SERVIR-Eastern and Southern Africa

Needs Assessment Report

Tanzania

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List of Acronyms

AEZ	Agro Ecological Zones
AFREF	African Geodetic Reference Frame
CBNRM	Community Based Natural Resources Management
CCCS	Centre for Climate Change Studies
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station data
COP	Chief of Party
DEM	Digital Elevation Model
E&SA	Eastern and Southern Africa
EAC	East African Community
ENACTS	The Enhancing National Climate Service initiative of IRI, Columbia University
ESAS	Ecologically Sensitive Areas
EO	Earth Observation
FEWSNET	Famine Early Warning Systems Network
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GIZ	Gesellschaft für Internationale Zusammenarbeit
HighRes	High Resolution
ICPAC	IGAD Climate Prediction & Applications Centre
IRA	Institute for Resource Assessment
IRI	International Research Institute for Climate and Society in Columbia University
IRRIP	Irrigation and Rural Roads Infrastructure Project
IWRM	Integrated Water Resources Management
LULC	Land Use Land Cover Change
LULCE	Land-use, Land-cover & Ecosystems
LVBC	Lake Victoria Basin Commission
LVFO	Lake Victoria Fisheries Organization
MALFC	Ministry of Agriculture, Livestock, Fisheries and Cooperatives
MALFC- T	Ministry of Agriculture, Livestock , Fisheries and Cooperatives in Tanzania mainland
MANLF-Z	Ministry of Agriculture Natural resources, Livestock and Fisheries in Zanzibar
MOLHHSD	Ministry of Lands, Housing and Human Settlement Development
MVIWATA	National Network of Farmers Groups Tanzania

MWEDO	Maasai Women Development Organization
MWI	Ministry of Water and Irrigation
NAFAKA	USAID funded Tanzania Staples Value Chain Project
NaFIRRI	National Fisheries Resource Research Institute
NARAM	Natural Resource Assessment and Management
NASA	National Aeronautics and Space Administration
NEMC	National Environmental Management Council
NSDI	National Spatial Data Infrastructure
NGO	Non-government organization
OPM	Office of the Prime Minister
PFM	Participatory Forest Management
PREPARED	Planning for Resilience Through Policy, Adaptation, Research and Economic Development
RCMRD	Regional Centre for Mapping of Resources for Development
SMOLE	Sustainable Management of Land And Environment
SMS	Short Message Service
SRTM	Shuttle Radar Topography Mission
SUA	Sokoine University of Agriculture
TAFIRI	Tanzania Fisheries Research Institute
TAWA	Tanzania Wildlife Management Authority
TMA	Tanzania Meteorological Agency
TNC	The Nature Conservancy
UNICEF	United Nations Children's Emergency Fund
USAID	United States Agency for International Development
USSD	Unstructured Supplementary Service Data
WARIDI	Water Resource Integration Development Initiative
WRF	Weather Research and Forecasting

EXECUTIVE SUMMARY

SERVIR E&SA has prioritized user engagements in the design and development of services in four service areas that include Land Cover Land use and Ecosystems, Agriculture and Food Security, Weather and Climate, and Water and Hydro-climatic Disasters to ensure that they address the needs of the stakeholders and users. SERVIR E&SA builds on the institutional partnerships and networks in Eastern and Southern Africa together with the network and partnerships associated with USAID country missions in the region.

SERVIR E&SA conducted needs assessment in Tanzania to identify and understand existing and emerging needs in the use of Earth Observation and geospatial technologies in informing decision making in the four service areas. Governmental and non-governmental agencies, private agencies and research institutions were involved in this assessment. The assessment took the form of stakeholder presentations to understand the roles, achievements, challenges and existing initiatives that use or are potential users of geospatial technologies and also to understand decision making context in addressing environmental management issues and how geo-information is used to inform decision making processes.

SERVIR-E&SA also led the participants through a group exercise to identify at development problems related to climate change in each of the four service areas while also understanding the factors, both climatic and non-climatic, that contribute to these problems. The team also sought to understand the decision making context in addressing environmental management issues and how geo-information is used to inform decision making processes. The exercise identified various areas that could be improved relating to data sharing and access, outreach, feedback and capacity development.

Among the development problems identified are LULC mapping, climate change impacts and vulnerability of livelihoods, sea-level rise and coastal flooding, water resources and water quality monitoring, low crop productivity and poor market access for agricultural products.

Some of the opportunities for improvement that were identified include development of smaller scale LULC maps for areas of great interest such as wildlife corridors and natural resources (e.g. minerals) rich areas, capacity building of stakeholders in development of maps and a need to improve tools used by Tanzania Meteorology Agency (TMA) to forecast and manage meteorological data. Enhancement of climate risk modeling and spatial analysis skills of technical experts was a priority need that addresses multiple issues including vulnerability assessments to inform the development of basin level climate adaptation, environmental conservation, health improvement and water resources management in the coastal areas. Water quality monitoring for Lake Tanganyika, stream flow monitoring and forecasting,

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determination of potential irrigation areas and development of updated AEZ maps are other areas that could be improved. It was also noted that across the service areas, there is an overarching priority to address the challenges policy makers face in interpreting information coming from technical analysts. This is seen as an area that impedes the use of information coming from EO and geospatial technologies to inform decisions and policy making.

1   BACKGROUND INFORMATION

SERVIR is a joint initiative of United States Agency for International Development (USAID) and National Aeronautics and Space Administration (NASA) to help developing countries improve environmental management and resilience to climate change by strengthening the capacity of governments and other key stakeholders to integrate Earth Observation information and geospatial technologies into development decision-making.   NASA brings world-class science and data from more than 20 satellites and USAID brings development partners and relationships around the world to this unique program.

The all-encompassing goal of the SERVIR-E&SA project is to improve environmental management and resilience to climate change by strengthening the capacity of governments and other key stakeholders to integrate Earth Observation information and geospatial technologies into development decision making. The specific objectives of SERVIR-E&SA are to:

- Improve the institutional capacity of RCMRD and plan for sustainability of SERVIR Eastern and Southern Africa.

- Improve Capacity to use Information. Building the capacity of analysts and decision makers in government, civil society groups, and the media to integrate geospatial and Earth observation data, including climate data, and technologies into their analysis, policy, planning, management, and communications.

- Improve Awareness of and Access to Information. Raise awareness of and increase access to geospatial data and information by improving management and access to existing and new data and information at national and regional levels.
- Increase Provision of User-Tailored Data and Tools for Decision-Making. Create user-tailored geospatial products and services (such as decision support tools, applications, models, dissemination, and training) to get information to people who need it to address priority development issues, in collaboration with NASA and other international scientists.

To achieve these objectives and to ensure that user needs in the Eastern and Southern Africa region are addressed, SERVIR E&SA prioritizes user engagements in the design and development of services in four main Service Areas: (i) Land Use, Land Cover Change & Ecosystems (LULC&E), (ii) Weather and Climate, (iii) Agriculture & Food Security, and (iv) Water Resources and Hydro-climatic Disasters.

SERVIR-E&SA organized two-day user needs assessment/stakeholder consultation workshop in Dar es Salaam, Tanzania, from May 30 to 31, 2016 where governmental, non-governmental, and academic and

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private sector institutions participated. The main objective of this assessment was to engage with stakeholders from various institutions, understand the projects they are implementing and map out climate-related development problems, the needs and gaps in form of geospatial data availability and acquisition, data sharing challenges, geospatial tools used and capacity building needs. This activity enabled SERVIR E&SA Africa to understand some of the existing and emerging needs in the four service areas in Tanzania. A total of 22 participants from 17 institutions in Dar El Salaam, Tanzania attended the workshop. (See figure 1 for the group photo and Annex B for participant list).

Figure 1: Workshop participants in Dar El Salaam, Tanzania.

1.1   Objectives of the workshop.

The main objective of the needs assessment workshop was to engage with stakeholders from various institutions, understand the projects they are implementing and map out climate-related development problems, the needs and gaps inform of geospatial data availability and acquisition, data sharing challenges, geospatial tools used and capacity building needs.

1.2   Methodology

In order to understand the stakeholders roles and activities and map out climate-related problems in terms of the needs and gaps in geospatial data availability/acquisition, geospatial tools used and capacity required in processing and using the tools, group presentations and discussions were conducted with the participants. The groups were based on SERVIR's four service areas (i) Land Use, Land Cover Change &

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Ecosystems (LULC&E), (ii) Weather and Climate, (iii) Agriculture and Food Security, (iv) Water Resources and Hydro-climatic Disasters.

The stakeholders showcased their institutions' mandate/activities and achievements and also highlighted challenges that they face in their work. Group discussions on the other hand concentrated on:

- Identification of development problems in the service areas and the factors (climatic and non-climatic) influencing them;
- Decision making related to the development problem;
- Identification of existing efforts seeking to address the development problems;
- Identification of potential improvement opportunities in user engagement, data sharing, access and management, capacity development, outreach, uptake and feedback.

2   INTRODUCTORY AND STAKEHOLDERS' PRESENTATIONS

The opening remarks were made representatives from RCMRD, USAID Kenya & East Africa, USAID Washington and SERVIR-E&SA. Participants were then grouped into two groups for the first session of stakeholder presentations. Thereafter, participants gave presentations summarizing their institutions' roles and mandates while highlighting their main activities, achievements and challenges with respect to the use of geospatial information.

2.1   Land Use Land Cover and Ecosystems

The LULC and ecosystems group in Tanzania had participants from four institutions, namely Tanzania Wildlife Management Authority (TAWA) and Tanzania Wildlife Research Institute (TAWIRI) which are government institutions involved on Wildlife research, protection and collection of revenue from wildlife related activities; Sokoine University of Agriculture (SUA) an academic institution of higher learning doing teaching, research, outreach and consultancy; and PROTECT Project which is a USAID funded project with an aim to improve capacity for conservation and to combat wildlife poaching and trafficking throughout Tanzania by assisting stakeholders in the wildlife sector to scale up their activities and providing them with data and information.

2.2   Weather and Climate

The Institute of Resource Assessment's Climate Change Studies (IRA-CCCS) department and the Tanzania Meteorological Agency (TMA) represented the weather and climate group. IRA-CCCS in addition to offering post graduate training also does research and consultancy in the agriculture and food security, population and human settlements, social policy analysis and natural resources and environment. Their main activities include land cover mapping for Kagera region (Uganda, Tanzania, Rwanda and Burundi), climate resilience assessment of maize and rice in Rufiji Basin and status of land degradation in Tanzania.

TMA on the other hand observes, collects, archives and disseminates met and related information for the country, participates in global exchange in met activities, provides met services and warnings, issues mobile weather alerts to aid in risk reduction in fishing and farming in L. Victoria Basin. They have also mapped malaria areas using GIS. One of their main challenges is the insufficiency in number of weather stations.

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2.3   Water Resources and Hydro-climatic Disasters

Three institutions represented the water resources and hydro-climatic disasters service area. These are the Ministry of Water and Irrigation (MWI) whose main activities are rehabilitation of hydrometric stations, rehabilitation, expansion and construction of water supply systems and sewerage facilities, underground water exploration, conservation and efficient use of existing water sources and water quality monitoring.

Tanzania Fisheries Research Institute (TAFIRI) mainly conduct research in fisheries and water quality with respect to aquatic life, seasonality research activities for wet and dry seasons, assessing impact of land use on water quality, aquatic ecosystems and biodiversity and integration of fish farming in agricultural activities; and Water Resource Integration Development Initiative (WARIDI) focusing on increasing utilization of multiple use water and sanitation services in 2 basins, promoting private sector investments in water sector, improving resilience of coastal livelihoods to climate change and vulnerability assessments.

MWI has implemented projects such as construction of irrigation infrastructure, mapping of water points, construction, rehabilitation, installation of water points and sanitation services in rural and urban areas (over 38000 water points constructed). TAFIRI on the other hand has achieved in identification of critical habitats for conservation in L. Tanganyika, catchment conservation in Lake Victoria, identification and mapping of suitable sites for CAGE fish in Mwanza gulf, identification and mapping of ecologically sensitive areas and use of EO for potential fishing zones.

2.4   Agriculture and Food security

Seven organizations participated in the session representing the agriculture and food security sector. They include Africa Lead II; Irrigation and Rural Roads Infrastructure Project (IRRIP) with activities ranging from flood and terrain modelling for impact assessment from proposed infrastructure, soil and topographic surveys, feasibility studies for irrigation schemes to rehabilitation of Dakawa irrigation scheme; Ministry of Lands, Housing and Human Settlement Development (MOLHHSD) with activities in surveying, mapping, land tenure and squatter upgrading.

Ministry of Agriculture Natural Resources, Livestock & Fisheries - Zanzibar (MANLF-Z) – implements sampling frame for agricultural statistics data collection and mapping land cover focusing on Forests; Ministry of Agriculture, Livestock , Fisheries and Cooperatives in Tanzania mainland (MALFC-T) - Tanzania accelerate food security program, analyzing productivity and crop variations, market information on agricultural produce in the country; Maasai Women Development Organization (MWEDO) - increase

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access to land ownership and improve livelihoods of members; and NAFAKA a USAID funded Tanzania Staples Value Chain Project improving agricultural management practices, provision of loans for agriculture and promotion of savings for groups. See figure 2 for stakeholder presentation photo.

Figure 2: Stakeholder giving presentation in Dar El Salaam, Tanzania.

2.5   Challenges facing institutions

Among the challenges highlighted are poor availability and accessibility of geospatial data, lack of data sharing policies within the institutions, data and product dissemination challenges, varied methodologies for doing a similar activity, poor coordination activities, lack of a common data repository, limited access to proprietary geospatial software, lack of metadata and inadequacy in geospatial technology skills and knowledge.

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3   CLIMATE-RELATED DEVELOPMENT PROBLEMS

On day two, the participants were grouped into the four SERVIR-E&SA service areas. The discussions were aimed at needs identification in the four SERVIR service areas Land Use, Land Cover & Ecosystems, Agriculture and Food Security, Weather & Climate; and Water Resources and Hydro-climatic Disasters.

3.1   Land Use Land Cover and Ecosystems

The LULC and Ecosystems discussion group identified land cover land use change mapping as a major development problem.

3.1.1   Land Use Land Cover Change Mapping

One of the major development problems in the area of LULC and Ecosystems was identified as land use change mapping. There has been conflicts among communities, investors and other groups on use of land. There is rapid loss of forest cover (about 400,000ha every year) mainly due to change of land use from forests to agriculture and settlements. This has been due to increase in population and rural to urban migration. As a result there is a lot of land degradation and habitat fragmentation.

Factors contributing to the problem

Climatic factors contributing to the problem were identified as inter-annual and inter-seasonal rainfall variability, prolonged droughts and extreme weather events e.g. El Nino. Non-climatic factors contributing to the problem include conflicting policies due to weak multi-sectorial coordination platforms, non-compliance and laxity in enforcement of regulations resulting in some parts of the land not being used for planned purposes, increase in population creating more demand for agricultural activities and residential premises, political interference, poverty, lack of land tenure information and shortage of resources especially forestry management staff.

The geospatial data required to address the problem are land cover maps and high resolution images for validation and mapping of small areas. The 2010 land cover map of Tanzania is available with MOLHHSD and also as a download from the land cover viewer at http://apps.rcmrd.org. High resolution images however have to be purchased.

There are a number of stakeholders that are already dealing with the problem. They include government institutions (Ministry of Lands, Housing and Human Settlements Development, Ministry of Natural Resources and Tourism, Ministry of Agriculture Livestock and Fisheries, Ministry of Water and Irrigation, National Land Use Commission, National Bureau of Statistics, Vice President's Office, Prime Minister's Office, National Carbon Monitoring Centre and local government), academic and research institutions,

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NGOs such as WWF and private sector institutions such as Green Resources. The Nature Conservancy (TNC) and Tanzania Wildlife Authority (TAWA) are also engaged in mapping of wildlife corridors in the country. The cities' master plans are also being revised.

Decision making context

Decisions that are made related to land use include the following:

- Village land use framework and plans – this involves creation of a village level framework for land use and is done by the tenure support program in the Ministry of Lands, Housing and Human Settlement Development.
- Participatory Forest Management (PFM) including resurveying and reservation of forest areas by Ministry of Natural Resources.
- Development of urban areas master plans.
- Transformation of government institutions into semi-autonomous institutions to improve governance, e.g. TAWA.
- Strengthening the semi-autonomous institutions to enhance their mandate.
- Community management of resources being improved when their accessibility is more accurately determined.

For these decisions related to land use change to be made, land use plans are required as well as information on location of natural resources in any given area. A natural resources inventory is therefore a critical requirement. Availability of models that can shoe how specific land use changes drivers affect land cover would greatly help in decision making on land use. The land use plans exist but they need to be updated to incorporate changes that have taken place over the years. The Community Based Natural Resources Management (CBNRM), Wildlife Management Areas and Participatory Forest Management (PFM) are all providers of information on location of various natural resources. A consolidated natural resources inventory is, however, non-existent and its development would greatly enhance land use change decision making.

User capacities and needs

The main users of the information on land cover land use change maps are the natural resources committees (village to national level committees), appointed and elected officials, district councilors, government ministries (Natural Resources and Tourism, Agriculture, Water and Irrigation), Office of the Prime Minister (OPM), NGOs, public and private institutions. The LULC maps developed by RMCRD under SERVIR are accessible online while the CBNRM and Village NR Committees have information on

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the types and location of various natural resources in their areas, though this information is not readily accessible to the decision makers in a timely and useful format.

There is also a challenge in affordability of necessary hardware and software and inadequacy of users' capacity to use the information to make more informed decisions. For example the village level natural resources committees do not have the capacity to interpret land cover maps and would require information that is already interpreted and packaged to the level they can use.

Opportunities for improvement

Among the areas that can be improved to address the LULC change mapping issue in Tanzania is engagement of the main stakeholders such the WMA and CBNRM and the private sector institutions in the decision making process.

Challenges in data sharing were highlighted with all institutions expressing difficulties in acquiring data which they knew already existed with other institutions. There are different initiatives doing similar work but lack coordination to avoid duplication. (PROTECT is already in discussions with some of the stakeholders in a bid to develop a database to store LULC information from various institutions). Further consultations between stakeholders where follow-up action plans are developed to enhance data sharing could be organized probably with an institution/government driving the effort with SERVIR-E&SA supporting distinct activities such as training on geospatial data management practices.

Training on development of geospatial applications especially LULC maps and LULC change analysis was also identified as an area that could be improved as well as translation and packaging of information into decision making tools. Formation of communities of practice such as the Tanzania Forest Working Group would improve sharing of available information and creation of awareness within the membership in order to improve the members' knowledge and skills.

The main decision makers who use the LULC maps include community level committees and natural resource managers who deal with smaller areas and therefore would require higher resolution maps to be able to get the best level of detail for their decisions. Development of smaller scale LULC maps for certain areas that are of great interest such as wildlife corridors and natural resource (e.g. minerals) rich areas could be developed.

3.2   Weather and Climate

In this service area two major development problems were discussed by the participants, namely climate change impacts and vulnerability of livelihoods and sea level rise and coastal flooding.

3.2.1 Climate Change impacts and Vulnerability of Livelihoods

Climate change impacts are expected to increase in the future based on current climate change projections (IPCC). Changes in rainfall patterns (duration, intensity, variability, and amount) and increasing temperatures (leading to warmer cold and dry seasons) will have dire consequences on key development sectors that support Tanzania such as in agriculture, energy (hydro), health among others. These impacts (losses and damages to lives and property) are related to increased dry spells and droughts to increased extreme climate events, forest fires, and vector-borne diseases. It has been estimated that these will affect between 20-30% of the GDP of the country.

Factors contributing to the problem

Specifically, these changes will be manifested through climate related factors such as seasonal migration of the ITCZ in Tanzania (affecting the distribution of rainfall); strong winds affecting marine transport and the fishing industry; erratic rains causing droughts and flash floods (shortages and El-nino); climate variability (seasonal variations in precipitation causing shortening of seasons and more intense, prolonged dry spells) and increased temperatures in urban areas (expansion of Urban Heat Islands). Non-climate related factors that will exacerbate this problem include urbanization, poor drainage systems, topography and deforestation.

The Tanzania Meteorological Agency (TMA) is primarily responsible for collection, archiving, analysis and dissemination of weather and climate related information to various stakeholders. Precipitation (rainfall), temperature data, cloud cover and winds are primary datasets used for short-term and long-term weather forecasts and weather monitoring. TMA has a national network of ground weather stations that collect this data. However, due to various challenges in the maintenance of these stations and the insufficient ground coverage of the stations across the country, TMA supplements their ground observations with data from ground observing satellites and weather and climate data from models. Weather models include WRF, ECMWF while historical climate datasets have also been derived by blending satellite estimates with station measurements, as is in the case of CHIRPS and ENACTS produced as a partnership between TMA and UCSB/FEWSNET/ICPAC and IRI respectively.

Decision-making Context

TMA works with a range of stakeholders, most of whom are users of their weather and climate advisories. These stakeholders are drawn from government, non-governmental organizations, private sector, academic institutions (including private researchers) and the local populations. More closely, TMA works with the department of disaster management in the Office of the Prime Minister, the ministry of

agriculture, livestock and fisheries, ministry of health, tourism sector, marine transport sector, energy and water regulatory authority, park management authorities (such as TANAPA) and the aviation industry.

Information from TMA is required by these stakeholders in order to make decisions related to among others: timing of planting and types of crops (in the case of farmers), location, duration, intensity and frequency of weather related hazardous events such as floods and droughts (in the case of disaster response and relief), hotspots of climate change (for strategic development planning), duration and severity of strong winds, storms and lightning.

User Capacities and Needs

Although TMA provides much of the information required, users of this information have various challenges. It was observed in this assessment that most of these users lack sufficient skills to interpret weather information disseminated by TMA. For example, in cases where TMA produces maps of rainfall distribution (such as anomalies), users are unable to interpret this information in the context of their activities. Farmers for instance require assistance to derive meaning in forecast maps provided by TMA and what the implication is to their activities in relation to the forecasts.

Another challenge raised was the lack of an enabling environment (software and hardware) to process data available from TMA while TMA itself requires more rigorous, and better resolution models (weather forecasting models) than they currently have.

Existing Efforts

Currently, various efforts exist that are working on providing services related to the problem identified. These include:

- PREPARED: a climate adaptation project supported by USAID for the East African Community. This project is working with various climate information providers and users to develop climate adaptation tools and mechanisms to support EAC member states (Kenya, Uganda, Rwanda, Burundi and Tanzania). The project addresses climate adaptation issues in agriculture, biodiversity, health, energy and ecosystems.
- WARIDI - Water Resources Integration Development Initiative is supported by USAID and seeks to achieve improvements in health, water resources management, agriculture, climate change adaptation and the environment in the Wami-Ruvu and Rufiji river basins.
- FEWSNET and ICPAC have an ongoing collaboration with support from PREPARED to support climate data management at TMA. This includes blending of satellite estimates of precipitation

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with ground stations that are maintained by TMA. Additionally, this effort is also addressing the issue of technical capacity in climate data analysis by TMA experts and other stakeholders.

- TMA holds regular seminars with users to raise awareness about TMA activities.
- WWF Tanzania has an ongoing initiative in coastal climate adaptation in Tanzania.

Opportunities to improve

Stakeholders identified various ways to improve their capacities. TMA needs to improve their modeling and spatial analysis tools and skills. This is in form of improvement of forecasting tools, improvement of climate data records (filling of gaps) and the enhancement of technical experts' skills at the agency and among users of weather and climate information. Specifically there's need to improve user engagements by holding regular meetings with various user groups of weather and climate information and a platform to share and disseminate data with users and stakeholders and ensuring all data is in digital format and processed and packaged in a way users can use (simplification of data) is required. Improvement of infrastructural capacity and personnel skills and improvement in the technology for forecasting (e.g. forecast models) are also other opportunities to address the problem.

3.2.2 Climate change, Sea-Level Rise, Coastal flooding and Vulnerability

Impacts related to climate change in the coastal areas of Tanzania, manifested through periodic flooding that are becoming more intense are increasing the costs of response, recovery and rehabilitation, all aimed at reducing loss of lives and property and damage that results from these events. Sea Level Rise is posing a significant threat to coastal urban centres and villages. Flooding resulting from extreme events and exacerbated by SLR is causing water salinization in shallow wells making the water unsafe for domestic use while crop failures due to inundation is reducing the ability of agricultural communities to cope with the impacts of climate change. Apart from the impacts on agriculture, water resources and other coastal livelihoods, incidences of diseases related to these impacts is also evident.

Factors contributing to the problem

From observations and analysis of historical information, it has been noted that climate variability and change, specifically, highly variable inter-annual and inter-seasonal precipitation, increasing temperatures (minimum and maximum) and prolonged dry spells are contributing to this problem. Other factors that work in cohort with these climate related factors include: elevation, population increase, land use land cover changes, deforestation related to agricultural activities and energy (biomass) demand, overgrazing, salt mining, land degradation, poverty/lack of alternatives, land tenure issues, and access to information and knowledge.

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To tackle these development challenges related to this problem, various institutions and agencies both in the public and private sectors work with the Tanzania Meteorological Agency (TMA). To understand the issues related to climate change and how these affect the various sectors highlighted above (agriculture, health, water resources, etc.), these agencies require data such as precipitation (rainfall), temperature, sea-level rise and these are partly (all except SLR data) provided by TMA. TMA supplements their ground observations with data from ground observing satellites and weather and climate data from models which include WRF, ECMWF while historical climate datasets have also been derived by blending satellite estimates with station measurements, e.g. CHIRPS and ENACTS produced as a partnership between TMA and UCSB/FEWSNET/ICPAC and IRI respectively.

Additionally, Socio-economic data (livelihoods, bio-data, health data, poverty rates, etc.), data on land use and land cover as well as future climate scenario data from downscaled Global Climate Models are required in order to understand how past climate change has affected people and the systems they depend on and how these could impact these systems in the future.

Different stakeholders are involved in climate change adaptation initiatives in Tanzania, and more specifically, in the coastal landscapes. WARIDI is in the initial stages of developing a range of decision support tools to achieve improvements in water resources management, agriculture, climate change adaptation and the environment in the Wami-Ruvu and Rufiji river basins. The Office of Prime Minister has in the recent past worked with government agencies in providing resilience building tools and information to decision makers. The National Bureau of Statistics is the provider most of socio-economic data. This data, such as Multiple Indicator Cluster Surveys (MICS) by UNICEF, Household Surveys, Malaria Indicator Surveys, etc.) is an important source of information about people, their living conditions, education and health status and their poverty levels among others. Local communities (farmers and fishermen) are also major stakeholders as the primary beneficiaries of these type of initiatives. Research institutions such as Institute of Resource Assessment in the University of Dar es Salaam are a source of technical skills and knowledge leading research in various fields. The Water basin authorities in the coastal landscapes such as in Rubada, Kilombero among others are local authorities and important stakeholders in initiatives carried out in their respective basins.

Decision-making Context

Information derived from the integration of the datasets mentioned above is used to make decisions such as identification of vulnerability of the communities to impacts of climate change (sea-level rise, flooding), locally driven adaptation interventions to address the vulnerabilities and providing knowledge and skills to communities about climate change and impacts (awareness).

In order to make these decisions, these users require information such as severity, frequency, duration and intensity of climate change impacts (e.g. flooding, droughts/dry spells), information on potential hazards (e.g. from wind speeds and direction, expected storms along a fishing route) and vulnerability levels (community hotspots – where and who is likely to be impacted negatively and the capacity they have to cope with such impacts). WARIDI noted that they would find this kind of information very useful in designing their climate change adaptation interventions in the focus basins. RCMRD (GHG maps), TMA, DDM and Universities provide some of the required data.

User Capacities and Needs

Apart from the challenges of insufficient knowledge, skills and tools to maximize on the potential of the information and data provided by various institutions, users cited lack of awareness of available data and information while others cited ignorance/complacency of users to take action on information provided to them, e.g. from TMA.

Insufficient technical skills on integrating various datasets in development planning processes was cited as an impediment. Participants gave instances of government staff lacking adequate skills to process data using GIS software for specific applications e.g. in identification of vulnerable areas.

Existing Efforts

Currently, various efforts exist that are working on providing services related to this problem. They include REPARED project working with various climate information providers and users to develop climate adaptation tools and mechanisms to support EAC member states (Kenya, Uganda, Rwanda, Burundi and Tanzania), WARIDI seeks to achieve improvements in health, water resources management, agriculture, climate change adaptation and the environment in the Wami-Ruvu and Rufiji river basins, FEWSNET and ICPAC have an ongoing collaboration with support from PREPARED to support climate data management at TMA, the Institute of Resource Assessment has postgraduate training and short courses in GIS and application areas targeted at technical experts that use GIS in their processes and WWF Tanzania has an ongoing initiative in coastal climate adaptation in Tanzania. GIZ is also supporting basins (technical capacity and integration of climate change in IWRM plans and developing guidelines for basin officers) while RCMRD's land cover mapping project for GHG inventories has developed land cover maps for various epochs.

Opportunities to improve

The suggestions raised in the first development problem were noted to also apply to this development problem. In addition, WARIDI needs vulnerability assessments to inform the development of basin level

climate adaptation, environmental conservation, health improvement and water resources management in the coastal areas. Through the PREPARED project in which SERVIR E&SA is a partner, some of these needs from WARIDI can be addressed in the short term while others, such as scenario projections of vulnerability and development of basin-level relevant vulnerability products would require a dedicated intervention.

Improvement of policy makers' geospatial information comprehension skills and their appreciation of its value is a cross-cutting issue that can be addressed both in the short and long term.

3.3   Water and Hydro climatic disasters

In this service area two major development problems were discussed by the participants. They include water resources monitoring and water quality monitoring.

3.3.1   Water Resources Monitoring

Water availability was identified as one of the major challenges facing Tanzania. This problem is being associated with climate change, water levels going down, drought, and land use changes among others. Tanzania has nine river basins and the problem of water availability is affecting most of these river basins.

Factors contributing to the problem

Some of the climatic factors contributing to this problem are erratic rainfall, in terms of intensity and duration and high temperatures. The non-climatic factors include population growth and land use changes especially conversion of forests to agricultural lands.

Geospatial data which has been used to address the problem includes water levels/quantity from water gauging stations (some of the stations are known but not geo-referenced), temperature data and rainfall data and are provided by different government institutions such as TMA.

Different institutions are involved and some affected by issues of water resources monitoring. These include Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MALFC), WARIDI, Community Water Supply Organization Society, beverage companies and water users' associations.

Decision making context

Key decisions related to water resources monitoring are riparian protection, water allocation, water permits issuing, trans-boundary policies, land use monitoring, local government bylaws and catchment management strategies. In order for the above decisions to be made by the relevant institutions, information required include extent of the land use, population statistics, socio-economic activities within

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the catchment, status of the resources in terms of quantity, baseline information on water supply versus demand. The information used is provided by various government institutions: land use changes by Ministry of Agriculture and Ministry of lands and human settlement, population statistics by National Bureau of Statistics and baseline information by River Basin Authorities, local authorities, LVBC and research institutions to some extent.

User capacities and needs

The information on water resources monitoring is required by different users for decision making. They include the Directorate of Water Resources, urban water supply authorities, basin water officers, water users' associations, government representatives, rural water officers and Ministry of Agriculture, Livestock, Fisheries and Cooperatives.

Some of the users mentioned above have no access to raw data on water levels since they are not the primary collectors of the data. Data sharing is only possible within institutions. However, information generated by the mandated institutions from the raw data is shared to all users.

Institutions mandated to collect and process data on water resources like Ministry of Water and Irrigation have limited geospatial skills for processing and analysis and sustainability of the skills within the institutions is not assured since most staff are project based. There is also limited software and hardware. Information going to the policy makers is also not well packaged making it difficult to use in policy development.

Existing efforts

A number of activities are on-going in response water resources monitoring including water resources policies harmonization within all the sectors, formation of water board to involve all sectors involved in water utilization, watershed management project under MWI, water sector development program involving all sectors including the local government, water sources/watershed protection, water points mapping by rural water supply agencies and Ardhi University building GIS capacity for the Ministry of Water and Irrigation.

Opportunities to improve

A number of opportunities to improve how the institutions respond to the problem of water resources monitoring were identified and they include:

- Advocating for IWRM which would involve all the stakeholders at the basin level.
- Technical and decision makers consultations should be increased to help in efficient use of resources.

- Improvement in data availability, sharing (NSDI implementation already in progress) and use among institutions.
- Identification of the available tools which can be applied in water resources monitoring.
- Involvement of all stakeholders in identification and development of the specific products and databases.
- Improvement of the limited skills, hardware and software for organizations dealing with water resources issues.

3.3.2 Water Quality Monitoring

Water quality is a key issue especially for fresh water bodies. Most of the upstream areas like Mwanza are mainly cultivated hence leading to deteriorating water quality in the Lake Victoria. Water quality issues are also prominent in Lake Tanganyika especially due to its placement (it is at the lower levels while people live on the highlands). Pollution/effluent from domestic and industries are also affecting rivers and wetlands within those areas. Lake Victoria has problems of quality but has so many initiatives taking place, while Lake Tanganyika has minimal interventions hence water quality issues in the lake remain a challenge.

Factors contributing to the problem

Some of the climatic factors contributing to water quality issues are excessive rainfall and high temperatures. The non-climatic factors are human activities, population increase, land use change, and agricultural practices such as use of pesticides.

To address the problem, geospatial data which has been used include physical and chemical parameters, satellite information (Landsat for pollution trend analysis and MODIS), point data collection and Google Earth images. These datasets are provided by government institutions like National Environmental Council, MWI and research institutions like TAFIRI.

Institutions involved and affected by issues of water quality include Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MALFC) and Community Water Supply Organization Society, National Environmental Council (NEMC), beverage companies, TAFIRI and mining industries among others.

Decision making context

Key decisions related to water quality monitoring include issuance of waste discharge permits, protection of water bodies, pollution discharge management, and the development of community based environmental bylaws. Information required to make these decisions includes pollution extent/quantity, sources of the pollution, lake levels, river discharges and rainfall intensity. The information is majorly

provided by Ministry of Water and Irrigation (river discharges and lake levels), TMA (rainfall), NEMC and sector based environmental units provide pollution sources while research institutions like TAFIRI and LVFO provide baseline information.

User capacities and needs

The information on water quality monitoring is required by different users for decision making among them Directorate of Water Resources, urban water supply authorities, basin water officers, NEMC, government representatives, TAFIRI, mining industries and MALFC.

Some of the users mentioned above have no access to raw data on lake water levels and pollution parameters since they are not the primary collectors. Data sharing is only possible within institutions. Information generated from raw data by the institutions is however shared to all users.

Institutions mandated to process data on water quality analysis like MWI and NEMC have limited geospatial skills for processing and analysis of satellite information and no sustainability of the skills within the institutions since most data initiatives are project based. There is also limited software and hardware.

Existing efforts

Nyegezi bay project in Lake Victoria monitors human encroachment in terms of increased population and intensive use of land and proposes restoration efforts.

Opportunities to improve

A number of opportunities to improve how the institutions respond to siltation of the major rivers were identified and they include:

- Need for sensitization of end users/stakeholders during project inception.
- Identification of the available tools which can be applied in water quality monitoring.
- Involvement of the local leadership in project implementation for uptake and feedback.
- Skills development in the use of geospatial tools and data for water quality monitoring.

The above two development problems identified have on-going initiatives with some limitations. For instance, there has been extensive work done to monitor water quality in Lake Victoria but none for Lake Tanganyika. Most water resources monitoring initiatives identified are policy related. To further understand the water availability issue and narrow down to the most water stressed basins, further consultations with the stakeholders is required. Some of the broader opportunities therefore include water quality monitoring for Lake Tanganyika and stream flow monitoring and forecasting.

3.4 Agriculture and Food security

In agriculture and food security service area, two development problems were identified by the participants. They are low crop productivity and poor market access.

3.4.1 Low Crop Productivity

Low crop productivity in rain fed subsistence farming is a problem due to poor land management practices, increasing production through intensification to feed an increasing population, with poor access to proper inputs.

Factors contributing to the problem

 Droughts and floods, unpredictability of rainfall due to changes in rainfall patterns caused by climate change, changing temperatures affecting crop suitability and strong winds in banana and mango producing areas are some of the climatic factors contributing to the problem. Non climatic factors include pests and disease outbreaks, lack of information to assist in selection of the correct inputs, topography which influences flooding in flood prone areas and an increasing population.

The geospatial data required or used to address the problem includes cropping acreage and distribution, drought maps, seasonal forecasts/predictions, flood maps and models, LULC maps ortho-photos at 10m & DEM (IRRIP purchased from Southern Mapping), sampling area frame (satellite imagery to identify farms location is available), crop suitability, soil cover and oil use, AEZ (available).

Some of the stakeholders identified include government agencies such as Ministries of agriculture (MALFC-T, MANLF-Z), statistics departments, TMA, CBOs, Civil societies, traders, farmers' cooperatives and farmers' associations.

Decision making context

Some of the key decisions to be made concerning crop productivity include strategies for crop production (crop selection), supply of inputs (seeds and fertilizers), selection of irrigation areas, decisions promoting investments, land management decisions, extension advisory and market and commodity value chain decisions. Required information to make these decisions includes productivity by crop, crop distribution, crop suitability, factors affecting production, LULC maps, climate information, market information, insurance information, flood occurrence, seasonal weather and crop forecasts.

This information is required by national Ministries (agriculture, statistics, water and irrigation and lands). Farmers' associations such as MVIWATA which focuses on mechanization, collective purchase of inputs and advisory service provision with government assistance from the extension service. Farmers'

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cooperatives also require this information since they focus on collective aggregation, markets, finance and advisory with government assistance. Others include NGOs and CBOs. At the local level government extension services and other local government operatives also require information.

Different users have varied access to the information. Crop productivity and distribution information is available from MALFC- T, MANLF-Z and National bureau of statistics and is accessible to government bodies. Climate information is available from TMA. The information is less reliable as it trickles down to farmers and grassroots networks e.g. TMA climate information is analyzed by the Ministry of Agriculture and is disseminated through the extension services but it is not always available in a timely manner. Cooperatives and private sector groups operating at the local level have some access.

User capacities and needs

Institutions mandated to develop or process data to on agricultural lack sufficient hardware, software and skills to successfully do their work. Government institutions lack sufficient capacity to provide local level interpretation of products and disseminate them to their users especially at the grassroots since it is not tailor made to meet their needs.

Existing efforts

Ongoing initiatives in response to low crop productivity include:

- NAFAKA being involved in implementation of sustainable land management practices, provision of agricultural loans and connecting farmers to agro-dealers.

- IRRIP is part of the USAID, Tanzania and US Government Feed the Future initiative implemented by CD Smith and focusing on agriculture and food security, conducting topographic surveys, soil surveys, flood mapping using Lidar and SRTM and developing LULC maps.

- Agricultural sector support development programs.

- Africa Lead II focuses on improving agricultural productivity and food security.

- National agricultural research institutes which conduct research on crop variety, pest and diseases, e.g. KATRIN focusing on rice research and ILONGA focusing on maize and legumes. UYOLE, DAKAWA, KIZIMBANI research centers are also involved.

- Sokoine University focusing on agricultural Research and capacity building for both government and private sector.

Opportunities to improve

Below are some of the opportunities to improve how the stakeholders are responding to the problem of low crop productivity:-

- Make user specific data and information readily available at the grassroots and support development decision making tools such as flood models to provide required information.
- Promote data access, sharing and dissemination among data producers and users, promote collaborations between government and other sectors to ease access to data through establishment of data sharing policies.
- Provision of training in modelling and forecasting skills and user specific on job trainings, improvement in capacity of the extension service in service delivery by providing them with tools and products and involving universities and research institutions in trainings and product development.
- Promotion of outreach from data suppliers at national and grass root levels and increase in data and information dissemination channels to promote access and uptake such as radio, SMS and USSD.
- Development of a data catalogue with detailed metadata providing detailed information on data location, access terms; require data users of freely available data to avail them, use existing inter-agency committee or other institutional framework with the mandate to coordinate existing data dissemination and dissemination efforts.

3.4.2 Poor Market Access

Accessibility to markets affects agricultural production. Market access is affected by poor roads, distance to markets and changes in market prices for different crops.

Factors contributing to the problem.

Flooding that cause infrastructure damage was the main climatic factor influencing market access, while poor roads, distance to markets and market prices fluctuations were listed as the main non-climatic factors contributing to poor market access.

The geospatial data required or used to address the problem include infrastructure maps (roads, irrigation and markets), market location, yield information, livestock production information and information on ware houses and storage facilities such as cold rooms. The information is required by government ministries (agriculture and extension services), statistics departments and TMA, CBOs, civil societies, traders, farmers and farmers' associations and networks, farmers' cooperatives and stakeholders in the transport sector.

Decision making context

Some of the key decisions made concerning market access include crop production, agricultural intensification plans, and financial decisions in support of specific agricultural activities, roads rehabilitation and commodity value chain and irrigation infrastructure implementation.

Government ministries have access to market information but it is less accessible as it trickles down to farmers and grassroots in terms of timeliness and reliability. Cooperatives and private sector groups operating at the local level have insufficient access. Institutions mandated to develop or process data on market accessibility lack sufficient hardware, software and skills to successfully do their work.

User capacities and needs

Government institutions lack sufficient capacity to provide local level interpretation of products and disseminate them to their users.

Existing efforts

Ongoing initiatives in response to poor market access include:

- Tanzania Warehouse Licensing Authority producing information on location of warehouses and silos.
- East African Grain Council provides some market information.
- Rural roads rehabilitation efforts are also influenced by the need for market accessibility.
- NAFAKA provides information on warehouse rehabilitation and licensing information.
- Private companies such as SIBESONKE disseminate market and warehouse information using mobile apps.

Opportunities to improve

The opportunities for improvement identified by the group on this poor market access were similar to those of low crop productivity.

All the institutions present mentioned lack of sufficient data and skills as one of the main challenge they are facing and this is therefore an area that needs to be addressed. There is also insufficiency in decision making tools tailor made for different thematic areas. Building the capacity of institutions to access and use geospatial data and satellite data imagery and tools, determination of potential irrigation areas and updating the AEZ maps are some specific areas of improvement identified.

4   WAY FORWARD

The user needs assessment in Tanzania set a foundation for user participation in identifying priority needs that will form the basis of future services to address those needs by SERVIR E&SA. Opportunities in existing and future efforts to improve environmental management and resilience to climate change were identified. SERVIR E&SA assistance will take the form of strengthening the capacity of governments and other key stakeholders to integrate Earth Observation information and geospatial technologies into development decision making. While some of the areas of improvement identified could be addressed through ongoing activities and other initiatives that SERVIR E&SA is participating in, prioritization of the needs through a 'value-addition approach' will be required. This might call for further assessments and complemented by more engagements/consultations with the relevant stakeholders. The technical capacity, resources available and collaboration patterns with the stakeholders will also be factors to consider.

This approach will ensure the right services are planned and implemented and that they address key decision making gaps in each of the SERVIR service areas covered within the country. This approach further addresses the issue of user buy-in, a result that would potentially increase the use of geospatial technologies in decision making in the country.

These assessment results and of further engagements and consultations will form a core component of SERVIR E&SA's future work plans.

Annex A: Workshop Agenda

Day 1: Monday 30 May		Facilitator: Mubea	
8:30 – 9:00	Registration		Stella/Lilian/Faith

Introductions			
9:00 – 9:05	Opening Remarks by RCMRD		Farah
9:05 – 9:15	Remarks by USAID		Chihenyo/Albert
9:15 – 9:20	Ministry of Lands, and Human Settlements Development		Lyamuya
9:20 – 09:30	Introduction to SERVIR-E&SA		Robinson

9:30 – 10:00	Group Photo Session /Health break		

STAKEHOLDERS' PRESENTATIONS

Water & Water Related Disasters (WRD) / Agriculture and Food Security (AFS)	Kiema	Weather & Climate (WC) / Land-use, Land-cover & Ecosystems (LuLcE)	Robinson
10:00 – 12:30	Wildlife Division	AFS	Tanzania Wildlife Research Institute (TAWIRI)	WC
	Africa Lead II	AFS	Irrigation and Rural Roads Infrastructure Project	WC
	Centre for Climate Change Studies (CCCS)	AFS	Tanzania Meteorological Agency (TMA)	WC
	Office of the Vice President	AFS	WARIDI	LuLcE
	Ministry of Agriculture Food Security and Cooperatives (MAFC)	AFS	Wildlife Division	LuLcE
	Ministry of Lands, and Human Settlements Development	AFS	Ministry of Agriculture Food Security and Cooperatives (MAFC)	LuLcE
	MWENDO	AFS	The Nature Conservancy	LuLcE
	NAFAKA	AFS	World Food Program	LuLcE
	Tanzania Fisheries Research Institute (TAFIRI)	WRD	University of Dar es Salaam-Institute of Marine Sciences (USDM-IMS)	LuLcE
			Tanzania PROTECT Project	LuLcE

12:30 – 14:00	**Lunch**	
14:00 – 16:00	Thematic Groups Report Back	
16:00 – 16:15	**Health Break**	
16:00 – 17:00	Discussions/Questions	

Day 2: Tuesday 31 May	**Facilitator: Mubea**	
08:45 – 09:00	Recaps/Day's Instructions	Kasera
09:00 – 09:30	Service planning	Albert
09:30 – 10:30	**Thematic breakout groups discussions:**	Facilitator/Note-takers
	I. Land-use/Land cover & Ecosystems	Chihenyo/Anastasia
	II. Weather & Climate	Kiema/Denis
	III. Agriculture & Food Security	Carlos/Lilian
	IV. Water & Water Related Disasters	Robinson/Faith
10:30 – 10:45	**Health Break**	
10:45 – 12:30	Groups Discussions (Contd.)	
12:30 – 14:00	**Lunch Break**	
	Group Report Back	
14:00 – 14:15	Weather & Climate	Denis
14:15 – 14:30	Water & Water Related Disasters	Faith
14:30 – 14:45	Agriculture & Food Security	Lilian
14:45 - 15:00	Land-use/Land cover & Ecosystems	Anastasia
15:00 – 15:10	USAID Tanzania Remarks	Jonathan
15:10 – 15:40	Questions session	Albert
15:40 – 16:00	Health Break	
16:00 – 16:30	NASA support to SERVIR	Ashutosh
16:30 – 17:00	Remarks from Participant	One Participant
	Ministry of Lands, and Human Settlements Development	Lyamuya
	Remarks from USAID	Chihenyo/Albert/Jonathan
	Closing Remarks from RCMRD	Farah/Kiema
	Way Forward	Robinson

Annex B: List of Participants

No	Name	Organization	Email address	Gender
1	Aloyce Mpinga	Wildlife Division	aloycempinge@yahoo.com	F
2	Godwin Mende	Africa Lead II	Jackson_Mahenge@dai.com	M
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4	Mr. Mzee Mzee	MAFC (Ministry of Agriculture, Food and Cooperatives)	m_mzee@yahoo.co.uk	M
5	Esupat Nglupa laizer	MWEDO (Maasai Women Development Organization)	esupat_3@yahoo.com, mwendo@habari.co.tz	F
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7	Mr. Muhaji Abdillah Chande	TAFIRI (Tanzania Fisheries Research Institute)	muhajichande@yahoo.com	M
8	Mr. Said Khamis Said	TMA (Tanzania Meteorological Agency)	sakha200464@yahoo.co.uk, ladislaus.changa@meteo.go.tz	M
9	Mr. Elinasi Monga	UDSM (University of Dar es Salaam)	e.monga@yahoo.com	M
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11	John Noronha	USAID/Tanzania PROTECT Project	John.Noronha@tzprotect.org	M
12	Erneus Kaijage	WARIDI (Water Resources Integration Development Initiative)	ekaijage@gmail.com	M
13	Mr Alex Choya	Wildlife Division	alex_choya@yahoo.co.uk	M
14	Mr. Daines Mtei	MAFC (Ministry of Agriculture, Food and Cooperatives)	dainess.mtei@kilimo.go.tz OR dainesmtei@yahoo.com	M
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16	Mr. Boniface Mbilinyi	Sokoine University	Mbly_sua@yahoo.com,	M
17	Hanza Kija	TAWIRI (Tanzania Wildlife Research Institute)	hamza.kija@tawiri.or.tz/hamza01kija@yahoo.com	M
18	Godfrey Kashasha	Irrigation and Rural Roads Infrastructure Project	freyzi2000@yahoo.com	M
19	Elizabeth Mrema	Ministry of Lands, and Human Settlements Development	elizabethmrema@yahoo.com	F
20	Mr. Samweli Katambi	Ministry of Lands, and Human Settlements Development	katambi65@gmail.com	M
21	Elvis Magara	Ministry of Lands, and Human Settlements Development	emagare@yahoo.com	M
22	Zakaria Ngereja	Ardhi Univeristy	ngereja@gmail.com	M

Service Areas and Services

Food security

- Agricultural monitoring
- Drought management
- Crop productivity
- Rangeland decision support
- Aquaculture decision support

Water resources and disasters

- Water resources monitoring and forecasting
- Flood management
- Hazard monitoring and forecasting
- Fire monitoring
- Water quality monitoring

Weather and climate

- Weather monitoring and forecasting
- Climate modeling and scenario planning
- Air quality monitoring
- Adaptation planning

Land cover/land use and ecosystems

- Land cover/land use change mapping
- Ecosystem management
- REDD+ decision support
- Land use decision support
- Low emission development planning

Annex D: Break Out Questions

Needs assessment questions (Break-out Groups)

Identify a plenary presenter and plan approximately 20 minutes per question (120 minutes total)

1. **Problem Description and Stakeholders**
   a. What is the major development problem in this thematic area? (e.g., drought, flood, water availability, crop failure, pest outbreaks, land use change, etc.)
   b. What climatic factors contribute to the problem?
   c. Are there other non-climatic factors/issues that contribute to the problem? If yes, list them here.
   d. What geospatial data are required and/or are currently being used to address the problem above? And how do you acquire the data used?
   e. What stakeholders are affected and involved? (Including government, civil society, private sector)

2. **Decision-making Context**
   a. What are the key decisions related to this problem? (What decisions are getting affected by the problem)
   b. What information is needed to make these decisions?
   c. Is this information being provided? If so, by whom?

3. **User Capacities and Needs**
   a. Who is the target information user (or users) to make these decisions?
   b. Does the user have access to the necessary data or information?
   c. Does the user have the necessary hardware, software, and/or skills to use the information?

4. **Existing Efforts**
   a. What related activities are on-going in response to these needs?

5. **Opportunities to improve**
   a. What could be done to improve how you tackle the problems above in the following areas? (Consider feasibility of your options)
      i. User engagement
      ii. Data sharing, access and management
      iii. Developing Products and tools
      iv. Capacity development – skills development/enhancement
      v. Outreach, uptake and feedback
      vi. Coordination of on-going efforts