



REPORT ON A VULNERABILITY AND ADAPTATION ASSESSMENT OF CLIMATE CHANGE IMPACTS ON HUMAN HEALTH AND WATER SECTOR IN TANZANIA

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Executive Summary

The main objective of the present work was to undertake assessment on vulnerability and adaptation to climate change impacts on populations in water and health sectors in Tanzania. The assessment had eight (8) specific objectives namely: (1) To establish the association between climate change and four priority health issues (i.e. nutrition; vector-borne diseases; disasters; and water related diseases); defining the magnitude and distribution (in spatial and temporal scale) of vulnerability; (2) To describe risks posed by climate change for the water and health sector and develop recommendations for key national strategies and sectoral programming; (3) To assess impacts of climate change on water availability and quality, and its implications on health and rural WASH services (considering both quantity and quality issues) in order to inform investment in Water Safety Plans and other WASH programmes; (4) To establish baseline health conditions and risk factors which can be monitored overtime to observe additional impacts of climate change on health; (5) To describe the policy landscape and opportunities available to bridge, converge, and unite efforts under a climate strategy for health; (6) To identify research needs and information gaps in relation to the impacts of climate change on health; (7) To describe the health sector existing capacities and adaptation needs in relation to climate information; and (8) To assess current practices of health professionals to access, interpret and apply climate information in the design and implementation of nutrition, disease control and emergency preparedness programmes.

In achieving these specific objectives the study was carried out in Ilala district (representing hot humid coastal plain climatic zone), Mbeya (temperate highland climatic zone), Nyamangana (Mwanza Region, representing high-moist lake zone), and Loliondo (Arusha; representing arid-semiarid climatic zone). Other sites were Kigoma-Ujiji Municipal Council in Kigoma region and Kongwa (Dodoma Region) which in addition to climatic zones are pilot sites for Climate Resilient Water Safety Plan (CRWSP) Various data sets were collected including (i) Monthly meteorological data for a period of 30 years, (ii) stream flow, and water levels from gauged rivers within the Rufiji, Wami-Ruvu and Malagarasi river basins. These data were used to assess climate change impact and vulnerability in water sector and Water Sanitation and Hygiene (WASH) program. Similarly, lake levels fluctuation for the Lake Tanganyika for the past 30 years were used to assess impact of climate change on water resources. Furthermore, health data on morbidity and mortality from climate related diseases archived through the Health Management Information System (HMIS) and at various district and regional hospitals in conjunction with meteorological, demographic and socioeconomic data, and information on floods and droughts were used to assess vulnerability and adaptation to climate change in health sector. Also review of policy landscape and opportunities available to bridge, converge, and unite efforts under a climate strategy for health was undertaken. In addition to data from the above mentioned districts and municipalities, various data at regional level on health, water and WASH programme covering all regions were collected from the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC), and Government Open Data Portal (<http://opendata.go.tz/>).

Generally, long term health data were not easily available and only recent data archived under the HMIS program are available on monthly basis since 2013 at a national level. Such short record cannot be easily correlated with climatic conditions. A 20 years record of cholera for Mbeya region, which was the longest of the records obtained in this study, showed four (4) major events of cholera outbreak in which 1997 had the highest morbidity and mortality. This outbreak coincided with the strong El Nino event of 1997-98. The rest of the regions of mainland Tanzania had only five years cholera records or less. The prevalence of cholera with highest morbidity was reported in Mara, Shinyanga, Singida, Kigoma and Dar es Salaam regions particularly for the over five years. Regions of Lindi, Pwani and Arusha had the lowest cases of cholera.

Malaria occurs all over Tanzania and the most affected regions are Dar es Salaam, Mwanza, Morogoro, Tanga and Shinyanga with the mean malaria cases higher in age group of above-fives than under-five. The lower malaria cases to under-fives are attributed to the number of intervention initiatives that focused on pregnant women, infants and children under five years old. The least affected regions are Iringa, Manyara, Rukwa and Arusha.

A thirty years' time series of both monthly minimum and maximum temperatures showed a general increase with time at various meteorological stations; with some months showing highest change. In contrast, the total annual rainfall showed a general declining trend in Arusha, Kigoma, Mtwara, Mbeya and Tanga. However, Tanga and Mbeya showed the largest change. A slight increase in rainfall with time was recorded at Bukoba, Mwanza and Sumbawanga meteorological stations. Spectral analysis for the time series of annual maximum rainfall for each of study sites indicated four spectral peaks centred at around 2.2 - 2.8 years, 3 - 4.0, and 6 -10 years suggest occurrence of extreme precipitations during these time intervals.

Droughts and floods are the primary hazards affecting the entire country with many low lying areas and river valleys being particularly more vulnerable to flooding while semiarid to arid areas being hard hit by climate change. Tanzania has experienced several episodes of flooding, where flooding has caused infrastructure destruction such as road and railway line in Kilosa and Dar es Salaam. Flooding has also been accompanied by outbreaks of common diseases, such as malaria, diarrhoea and intestinal worms.

The IPCC projected that climate change will have both positive and negative consequences to Tanzania's water-resources. It is anticipated that the Wami-Ruvu basin could experience a 10% decrease in annual runoff, while annual basin runoff in the Pangani basin is estimated to decrease by 6%. The Rufiji River is expected to experience an increase in river flow by 5-11%.

Climate change has impacted hydrological system and water availability. Although provision of water services in rural and urban areas has been increasing since 2001, yet water services is inadequate. Out of the current total population of about 45 million people in the country, 46.5% of rural and 27% urban populations do not have access to

safe and clean water. The large majority of Tanzanian's water is extracted from unimproved sources such as ground water. Failures in supply of safe water directly impact upon the ability for households to practice adequate hygiene.

Records of lake level fluctuation of Lake Tanganyika showed a general decline with a slight increase since 2006. Decrease in lake level could be a result of decreasing trend in precipitation that is amplified by higher rate of evaporation owing to increase in temperature in some months. Similarly, flows in the Pangani, Malagarasi, and Wami-Ruvu river basins and most likely in the remaining basins have declined. However, there are no continuous river discharge records for the Malagarasi, and Wami-Ruvu basins despite of being characterized by a number of river tributaries. These tributaries are not gauged and when gauged, outdated rating curves are used.

In all visited municipalities and district councils, it was noted that there was lack of data on WASH activities. Generally, WASH activities are not well addressed owing to inadequate funding, poor documentation, competing approaches, and conflicting institutional arrangements.

Human resources in the health sector by 2014 were 70,183 out of which 3,446 are Medical Officers and Assistant Medical officers. New regions of Geita, Simiyu and Katavi had the least health workers. The number of health professionals per 10,000 populations is less than 7 with lowest for the Medical Officers and Assistant Medical officers and Pharmacists. Therefore, the number of human resource in the health sector is low and requires government commitment in training health experts particularly Medical Officers and Assistant Medical and pharmacists.

Although meteorological data were available, they had several gaps and coverage density was not high enough to make fine assessment of relating meteorological parameters and diseases. Shortage of data was critical in the health sector at both district council and municipal levels. Also river flows data in river basins are only recorded at a number of locations; a good number of rivers in the basins are not gauged. The quality of the discharge in some cases is doubtful because of unstable river cross-sections, heavily extrapolated rating curves and gaps in the data records. It is recommended that training and equipping all health providers with the necessary facilities be undertaken so as to have sustainable and long term data recording. It is also recommended to increase hydrometric and meteorological networks as well as human capital so as to meet the data needs required for detailed planning, forecasting and modeling.

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Acronyms

AAP	Africa Adaptation Programme
AAT	African animal trypanosomiasis
CCA	Climate Change Adaptation
CLTS	Community Led Total Sanitation
CMIP5	Coupled Model Intercomparison Project phase 5
CO ₂	carbon dioxide
COWSOs	Community-Owned Water Supply Organizations
CRWSP	Climate Resilient Water Safety Plan
EWURA	Energy and Water Utilities Regulatory Authority
GFATM	Global Fund Partnership: HIV, Tuberculosis and Malaria
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
HMIS	Health Management Information System
HSR	Health Sector Reforms
HSSP	Health Sector Strategic Plans
IPCC	Intergovernmental Panel for Climate Change
IPCC	Intergovernmental Panel on Climate Change
IWRM	integrated water resources management
NAPA	National Adaptation Programme of Action
NCCS	National Climate Change Strategy
NGOs	Nongovernmental Organizations
NMCP	National Malaria Control Program
NSGRP	National Strategy for Development and Poverty Reduction
NSS	National Nutrition Strategy
NSS	National Nutrition Strategy
SWASH	school water, sanitation and hygiene
SWASH	School Water, Sanitation and Hygiene
TMA	Tanzania Meteorological Agency
T _{max}	Maximum temperature
T _{min}	Minimum temperature
TNVS	Tanzania National Voucher Scheme
UNFCCC	United Nations Framework for Climate Change Convention
V&A	Vulnerability and Adaptation
WASH	Water, Sanitation and Hygiene
WASSA	Water Supply and Sanitation Act
WRMA	Water Resources Management Act