Global Partnership for Sustainable Development Data

AFRICA REGIONAL DATA CUBE

A Study of Africa Regional Data Cube Governance Frameworks and Operationalization

September 2019

Introduction

The Africa Regional Data Cube (ARDC), based on the Open Data Cube infrastructure, is a technological innovation that currently layers 17 years of satellite imagery and Earth observation data for five African countries: Ghana, Kenya, Senegal, Sierra Leone, and Tanzania. It was developed as a partnership between the Global Partnership for Sustainable Development Data, NASA, CEOS, GEO, AWS, Government of Kenya, and Strathmore University in Kenya. The ARDC stacks imagery across a time series and makes the data – which is compressed, geocoded, and analysis-ready – accessible via an online user interface and Python application notebooks. The ARDC was created in response to data needs and gaps identified by partner countries and based on examples of some countries' successful usage of Open Data Cube technology. It is a solution that is helping address countries' respective needs and fill data gaps. The ARDC currently layers data from January 1, 2000 to December 31, 2018. However, additional historical data as well and current data is being prepared and will be continually added to ensure that it provides the most comprehensive and up-to-date data possible.

While the technology and approach are currently being institutionalized in the initial five countries, GPSDD, along with partners aim to scale the technology and approach to include additional countries across the continent through Digital Earth Africa (DE-Africa). We hope the lessons from the ARDC will offer useful lessons for other initiatives around the globe.

Since its adoption as a solution, it has taken a significant commitment of time and resources to effectively build capacity and increase the use of the ARDC. The purpose of this study is to document the various governance frameworks that have been developed and implemented in the five pilot countries and identify the key enabling environment and data management and sharing factors that affect the operationalization of the ARDC. The findings and recommendations from this study are intended to help inform the scale-up of the technology and approach across additional countries. The following insights were compiled through inputs provided by key stakeholders in Ghana, Kenya, Senegal, Sierra Leone, and Tanzania, feedback survey responses by ARDC training attendees, the NASA team, and GPSDD secretariat members.

Governance Frameworks

In each of the five countries, GPSDD has facilitated the establishment of a governance framework that institutionalizes the ARDC and is unique to the political and technical context of that country. Please refer to Annex A for detailed organograms of each country's governance framework. It takes approximately four to six months of engagements and discussions with a variety of stakeholders to socialize the infrastructure, develop buy-in to invest time and staff resources to adopting the ARDC, and agree to an institutional governance framework. While the specific structure and list of stakeholders varies across the countries, each country delineates a distinction within the framework between political and technical leadership.

Multi-Stakeholder Approach

Identifying an institution and framework within which to anchor the ARDC has been critical in a number of ways. A clear governance framework ensures that there is a clear focal point with a mandate, responsibility, and incentive to promote adoption and use of satellite data, including both political support and logistical management. While the governance framework embodies a multi-stakeholder and multi-sectoral approach in every country, the committees predominantly consist of government agencies. In Tanzania, there are two distinct governance frameworks established: one for mainland Tanzania, and the other for Zanzibar, to be responsive to the political and operational context.

Demonstrating a multi-sectoral approach, Senegal's ARDC governance framework is unique in that the secretariat is housed within an agricultural and environmental think-tank, or non-state entity – IPAR (Initiative Prospective Agricole et Rurale). Similarly, the technical leadership in Zanzibar sits with a public education institution – State University of Zanzibar, not a government agency. Senegal, Tanzania, Kenya, and Ghana include non-state stakeholders, predominately academic or research organizations in the technical committees and working groups.

Integration into Existing Structures

One of the key elements of institutionalizing the ARDC governance frameworks within each country has been to situate the framework within existing, broader structures rather than creating a standalone ARDC governance framework that runs parallel to or siloed from other structures. For example, in Ghana, the ARDC governance structure is situated within the overall SDGs coordination and implementation structure. This is also true for Senegal. In Ghana, the ARDC work is housed within the Big and Spatial Data Working Group, whereas in Senegal, it is aligned with the platform for environment related issues. In Zanzibar, work is currently underway to also incorporate the ARDC governance framework into the SDG coordination structure. Kenya is the only country in which the ARDC governance framework is currently established as a stand-alone structure through the Kenya Space Agency - a semi-autonomous institution gazetted in 2017 to co-ordinate and regulate space related activities in the country.[1] However, efforts are underway to work with the Kenya Space Agency (KSA) to consider how to integrate this framework into a broader, and more sustainable structure.

Coordination between Institutions, Sectors, and Initiatives

Country partners state that establishing an effective governance framework has been beneficial in three primary ways: facilitating coordination, increasing political buy-in and sustainability, and advocating for resource mobilization. Establishing a formal framework with identified institutional hosts provides a coordination mechanism and mandate for implementation. Country partners note that the mechanism provided space for cooperation between state and non-state actors and broadened the government data community into a multi-stakeholder community. For example, in Senegal, the initial ARDC working group consisted of six initial government institutions which has now been broadened to seventeen institutions including civil society organizations (CSOs) and private sector. It is also important to consider how the ARDC governance framework coordinates with other relevant global stakeholders in country. For example, the Group on Earth Observations (GEO) focal points in Ghana are the same as the ARDC focal points. GPSDD is engaging with GEO on how best to leverage their programs in support of the country level demands around Earth observation (EO) data. The frameworks in some countries, such as Ghana, also coordinate along thematic and geographic interests by establishing sub-data communities for agriculture, water resources, deforestation, and specific regions within the country. Some stakeholders also noted that as countries start to produce outputs and products, they plan to use the governance mechanism to coordinate the promotion and dissemination of findings and results.

Political buy-in and Sustainability

Institutionalizing the ARDC governance framework ensures sustainability because it leverages existing structures and ensures national level ownership. Many country partners noted that this approach has helped garner political buy-in and support for the use of EO data at scale. In both Ghana and Sierra Leone, the ARDC has good political buy-in from the highest levels of government. In Ghana, the Vice President has endorsed the technology and approach publicly. However, some partners also note the challenges of maintaining sustained commitment from all institutions which can affect the pace of progress in fully adopting and integrating the use of EO to fill data gaps. Each of the countries is further trying to address the issue of sustainability by bringing onboard academic institutions to ensure more sustained technical capacity building across a range of stakeholders.

Country partners also state that the governance frameworks and mechanisms are important for helping to mobilize resources. Having the work situated within existing structures will help make the case for local funding. In particular, country partners are mindful that securing funding, both locally and otherwise will be important in building technical skills, including basic GIS trainings both at the national and sub-national levels.

Enabling Environment

Institutional Champions

It is important to note that the enabling environment varies across the five countries, with alignment to the most relevant policies, structures, and activities being the key element. However, one key factor of the enabling environment that has been critical to effectively operationalizing the ARDC in all five countries has been identifying and working with institutional champions. While institutionalization of the governance framework is important, it is critical to have a champion driving the process and consistently making a case for the ARDC to ensure buy-in and progress.

Open Government and Open Data

In addition, the mandate to work on specific areas and supportive policies that align with the ARDC create an enabling environment. In Kenya, an enabling environment is created by the country's commitment to the Open Government Partnership (OGP) which includes commitments to utilize open EO for development[2]. Through this mandate, KSA, the political and secretariat lead agency for the ARDC governance framework, is able to work with other government ministries to support the national development agenda (Big Four Agenda). Similarly, in Sierra Leone, the enabling environment is provided through commitment to open data via the Open Data Council which has secured political support through the Minister of Information and Communication.

Spatial Data Policies and Institutional Mandates

In both Ghana and Tanzania, the enabling environment is supported by spatial data policies. In Ghana, the National Geospatial Policy Framework and Ghana Space Policy, both support the use of geospatial and EO data. Similarly, the policy bolstering ARDC work in Tanzania is the National Spatial Data Infrastructure[3] (NSDI), which is a political process that started in 2015. In Senegal on the other hand, while the enabling environment is not created by a specific policy, the ARDC governance framework leverages lead institutions that have the mandate to work on environment-related issues using all data types and sources.

Data Management and Sharing

GEO acknowledges and commits to data sharing as a key ingredient for building an effective Global Earth Observation System of Systems (GEOSS). In its data sharing principles outlined in its strategy, GEO commits to ensuring that EO data and products will be shared as Open Data by default and is available without charge or restriction on re-use. In practice however, there remain some key barriers. GEO notes that more than half of its 105 member governments do not have legal frameworks/policies on open data sharing and therefore not able to share data across countries, continents, or even within government agencies. GEO further stipulates that despite the legal frameworks, there are capacity challenges on managing and using EO data that can result in unusable or unsustainable datasets that policymakers cannot benefit from.[4]

Ecosystems Approach

GPSDD's experience highlights that EO data management and sharing is often more hindered by more intangible elements than legal frameworks such as perceptions and attitudes. Country partners have noted that putting in place legal documents and frameworks may help institutions "fearlessly" share data if they choose to share data, however, it does not serve as an instigator or motivator to share data. Rather, partners note that the practice of regular and frequent data sharing will require mindset shift and political perception realignments. For example, many civil servants in the countries of operation are sworn to an oath of confidentiality during the beginning of their service which is interpreted broadly. In the absence of legal frameworks, GPSDD and country partners have found the data ecosystem approach of strengthening the whole ecosystem versus focus on specific outputs has been helpful because it provides a clear value proposition for all stakeholders involved that helps drive a shift in mindset. While no formal agreements exist within any of the five countries to share data within agencies, Ghana and Tanzania both have MoUs in place with a private sector/non-state entity to share geospatial data.

However, all country partners note that there is an interest, willingness, and commitment to share data across institutions once more products have been developed. The Kenya Space Agency anticipates that the KSA Strategic Plan will facilitate the sharing of data across government agencies, NGOs, and academia. Similarly, in Senegal, discussions around measuring water quality have increased interest among the stakeholders to share data between the institutions. Country partners also note a keen interest to share data across countries and work on cross-border issues which will involve accessing and using data about other countries.

The ARDC provides free and open satellite data and algorithms to users. All users will have access to all the Africa-wide satellite data, with only the resulting application products and enhancements to algorithms being at risk for non-sharing. Sharing in-country and trans-border application products as well as enhanced or new algorithms could be of high value to all user countries to foster capacity building.

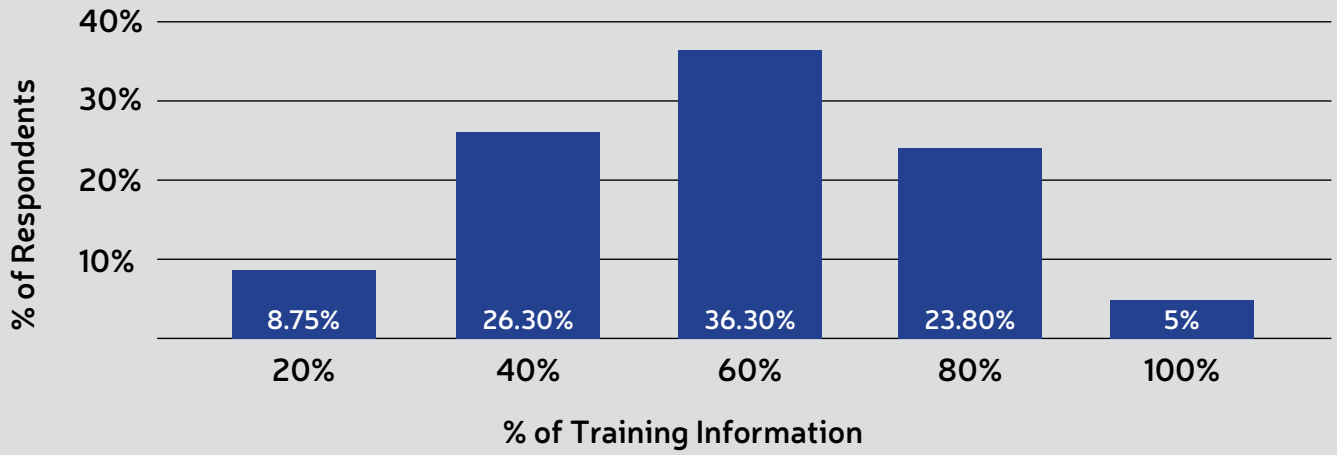
Knowledge Hub

While much of the focus to-date has been on in-country adoption of the technology and understanding use, country partners are now considering how they can best warehouse and share analytical outputs/products. In both Sierra Leone and Tanzania, partners are discussing how stakeholders can house their analytical products on the relevant portals in country. In Tanzania, the portal or platform will be supported by the NSDI policy mentioned above. In addition, there is keen interest from all partners to share tools, methodologies, and outputs across countries. The next phase of the ARDC work aims to focus on developing a knowledge hub or online platform that allows partners to share and access resources and outputs as well as information on aligned initiatives such as GRID3. For more immediate and real-time communication and knowledge exchange, the country teams in Ghana, Kenya, Sierra Leone, and Tanzania have created WhatsApp groups in which they discuss ARDC products and challenges.

Capacity Building and Awareness

Country partners note that while there has not been much data sharing between institutions yet, the ARDC trainings have significantly increased awareness of the benefits of EO data and the need to compare, validate, and join up data. GPSDD, in partnership with NASA, has conducted several trainings in each of the countries to-date. ARDC users' baseline GIS/coding understanding and skills fall on a broad spectrum ranging from none to advanced. From feedback collected from eight trainings conducted across the five countries between April and August 2019, participants noted that the most important thing they gained from the training was awareness and technical skills. Some of the areas in which participants noted that the training increased awareness was on how the data cube works, availability of processed satellite images, how satellite data can inform

How Much of the Information Covered in the Training was New to You?



*Responses are averaged across 8 trainings

SDG indicators, the importance of time series data, the existence of a common repository of information, and that timely information on SDGs such as 11.3.1 on urbanization is possible. Similarly, participants noted that they gained the following technical skills: how to use Jupyter notebooks, how to use the platform to analyze features such as water quality and land, understanding the Normalized Difference Vegetation Index (NDVI), understanding Python, how satellite data is used to come up with a given visualization, and the scientific interpretation of products.

In addition, when asked how much of the information covered in the training was new to them, the participants responses (as shown above) demonstrated that there was a relatively wide spread of EO-related knowledge levels, indicating the need for more tailored trainings.

This information indicates that as users learn more about the technology, why it is important, and how to use it, they will engage in more data sharing within and across entities, while strengthening data management capacities.

Accountability, Transparency, and Privacy

Global Level

At the global level, the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) was established by the Economic and Social Council (ECOSOC) as the apex intergovernmental mechanism for making joint decisions and setting directions regarding the production, availability and use of geospatial information within national, regional and global policy frameworks. It aims to address global challenges regarding the use of geospatial information, including in the development agendas, and to serve as a body for global policymaking in the field of geospatial information management.

UNGGIM, has a number of working groups. The working group on **Legal and Policy Frameworks for Geospatial Information Management**[5] was established in 2017 to:

- Raise awareness and highlight the importance of sound policy and legal framework for geospatial information management;
- Proactively explore appropriate policy and legal frameworks for geospatial information management; and
- Support the development of norms, principles and guides, including any regional capacity development initiatives, to significantly increase the availability and accessibility of geospatial information

Among its key achievements is the publication of the **Compendium on Licensing of Geospatial Information**[6] in 2018. This resource is useful for professionals within the geospatial ecosystem who do not have legal training and want a better understanding of geospatial information license agreements. In addition, another UN-GGIM Working Group in Development of a Statement of Shared Principles for the Management of Geospatial Information was established in 2013 with the core objective of preparing a preliminary proposal for a set of shared principles on the management of geospatial information.

In addition, the **Open Geospatial Consortium**[7] (OGC), a network of over 500 organizations, academia and governments, exists to develop standards on geospatial data that are open and accessible to further support and promote the use of EO data. In addition to these standards, from 2009, OGC established a committee, the **Spatial Law and Policy Committee**[8], to allow for an open conversation on the unique legal and policy issues associated with spatial data and technology.

Country Level

While there is broad consensus within each of the countries that there is a need to ensure accountability, transparency, and guidance on privacy-related issues related to EO data, there are no concrete frameworks yet. Many of the global level policies and guidance noted above, have not been translated into actionable guidance at the country level to-date. Some country partners note that this is a step that will progress as the technical side matures. Other partners note that the accountability and transparency elements are captured in the governance frameworks

given that they provide an in-built reporting structure and have high-level political buy-in that in theory supports transparency. In Sierra Leone, one of the lead institutions, the Right to Access Information Commission (RAIC) is advancing policies on data privacy which will provide guidance relevant to the access and use of the ARDC and EO data. Similarly, in Tanzania, the National Bureau of Statistics, Tanzania Data Lab (D-Lab), and the President's Office have started a dialogue to develop a concept note that will address accountability, transparency, and privacy-related concerns with the ARDC.

Technical Gaps and Challenges

Over the past year and half, GPSDD has solicited feedback from partners on technical and infrastructure challenges and concerns to ensure continuous improvements in the delivery of products and services. While many concerns have already been addressed, as it relates to data types, training materials, and user interface improvements, some continue to be worked on and new ones emerge.

Skill-building in multiple areas

As noted above, the ARDC user community includes a broad level of skills. However, optimal use of the ARDC platform requires a combination of skills including basic GIS skills as well as programming skills. There is an appetite among a subset of users to further build programming skills to better understand and use python and Jupyter notebooks so that users can build their own algorithms rather than depending on existing ones.

There is also a need to build skills in the interpretation of the data for science application purposes. This will require some experts in remote sensing and specific applications to conduct training and capacity building so users can improve their use of the data and learn how to interpret new products to address their needs. These are areas of capacity strengthening that GPSDD will work with its partners to further explore.

Translating and communicating outputs

In addition to capacity building, some partners have also noted the need to strengthen skills around translating and interpreting outputs/maps into quantitative and qualitative results that can be communicated both among users and with policy audiences. It is important that users are able to produce the outputs that they are interested in, interpret the information accurately, and communicate those results in a way that is accessible to non-technical audiences. GPSDD is working with the partners to meet this demand, particularly around clear policy questions or problem definition for the various use cases.

Infrastructure limitations

One of the main infrastructure limitations in operationalizing the ARDC is the lack of good Internet access in all target areas. This has posed a challenge both during trainings and for users' routine use. In order to mitigate this issue during trainings in some places such as Dodoma and Zanzibar, GPSDD brought Internet modems to boost access during trainings. For more routine use, some governments are partnering with education networks in country to access good Internet, such as in Kenya and Ghana. In Tanzania however, given the large size of the country and the current effort to finalize the fibre network across the country, it is taking longer to access reliable and routine Internet.

In addition, some users have expressed concerns with a cloud-based infrastructure that requires they download everything, posing a perceptional challenge that while initial costs are low, long-term costs of warehousing, licensing, and skill-building seem large. The ARDC is currently accessible offline on-demand. The team is in the process of compiling relevant data for immediate use on drives that can be accessed offline, which will then be built into an offline version of the data cube that users can access more regularly.

Access to Cloud Computing Capacity

Due to cloud credit constraints and costs, simultaneous access to the data and analysis is currently limited. Users have flagged this as a concern and a potential hinderance to continued momentum in using and increasing use of the ARDC. As the ARDC is scaled, it will be important to consider how access to and use of cloud computing capacity will be handled given the number of users.

Recommendations

Ensure institutionalization of a governance framework in each country of operation. As noted above, having a governance framework that delineate political and technical leads is important. However, it is critical that this framework is integrated into broader structures to ensure buy-in, sustainability, and streamlining of activities.

Identify and support institutional champions. Establishing a governance framework and institutionalizing it effectively requires institutional champions to drive the process through continuous engagement and advocacy to ensure ownership.

Identify and align with national mandates and interest. There is no standard template for an enabling environment that supports adoption and use of EO data. It is important to identify and leverage the policies and national interests in each country to facilitate operationalization.

Employ an ecosystems approach to fostering data sharing. While legal guidance and frameworks help share data, it is important to address the need for perception and attitude change around data sharing by facilitating coordination and increased awareness of mutual benefits to strengthen the entire data ecosystem.

Create a knowledge hub for EO resources. There is keen interest from partners to access and share tools, methodologies, and outputs within and across countries. This will also require coordination with country-specific portals to house outputs that are currently in discussion.

Provide more targeted trainings to address various skill-levels. ARDC users have a broad range of skillsets and understanding of the technology and how to use it. It is important to cater trainings to the different levels and offer basic, mid-level, and expert-level support to ensure effective and efficient capacity building across all interested stakeholders.

Translate global-level legal and policy guidance to national-level needs. While global-level guidance and frameworks exist, they have not been leveraged as accessible or practical resources at the country level. It is important to consider how global guidance can support country-level application.

Understand users' Internet accessibility. It is important that capacity building efforts and users understand the extent of Internet accessibility to enable effective use of the data cube in a given location. Understanding the Internet landscape and needs can inform mitigation strategies such as the use of additional modes, building sustainable partnerships, and developing offline access.

Work more closely with global efforts to increase and improve access and use. In an effort to strengthen the global Earth observation data ecosystem, it would be beneficial to work more closely with global groups such as UN-GGIM to develop algorithms and training packages based on the open data cube and relevant frameworks. This can help consolidate available resources for users and reduce reliance on specific platforms and approaches.

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Author: Charu Vijayakumar, on behalf of the Global Partnership for Sustainable Development Data (the Global Partnership). The Global Partnership, hosted at the United Nations Foundation, is a network of over 250 partner organizations including governments, businesses, civil society, international organizations, academia, foundations, and statistics agencies from across the globe working together to ensure the opportunities of the data revolution are available to and for all of humanity, helping to achieve sustainable development. The Global Partnership's goal is to drive better decisions and better lives for all by facilitating the production and use of better data through strategic partnerships, advocacy, technical assistance, and pilot initiatives to support our partners at the global, regional, and national levels.

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Annex A:
Governance Frameworks

Sierra Leone

Open Data Council

70+ public and private sector institutions meeting annually to address policy, programs and agenda of open data to promote data sharing and use. The ODC includes: the Ministerial Committee, National Steering Committee and Technical Advisory Committee. The operational level includes 6 Task Teams including Data Collaboratives which are mandated to work on specific pilot data projects with the GPSDD focused on Environment, Agriculture, Education and Geospatial/EO Data.

ARDC National Coordinating Committee

Political and administrative leadership for the implementation of the ARDC and is co-chaired by Statistics Sierra Leone and Right to Access Information Commission (RAIC). Other members include Ministry of Agriculture and Forestry, Environment Protection Agency (EPA), Stats SL, and RAIC.

ARDC Technical Committee

Functional and technical leadership in the implementation of the ARDC and is chaired by the Environment Protection Agency (EPA) with membership from: 1. Statistics Sierra Leone; 2. Right to Access Information Commission; 3. Ministry of Lands, Country Planning & the Environment; 4. Ministry of Agriculture and Forestry; 5. Water Resources Commission; 6. Ministry of Mines and Mineral Resources; 7. Forestry Commission; 8. University/Research Institute: that has a center for Remote Sensing and GIS.

Senegal

Political Level

Led by the Direction Générale de la Planification et des Politiques Économiques (DGPPE)/General Directorate of Planning and Economic Policies, Ministry of Planning and Economic Cooperation. This level is meant to provide political engagement, advocacy and support at the highest level of government.

Technical Committee

Chaired by the Directorate of Planning and Environmental Watch/ Direction de la Planification et de la Veille Environnementale (DPVE), Ministry of Environment and Sustainable Development. Agence Nationale de la Statistique et de la Démographie (ANSD). Members included: 1. Centre de suivi écologique (CSE); 2. Initiative Prospective Agricole et rurale (IPAR); 3. Direction de l'Environnement et des Établissements Classés (DEEC); 4. Direction de l'Analyse, de la Prévision et des Statistiques Agricoles (DAPSA); 5. Agence Nationale de l'Aviation Civile et de la Météorologie du Sénégal (ANACIM); 6. Direction des Eaux et Forêts, Chasses et de la conservation des Sols (DEFCCS); 7. Agence Nationale pour l'Aménagement du Territoire (ANAT); 8. DPN; 9. DAMCP; 10. UCG; 11. KRANTH/Senegal Flying Lab

Secretariat

Housed at Initiative Prospective Agricole et Rurale (IPAR), a lead agricultural and environment think-tank in Senegal. Work with both the political and technical leads to provide administrative and secretariat supports.

Ghana

SDG Implementation Coordinating Committee
Ghana Statistical Service (GSS) and National Development Planning Commission (NDPC) and Ministries, Departments and Agencies (MDAs)

Advisory Committee on the SDGs
High-level government (Institute of Statistical, Social and Economic Research – University of Legon, Bank of Ghana) and Development partners (UNDP, World Bank, GIZ).

Big and Spatial Data Workstream
Land Use and Spatial Planning Authority (LUSPA), Ghana Statistical Service (GSS) etc.

ARDC National Coordinating Team
Ghana Statistical Service (GSS), National Development Planning Commission (NDPC).

ARDC Technical Committee
Ghana Statistical Service (GSS), Ministry of Lands and Natural Resources, Land Use and Spatial Planning Authority (LUSPA), CERSGIS, Forestry Commission, National Information Technology Agency (NITA), Environmental Protection Agency (EPA), Ministry of Food and Agriculture (MOFA), National Communication Authority (NCA)

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Ghana (continued)

ARDC Technical Working Group

Ghana Statistical Service (GSS), Ministry of Lands and Natural Resources, Land Use and Spatial Planning Authority (LUSPA), CERSGIS, Forestry Commission, National Information Technical Agency (NITA), Environmental Protection Agency (EPA), Ministry of Food and Agriculture (MOFA), National Communication Authority (NCA), Water Resource Commission (WRC), Survey and Mapping Directorate in Lands Commission, University of Energy and Natural Resources (UENR), Asheshi University, Northern Development Authority (NDA), National Disaster Management (NADMO).

ARDC Sub-data Communities

Urbanization: GSS, MOFA, NADMO, LUPSA, WRC, EPA
Illegal mining: EPA, Ministry of Lands and Natural Resources etc.

Kenya

Political Level
Office of the Deputy President in Kenya

Secretariat
Kenya Space Agency

ARDC Technical Committee
Government: Kenya Space Agency, National Drought Management Authority, National Land Commission, Kenya Forest Service (KFS), Kenya Marine and Fisheries Research Institution (KMFRI), Kenya Meteorological Department, Department of Resource Surveys and Remote Sensing (DRSRS), Council of Governors

Academic/ Research Institutions: Strathmore University, GODAN, East Africa Grain Council (EAGC), LocatIT, Jomo Kenyatta University of Agriculture and Technology (JKUAT), ICRAF, Regional Centre For Mapping Resource For Development (RCMRD), Kenya Institute for Public Policy Research and Analysis (KIPPRA)

CSOs: Redcross, MercyCorp

Mainland Tanzania

Political and Secretariat
National Bureau of Statistics

ARDC Working Group
National Bureau of Statistics; Ministry of Water; Ministry of Minerals; Disaster management, Prime Minister's Office; Ministry of Agriculture; National Environment Management Council-NEMC; and National Land commission

Zanzibar

Political
Office of Chief Government Statistician (OCGS)

Secretariat
State University of Zanzibar

Technical Committee
OCGS Department of Land; Department of Forestry and Non Renewable Resources; Zanzibar Environment Authority; Department of Environment; Zanzibar Planning Commission; Ministry of Agriculture, Department of Research and Policy; Department of Fisheries; Department of Agriculture; State University of Zanzibar

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