context. But it also serves as a repository for hydrological data sets and geospatial data, as well as hydrometric data from networks of gauging stations that the ministry has collated, quality controlled, archived, and published. This data is open and free to download or view online. It includes historical and current data on rainfall, surface water, and groundwater.

As part of a larger project to evaluate all 28,000 improved water points in the country, the ministry surveyed members of the public on their impressions and experiences of the water system and made this information available online. Proactively soliciting and publishing feedback can help to build public trust and involvement in water resources management. These efforts demonstrate that while some climate-relevant data can be obtained from global sources—such as satellite data—some data sources can only be retrieved through direct monitoring and observation.

### Climate Information, Disaster Management, and Early Warning Systems (CIDMEWS)

In 2017, Integrated Geo-Information and Environmental Management Services developed and launched the [Climate Information, Disaster Management and Early Warning Systems](#) to provide tools and web services for collecting, managing, visualizing, mapping, and analyzing climatological, hydro-meteorological, disaster management, and early warning information to better understand climate and weather information over time and provide timely early warning information to avoid disasters. <sup>xvii</sup>

The platform, which was developed in partnership with the government of Sierra Leone and the United Nations Development Programme, seeks to enhance the technical and technological capacities of the primary MDAs in charge of disaster management and early warning—the Meteorological Agency, the Environment Protection Agency, the Ministry of Water Resources, and the Office of National Security Disaster Management Department.

## Capacity: What capacity gaps exist for the collection and release of more climate data?

The surveys and interviews helped to identify what the Sierra Leonean government authorities viewed as the capacity gaps that their institutions faced in responding to climate challenge. As Sierra Leone is a low-income country, financial capacity gaps are to be expected. But respondents identified other types of capacities that could be supported by international partners.

*Table 3: Sierra Leone capacity gaps for climate data sharing*

Identified Problem	Capacity Support Needed
<b>EPA relies on outside consultants to conduct technical assessments such as national communications to UNFCCC</b>	Develop technical capacity (understanding of methodologies and emission factors) to develop in-house
<b>Meteorological Agency lacks radar and other necessary equipment for data collection</b>	New initiatives (above) providing support; gap should be addressed through climate finance
<b>Sharing of climate-relevant data and information is not consistent or enforced</b>	High-level political attention may be needed to prioritize. Climate has never appeared as a priority in development plans and environment agencies often lack political capital.
<b>Low literacy rate; limited number of civil society engaged in climate issues</b>	Data portals like the ones above are useful for those who have internet access—less than 20 percent of the population—and those who are data literate. Intermediaries and data communications strategies are important to help affected communities understand the importance.
<b>Formats are not in open data and not included on open data portal as a mandatory requirement across agencies</b>	Much of the “data sets” on Open Data Sierra Leone are in fact PDFs and very little environmental or climate data is included. This portal should link with other climate data efforts.
<b>Unclear roles and responsibilities or overlap of efforts</b>	A climate framework law could establish clarity of roles, set clear expectations, and establish a finance mechanism
<b>Availability of geo-location or high-resolution data is limited</b>	An assessment of the use of international tools and international partnerships would address this shortcoming
<b>Challenge in developing greenhouse gas inventories</b>	Support from international partners and MRV capacity building is needed
<b>Agro-climatology data collection instruments in the Ministry of Agriculture Forestry and Food Security (MAFFS) are limited</b>	Updating of the e-station in the Planning, Monitoring, and Statics Division (PEMSD) for remote monitoring of climate data is needed, as are the rehabilitation and construction of new manual weather stations in all agricultural stations and the establishment of automatic weather stations in all district headquarters.
<b>Technical capacity to collect, analyze, and disseminate agro-climatology data on timely basis is limited</b>	Conduct training of M&E, agricultural statisticians, and engineering staff of MAFFS





## CONCLUSION: LINKING CLIMATE DATA TO SDG DATA MOVEMENTS

To ensure a data environment for achievement of the Sustainable Development Goals in terms of climate data will be challenging in both countries. There is work that needs to be done at the policy, coordination, and capacity building levels to ensure that data can support achievement of the SDGs. Greater institutional coherence between agencies implementing data capacity building and open data efforts is needed to ensure that innovations are shared more widely and rules are enforced. These coordination mechanisms can work between agencies to allow them to share experiences, successes, and failures.

At a minimum, standards for data collection need to be created that support stakeholders' need for climate data and allow verification and monitoring of climate commitments. A secondary need is to build awareness and understanding between institutions of their roles and responsibilities in relation to climate data and how this relates to laws and policies on access to information and open data.

There are many academic experts and data experts in Tanzania that have both the capacity and the interest to facilitate understanding and use of climate data, as well as donors in this field who could work more closely together to push for harmonization of data for decision-making. In Sierra Leone, a more open and inclusive climate change policymaking and implementation process could bring a wider range of civil society actors into the process. Given that climate must be confronted as a sustainable development problem, it's critical that they be addressed jointly.

The Tanzania open data platform is an exciting initiative that should not be wasted. It offers an opportunity for data experts and academics to facilitate use of data for decision-making. However, the lack of a method to harmonize and aggregate data may hamper its use for climate-related decision-making. Demand for more data, which would support the continued need for the open data portal, is unfortunately lacking. Investment in training for data analytics both within civil society and government is needed.

In Sierra Leone, 2017 brought two new open data efforts to share, visualize, and analyze water resources and early warning information. In fact, the Salone Water Security site contains far more open data sets than the Sierra Leone Open Data portal. It may be a model for making climate-relevant data more accessible and useful.

In Tanzania, close coordination between the Bureau of Statistics and the Division of Environment at the Vice President's Office will be essential to deliver on open data for climate objectives, as will be a more participatory approach to the involvement of civil society. There is exciting potential for open data to support attempts at adaptation in Tanzania but increased political support for open data and implementation of open government reforms more generally will be essential to ensure future success, as will investment in how the government and stakeholders generate, produce, and disclose data.

For Sierra Leone, greater institutional investment and political support may be needed to ensure the National Climate Change Committee is able to fulfill its critical purpose of coordinating climate change information production, management, sharing, and use. Given the country's context as a peacebuilding state emerging from a public health crisis, weak institutional capacity is understandable. There appears to be appetite—at least from bureaucrats—to strengthen their data and information systems and work more collaboratively.

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# Annex I: Climate Change and Open Data Survey Instrument

See appended PDF

- <sup>i</sup> <http://www.freedominfo.org/wp-content/uploads/Tanzania-Access-to-Information-Act-2016.pdf>
- <sup>ii</sup> <https://www.nbs.go.tz/nbstz/documents/Open%20Data/Open%20Data%20Policy%20draft%20Final%20final.pdf>
- <sup>iii</sup> The World Bank: Data. [https://data.worldbank.org/indicator/AG.LND.PRCP.MM?year\\_high\\_desc=true](https://data.worldbank.org/indicator/AG.LND.PRCP.MM?year_high_desc=true)
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- <sup>viii</sup> <https://www.usaid.gov/tanzania/economic-growth-and-trade>
- <sup>ix</sup> <http://www.twaweza.org/go/stats-act-analysis>
- <sup>x</sup> <https://www.twaweza.org/uploads/files/Twaweza%20ATI%20Act%20Analysis%20-%20BT130217.pdf>
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- <sup>xvii</sup> <https://www.cidmews-sl.solutions/>

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