



# **DATAVERSE AFRICA INTERNSHIP PROGRAM DATA GAP INITIATIVE**

## **A Literature Review on Data Gap in Africa: Causes, Effects and Solutions**

**Elma Fortunate Phiri  
Babatunde Matthew Oladoyinbo**



## Table of Contents

Understanding Data Gaps in Africa.....	3
Abstract.....	3
Introduction.....	3
Definition.....	4
Key challenges.....	4
The impact of data gaps.....	5
Industries Affected by Data Gaps.....	5
Health sector.....	5
Education sector.....	9
Agriculture Sector.....	11
Infrastructure Sector.....	15
Learning from Advanced Countries.....	18
Health Sector.....	18
Education.....	19
Agriculture.....	21
Infrastructure.....	23
Adaptable Strategies to Bridge Data Gap in Africa.....	24
Conclusion.....	28
References.....	29



## Understanding Data Gaps in Africa

### Abstract

In an era where data is abundant and increasingly accessible, Africa continues to face significant gaps in data availability and quality across sectors such as healthcare, education, agriculture, and infrastructure. Despite being surrounded by vast amounts of information, the region struggles with incomplete, fragmented, and inconsistent datasets that undermine effective decision-making and governance. As noted in a working paper commissioned by Paris21 and the Mo Ibrahim Foundation, data is at the heart of inclusive governance and development. Reliable, timely, and relevant data enables governments to manage resources efficiently, while the absence of such data results in misdirected policies that disproportionately affect the most vulnerable groups. The 2016 Africa Data Revolution Report emphasizes that these data gaps could severely impact the region's ability to meet its development objectives if left unaddressed. This study examines the root causes of Africa's data gaps, their consequences on socioeconomic growth, and the urgent need for data-driven strategies to fuel sustainable progress.

### Introduction

We are living in a world awash with data. Information is generated in ever greater quantities and at an unprecedented pace, with data now streaming in almost instantaneously from multiple sources. Yet, despite this global abundance, critical data gaps persist in Africa. These gaps manifest as missing, fragmented, or inaccurate datasets that hinder effective decision-making, policy formulation, and development initiatives. In an era where socioeconomic development is increasingly tied to research, innovation, and data-based governance, the absence of reliable data can have dire consequences. Credible, timely, and relevant data are essential to guide policy decisions, allocate resources efficiently, and ensure that the needs of the most vulnerable populations are met. Without such data, governments risk misdirecting their efforts, leading to inefficient resource allocation and the exclusion of those who need support the most. A working paper commissioned by Paris21 and the Mo Ibrahim Foundation emphasizes that “data are central to inclusive and effective governance. (Paris 21, 2021) You need to know where you are starting from, what you are aiming at, and whether you are getting there in the most efficient



manner.” Yet, as highlighted in The Africa Data Revolution Report, significant deficits continue to haunt the continent’s data ecosystems. If these gaps are ignored, they could hamper key development objectives at both national and regional levels, stifling progress and perpetuating inequalities. This research aims to investigate the underlying causes of these data gaps and explore strategies to bridge them, thereby ensuring that Africa is not left behind in the ongoing global development tide.

## **Definition**

Data gaps refer to the absence, fragmentation, or inaccuracy of data across various sectors. This can occur when information is missing entirely, scattered across multiple, incompatible sources, or collected using inconsistent methods. It is also defined as the absence, fragmentation, or inaccuracy of critical datasets needed to inform policy, innovation, and development. Gaps in reliable data can stunt the effectiveness of decision-making and investment in development, limiting the ability to monitor progress or address emerging challenges. Data gaps are often exacerbated by poor infrastructure, inadequate technological systems, and the lack of data-sharing frameworks, which hinder comprehensive data usage across sectors.

## **Key challenges**

Despite the global abundance of data, Africa continue to struggle with significant data deficiencies.

Key challenges include:

- Lack of technology and infrastructure

Many African countries rely on outdated data collection methods due to inadequate digital infrastructure and unreliable power supply.

- Unavailability of centralized data banks

Data is stored across disparate platforms and organizations, making it difficult to access a comprehensive, unified dataset. Different systems often use varying formats and standards, complicating data integration and cross-sector analysis.

- Poor state of infrastructure

Weak physical infrastructure is characterized by limited transportation networks, unreliable telecommunications, and insufficient computing facilities—severely impedes the collection and dissemination of data. Moreover, maintenance challenges further compound the issue, as existing infrastructure is often poorly maintained, thereby limiting the capacity to gather and share accurate



information.

- Lack of funding

Financial constraints restrict investments in modern data systems, technology upgrades, and training for skilled personnel.

- Limited data-sharing frameworks

Various government agencies and private organizations mostly operate independently, with little incentive or legal framework to share data. There are inadequate policies and privacy concerns which prevent the smooth exchange of data between stakeholders.

- Data Quality and Reliability Issues

Inconsistent data collection methods result in datasets that are often incomplete, outdated, or inaccurate.

## **The impact of data gaps**

- Poor decision-making

Policymakers struggle to implement effective solutions without accurate data.

- Reduced Accountability and Transparency

When there's no centralized data, it's tough to keep track of government actions, making it difficult to track government expenditures and service delivery.

- Lack of Innovation

Not having good data holds back research and development, making it harder to use new solutions like AI health checks or advanced farming methods.

- Inefficient resource allocation

Without specific data, it's hard to plan well and use money wisely, which affects areas like healthcare, education, and farming.

- Limited technological advancement

The absence of high-quality data restricts research and development, slowing the adoption of innovative solutions such as AI-driven diagnostics or smart farming practices.

- Limited Data Driven Policy

If decision-makers have to rely on personal stories instead of solid data, the resulting policies might not work well or even cause more issues.



## **Industries Affected by Data Gaps**

Various aspects of the continent are affected by this data gap challenge but we shall be looking into just four sectors: Health, Agriculture, Education and Infrastructure.

## **Health sector**

### **Challenges in Health Data Collection**

Among the numerous challenges that Africa faces in improving its healthcare systems, the scarcity of health data stands out as paramount. Health data refers to any information related to an individual's health status, past or present, including clinical records, mobile health tracking, and digital health applications. Although data-driven healthcare is becoming increasingly important globally, Africa continues to experience significant gaps in health data representation.

Most African countries lack up-to-date, comprehensive, and accurate data on health inequalities and causes of death. This lack of data prevents health authorities from tracking progress toward the Sustainable Development Goals (SDGs), assessing the effectiveness of health programs, and prioritizing healthcare interventions.

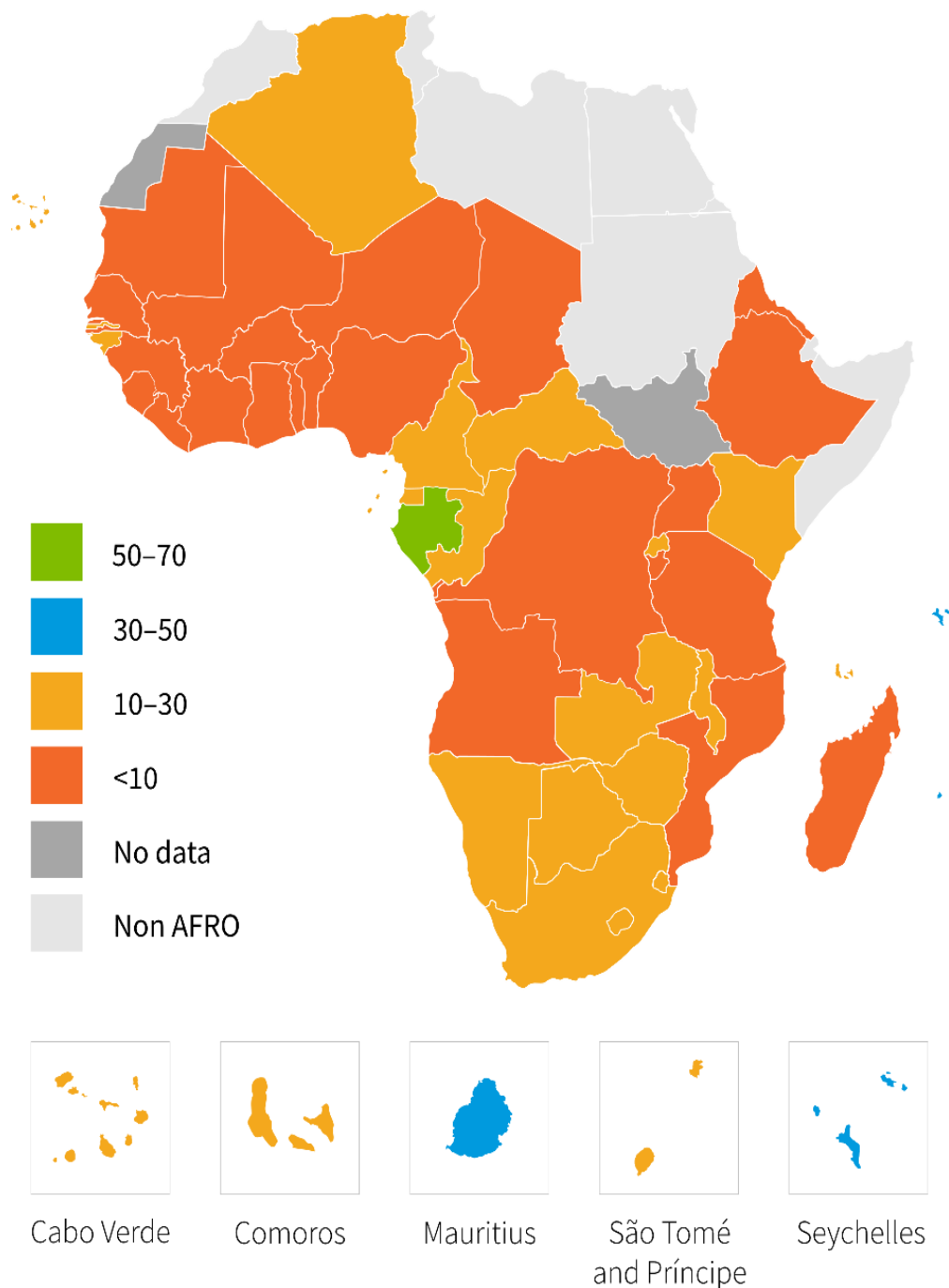
### **Barriers to Effective Health Data Management**

One major cause of these data gaps is the failure to capitalize on available opportunities for data collection. Thousands of patients visit healthcare facilities daily, but a structured system to collect and analyse population health data is often absent. Many healthcare facilities do not have dedicated data management departments, and where they do exist, they primarily focus on patient record-keeping rather than analysing data for broader health interventions. Additionally, reliance on manual record-keeping further exacerbates challenges in monitoring public health trends at a national level.

The COVID-19 pandemic highlighted the impact of these data gaps. Reporting inconsistencies regarding testing, case counts, and mortality made it difficult for African governments to respond effectively to the crisis. The lack of real-time data hindered resource allocation, policy adjustments, and emergency response strategies.







*Figure 1- Government health expenditure as % of total government expenditure in the WHO African Region, 2019, WHO*

### Challenges Leading to Health Data Gaps

1. Effective Usage – In some cases where data is collected, there is underutilization due to a lack of analytical tools and knowledge. Health information should guide resource allocation and policy decisions, but without proper analysis, it remains ineffective.



Solution: Healthcare facilities should be equipped with tools and trained personnel to analyze collected data effectively.

2. Data Structures – Periodic health surveys often consist of vast amounts of data, requiring well-trained staff with appropriate analytical skills. Routinely collected health service data is underutilized due to a lack of government demand and analytical expertise.

Solution: Data collection should focus on relevant indicators under expert supervision to ensure meaningful insights.

3. Data Cost – Collecting high-quality health data is expensive, requiring modern technological tools and secure management systems. Many African countries lack sufficient funding for such initiatives.

Solution: Partnerships with NGOs and private companies interested in healthcare can help finance and implement data collection strategies.

### Proposed Solutions

1. Centralized Health Databases – Establishing national health data systems to integrate records across hospitals and clinics.
2. Adoption of Electronic Health Records (EHRs) – Encouraging digital patient record systems to improve data accuracy and accessibility.
3. Training and Capacity Building – Investing in data analytics training for healthcare professionals to improve data usage.
4. Public-Private Partnerships – Collaborating with tech companies and NGOs to implement scalable health data solutions.

### African's effective Health Data initiatives

- Kenya's mHealth Initiatives

Kenya has pioneered mobile health (mHealth) solutions, particularly in rural areas where traditional health infrastructure is limited. Mobile applications for maternal and child health tracking have improved patient monitoring and early disease detection, thereby enhancing the overall quality of healthcare services. These mHealth programs have empowered community health workers and bridged data gaps in resource-constrained settings. (Otieno, 2021)

- Rwanda's Community Health Information System



Rwanda has built a robust community health information system that aggregates data from community health workers into a centralized national database. This system has improved disease monitoring, streamlined emergency response, and facilitated targeted healthcare interventions, especially in remote regions where access to health services is challenging. The Rwandan Ministry of Health partnered with the Integrated Health Systems Strengthening Project (IHSSP) to strengthen and coordinate its health information system. (Management Sciences for Health, 2025)

- South Africa's National Health Information System (NHIS)

South Africa has adopted a comprehensive National Health Information System that integrates data from hospitals, clinics, and laboratories. By leveraging Electronic Health Records (EHRs), the NHIS has enhanced disease surveillance, enabled more effective resource allocation, and improved patient care across the country

## **Education sector**

### **Importance of Education Data**

Data is critical in formulating education policies, setting realistic objectives, and monitoring progress. Accurate data not only highlights achievements but also identifies setbacks, guiding stakeholders in resource allocation and program improvement. Without reliable data, it becomes challenging to address disparities, particularly for disadvantaged children and learners with special needs.

### **Challenges in Education Data Collection**

Incomplete and Uneven Data Coverage:

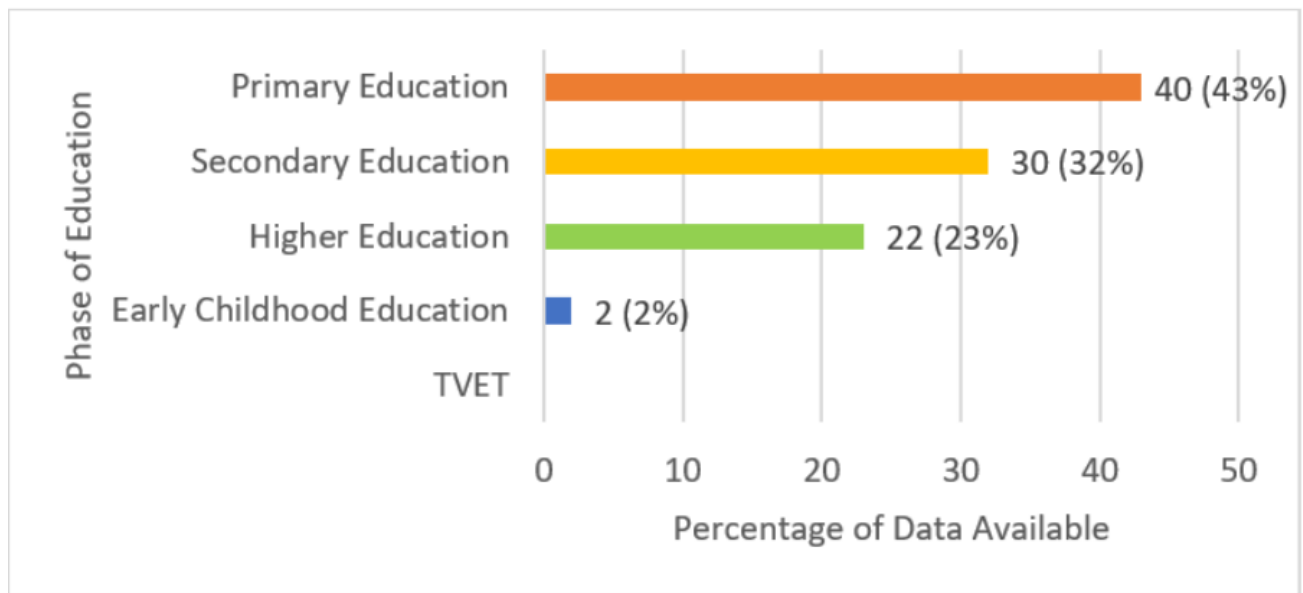
- Primary and Secondary Focus: Most datasets (43% for primary and 32% for secondary education) capture only a portion of the education spectrum.
- Neglect of Early Childhood and TVET: Early childhood education (only 2% coverage) and Technical and Vocational Education and Training (TVET) (0% coverage) are underrepresented, despite their critical roles in long-term development and employment.

Tertiary Education Limitations:

- Research addressing challenges at lower educational levels is predominantly conducted by tertiary institutions, highlighting a gap in



comprehensive data collection across all education levels.



### Specific Challenges and Proposed Solutions

#### 1. Gender Disparities in Data Collection

- *Challenge:* Cultural beliefs in certain communities discourage female education, resulting in biased data.
- *Solution:* Collaborate with NGOs to organize outreach programs that promote the value of educating all genders, thereby improving the balance in data collection.

#### 2. Lack of Program Feedback

- *Challenge:* There is often little to no systematic effort to collect feedback on educational programs, making it difficult to analyse and refine teaching methods.
- *Solution:* Government and educational stakeholders should encourage the collection and analysis of feedback data to continuously improve program effectiveness.

#### 3. Quality of Education and Data Literacy



- o *Challenge:* In regions where education quality is low, there is a corresponding lack of exposure to data literacy, affecting the ability to collect and analyse educational data effectively.
- o *Solution:* Invest more in the research and development segment within the education sector to enhance data collection, processing, and utilization.

### African's effective Education Data initiatives

- Kenya's Education Management Information System (EMIS):  
The Kenya Education Management Information System (KEMIS) is an integrated platform developed by the Ministry of Education to streamline the management of educational data across schools in Kenya. KEMIS provides a centralized database that captures comprehensive student information, school performance data, curriculum documents, and much more. It serves as a valuable tool for decision-making, policy formulation, and monitoring of educational progress at various levels. This system provides comprehensive data on enrolment, gender balance, learning outcomes, and infrastructure, enabling more informed policy decisions. (@Educationnewshub.co.ke, 2024)
- Nigeria's Digital Learning Projects:  
In Nigeria, several digital initiatives have been implemented to capture real-time student performance data. These projects have helped identify gaps in learning and direct resources more effectively, demonstrating the benefits of technology-driven data collection in improving educational outcomes. Many educational institutions—from primary schools to universities—are adopting digital tools such as e-learning platforms, learning management systems, and data analytics solutions. (FUC E-Learning, n.d.)

### Global Best Practices and Their Relevance to Africa

- Standardized Assessments and Digital Platforms: Many developed countries employ standardized testing and robust digital data platforms to monitor education performance. However, in Africa, these practices need adaptation:
- Affordability and Infrastructure: Global models often assume widespread access to advanced technology, which may not be feasible



in many African contexts. Adapted solutions must account for limited internet connectivity and funding.

- **Cultural Sensitivity:** Practices that work in Western contexts might require modifications to address local cultural norms, such as overcoming gender biases in data collection.

## **Agriculture Sector**

Africa's agricultural sector is the continent's best bet to achieve sustainable development and a return on investments. The sector is a source of livelihood for over 70% of the population and is the largest contributor to total gross domestic product (GDP). However, Africa faces a major data gap that significantly hinders policymaking, investment, and sustainable development in the sector as well as efforts to reduce poverty. A significant agricultural data gap currently exists across Africa. Although agricultural data exists in many African countries, accessibility challenges make it difficult to adequately collect and process the data for use in wider research.

The executive director of the Alliance for Science, Dr Sheila Ochugboju, has come face to face with the scourge of data gaps while serving in an advisory capacity in one African country. She explained her frustrations thus: "The data gaps, especially in agriculture, were so stunning that one would even wonder what was the basis for decision making. For instance, we didn't have the figures for how much maize was being produced, or even what challenges the farmers were facing. Most of the work we did was based on guestimates! We figured that we needed to put systems in place to capture the data, because we couldn't work out solutions without the data."

### **Data Challenges in Agriculture**

#### **1. Irregular and Inadequate Data Collection**

- **Limited Censuses and Surveys:**  
Many African countries lack regular, high-quality agricultural censuses and surveys. Even when data sources like FAOSTAT or CountrySTAT are used, the information is often outdated or sparse.
- **Lack of Smallholder Representation:**  
The majority of agricultural data fails to capture the realities of smallholder farmers, leading to gaps in understanding crop performance and local farming practices.



- Impact on Planning:

The scarcity of timely and accurate data complicates efforts to forecast yields, plan resource allocation, and design effective interventions for economic growth.

## 2. Representation and Accessibility Issues

- Incomplete Data on Farming Practices:

Existing datasets often do not reflect the diversity of farming practices across different regions, particularly neglecting small-scale and subsistence agriculture.

- Barriers to Data Access:

Data collected by government agencies or international organizations may not be easily accessible or fully processed for local research purposes, limiting its utility for grassroots development initiatives.

## 3. Impact on Decision-Making and Policy

- Misdirected Policies:

Without reliable data, policymakers risk misdirecting resources, which can exclude vulnerable groups and result in inefficient use of funds.

- Economic and Poverty Reduction Implications:

Inaccurate data hampers the ability of governments to implement programs that could boost productivity and alleviate poverty.

According to a working paper commissioned by Paris21 and the Mo Ibrahim Foundation. It emphasizes that “data are central to inclusive and effective governance. You need to know where you are starting from, what you are aiming at, and whether you are getting there in the most efficient manner.”

As was noted in The Africa Data Revolution Report 2016 (Oliver J.M. Chinganya, 2016), significant deficits remain within the continent’s data ecosystems.

“If Africa is to harness the full transformative power of the on-going data revolution, significant investment will need to be made in human resources, technological capabilities, platforms and tools, and in establishing effective governance frameworks related to the production, processing, protection, ownership, quality, openness, timeliness, relevance, accessibility, harmonization, interoperability and use of different types of data, regardless of who produces or owns them,” the report stated.

In Agricultural sector, the most prominent challenge is Lack of Data. In past years there had been complete lack of records or data concerning the farmers activities or



little as to the type of fertilizer used and proper documentation of the weather conditions as well. All of which have compounded and have heaped up challenge for the innovative farming systems around the world to be situated or used in some parts of Africa. The government are encouraged to put in place committee and policies which could help put the order and right systems in place.

#### Proposed Solutions

- **Invest in Mobile and Low-Cost Technologies:**  
Encourage the use of mobile data collection systems and affordable sensors to gather real-time information from smallholder farms.
- **Foster Public-Private Partnerships:**  
Collaborate with NGOs and private companies to finance and implement modern data collection initiatives.
- **Develop Standardized Data Protocols:**  
Establish guidelines to ensure consistency and accuracy in agricultural data collection, focusing on capturing the nuances of small-scale farming.
- **Build Local Capacity:**  
Invest in training programs for local officials and researchers to analyse and utilize agricultural data effectively, ensuring that the information collected translates into actionable insights for policy and planning.

#### African's effective Agriculture data initiatives

- **Ethiopia's Agricultural Transformation Agency:**  
Ethiopia has implemented a comprehensive data-driven initiative to monitor crop yields, track weather patterns, and assess market access. The Agricultural Transformation Agency (ATA) is a government institution established to drive substantial reforms in Ethiopia's agricultural sector. With the goal of modernizing agriculture, enhancing productivity, and improving rural livelihoods, ATA works to bridge the gap between policy formulation and on-the-ground implementation. Its initiatives have been pivotal in piloting innovative agricultural practices and scaling up successful interventions to benefit smallholder farmers across the country. This initiative has helped smallholder farmers receive targeted support and improved national planning and budgeting. (Agency, n.d.)



- Ghana's Digital Agricultural Platforms:

In Ghana, digital solutions such as GhAAP have been deployed to collect real-time data on crop performance and market prices. The Ghana Agriculture and Agribusiness Platform (GhAAP) is an integrated and interoperable web-based platform that provides agribusiness value chain actors with information, insights, inputs, agronomic practices, markets and other resources to enhance coordination, transparency, interaction, tracking, monitoring and reporting in real-time. These platforms enable more accurate forecasting and resource allocation, demonstrating how technology can bridge data gaps and drive agricultural development. (Ghana Agriculture and Agribusiness Platform (GhAAP), n.d.)

- Kenya Agriculture Reforms & Innovations (KARI) Portal:

The portal gathers data on a wide range of agricultural reforms, including policy changes, technological advancements, and sustainable practices. This extensive repository ensures that all significant developments in the sector are captured and made accessible. KARI provides up-to-date information thereby, empowers stakeholders such as farmers, policymakers, researchers, and entrepreneurs to make data-driven decisions. This leads to more effective interventions and reforms in the agricultural sector. The Kenya Agriculture Reforms & Innovations (KARI) Portal is a pivotal tool for modernizing Kenya's agricultural sector. It provides a robust framework for collecting and sharing critical data, thereby supporting reforms that enhance productivity, sustainability, and overall sector transformation. (Kenya Agriculture Reforms and Innovation, n.d.)

#### Global Best Practices and Adaptation to Africa

- Precision Agriculture Technologies: Developed countries utilize technologies such as GPS, drones, and sensors to monitor crop performance. While these are costly, Africa can adopt mobile-based alternatives tailored to local conditions.
- Data Integration and Standardization: Global best practices emphasize the integration of diverse data sources. For Africa, developing





standardized protocols that capture both large-scale and smallholder data is essential to inform policy decisions.

## **Infrastructure Sector**

The infrastructural development of a continent is measured with different metrics such as air transport, ICT, irrigation, ports, power, railways, roads, water and sanitation. Infrastructure development is a critical driver of economic growth and social progress in Africa. However, a significant obstacle to effective infrastructure planning and management is the persistent data gap. This gap hinders informed decision-making, efficient resource allocation, and sustainable development.

Analysis data of this could help develop the infrastructural of the country very well. But unfortunately, otherwise could be said of Africa.

The availability of dataset in this sector is low and inconsistent as such that during this research work, it was difficult to find any dataset without fragmentation or with complete indicators.

It is advised that the government should look earnestly into this and ensure that the proper documentation as rightly is done.

### **Data Challenges in infrastructure**

#### **1. Lack of comprehensive data**

- **Incomplete Datasets:**

Information on the condition, usage, and maintenance needs of existing infrastructure (roads, bridges, railways, energy grids, water systems, etc.) is often incomplete or outdated. This gap makes it difficult to assess current infrastructure performance and forecast future needs.

#### **2. Data fragmentation**

- **Disparate Data Sources**

Data is often collected by different government agencies, private sector entities or research organizations using varying methodologies. This results in fragmented datasets that are challenging to integrate and analyse cohesively

#### **3. Limited data sharing**

- **Siloed Information**

Data is often not shared between government agencies, private sector

actors, and research institutions, hindering collaboration and informed decision-making.

#### 4. Insufficient capacity for data analysis

There is a shortage of skilled professionals who can collect, analyse, and interpret infrastructure data. This means that without robust analytical capacity, the valuable data that is collected remains underutilized.

#### 5. Data quality issues

- Inaccurate or Biased Data

Variations in data collection methods lead to issues with reliability and accuracy. Poor data quality can result in flawed conclusions and ineffective infrastructure policies

### Proposed Solutions

- Invest in Open-Source Technologies:

Encourage the adoption of open-source GIS, remote sensing, and mobile data collection tools to gather real-time infrastructure data cost-effectively.

- Establish Centralized Data Platforms:

Develop and maintain centralized systems for data sharing across government agencies, private entities, and research institutions. Such platforms can consolidate fragmented datasets and facilitate comprehensive analysis.

- Enhance Local Analytical Capacity

Invest in training programs to develop local expertise in data collection, analysis, and interpretation. Building this capacity will ensure that collected data is transformed into actionable insights for infrastructure planning.

- Implement Standardized Data Protocols:

Collaborate with international organizations to develop and adopt data collection standards that are tailored to Africa's unique infrastructure needs.

### African's effective infrastructure data initiatives

- South Africa's Smart Cities Initiative

South Africa's Smart Cities Initiative aims to leverage digital technologies to transform urban centres into more efficient, sustainable, and inclusive environments. According to Sunil Geness,



Director of Global Government Affairs & CSR for Africa at [SAP](#), smart cities hold enormous potential for improving the quality of life for millions of South Africans. A smart city uses technology and other innovative means to improve the quality of life for citizens, deliver efficient services, and meets the needs of current and future generations as they relate to economic, social and environmental aspects.

Smart cities enable better management through more effective data-driven decision-making, reduced environmental impact, expanded opportunities for economic development, safer communities, and general enhancements in how communities and municipalities collaborate

- Kenya's Integrated Urban Infrastructure Projects

Kenya's Integrated Urban Infrastructure Projects focus on modernizing urban spaces through holistic infrastructure development. This project aims improve roads, water supply, sanitation, waste management and energy systems. It will also integrate ICT solutions to support efficient urban planning, traffic management and service delivery

- Rwanda's ICT-Driven Urban Development

Rwanda's ICT-Driven Urban Development involves the integration of information and communication technology into urban planning, with a focus on digital governance, smart city projects, and inclusive development. Key initiatives include the implementation of e-government platforms to enhance transparency and efficiency in municipal services, as well as smart city projects like Kigali Innovation City, which aims to create technology hubs and sustainable infrastructure. Additionally, ICT is leveraged to improve service delivery, citizen engagement, and overall quality of life in urban areas, fostering an inclusive and modern urban environment.

#### Global Best Practices and Adaptation to Africa

- Geospatial Mapping and Real-Time Analytics: Developed countries use technologies like Building Information Modeling (BIM) and real-time data analytics for effective infrastructure management. Although such systems can be expensive, Africa can adopt open-source GIS software and mobile reporting tools as cost-effective alternatives.



- Collaborative Data Sharing Platforms: Global practices emphasize the importance of sharing data across multiple stakeholders to ensure transparency and efficiency. For Africa, establishing centralized data-sharing platforms could significantly reduce fragmentation and improve decision-making.

### **Learning from Advanced Countries**

Numerous developed countries have effectively tackled data gaps in key sectors by implementing innovative strategies, leveraging technological advancements, and establishing strong regulatory frameworks. These successful approaches provide valuable insights for African nations seeking to enhance data collection, accessibility, and utilization. Developed nations have effectively bridged data gaps in essential sectors by leveraging innovative strategies, advanced technologies, and robust regulatory frameworks. These proven methods provide a valuable blueprint for African countries looking to enhance data collection, improve accessibility, and optimize utilization.

### **Health Sector**

Developed countries are utilizing HL7 FHIR and advanced integration, to ensure organizations have seamless data exchange and meaningful use for improved clinical decision-making. The implementation of these standards extends beyond technical advancements; it fosters environments where patient care transcends organizational boundaries. Seamless data flow enables healthcare providers to deliver coordinated treatments and respond swiftly in emergencies. This not only improves disease surveillance but also informs public health strategies in real time. (Rajhamundry, 2025). Developed nations, including the United Kingdom and the United States, have spearheaded initiatives such as the UK Biobank, Public Health England's 1,000 Genome Project, the U.S. "All of Us" initiative, and the European Network of Cancer Registries. These projects have made comprehensive genetic, clinical, biological, and socio-demographic health data accessible to clinicians worldwide, thereby enhancing the understanding of risk associations and the genetic underpinnings of diseases. These initiatives collect diverse, large-scale health data to enhance personalized medicine and public health planning. (Sulaiman Muhammad Musa, 2023). Countries like United States of America, the United Kingdom, and Germany have effectively implemented Electronic Health Records (EHRs) to streamline



patient data management. The Health Information Technology for Economic and Clinical Health (HITECH) Act in the U.S. played a pivotal role in expanding the adoption of EHRs, improving patient data security, and enhancing interoperability between healthcare institutions. Africa can adopt frameworks like HL7 and FHIR to unify fragmented datasets and address data gaps in healthcare.

## **Education**

Africa can learn a great deal from advanced continents in addressing data gaps in education, but it's crucial to adapt these lessons to the specific context and challenges faced on the continent.

Here's a discussion of potential learning areas:

### **1. Building a Culture of Data Use:**

In many developed nations, data is integral to decision-making at all levels of the education system, from individual schools to national policy. There's a strong emphasis on evidence-based practice.

Africa can foster a similar culture by promoting the value of data in education. This involves training educators and policymakers on how to interpret and use data, as well as creating a culture of transparency and accountability where data informs decisions about resource allocation, curriculum development, and teacher training.

### **2. Leveraging Technology Appropriately:**

Developed nations often use sophisticated technologies like Learning Management Systems (LMS), standardized testing platforms, and data analytics tools.

While these technologies can be beneficial for African countries, it's essential to consider affordability, infrastructure limitations (e.g., internet access, electricity), and the digital literacy of teachers and students. Focus on mobile-first solutions, offline data collection tools, and open-source software can be more appropriate in many African contexts. For example, using SMS-based systems for student attendance or basic assessments can be very effective.

### **3. Developing Standardized Assessment Systems:**

The use of Standardized testing in advanced continents provides valuable data on student achievement and allows for comparisons across schools and regions. This data has more effective indicator that can be used.

The development of robust and culturally relevant assessment systems is crucial. If Africa could adopt the training of teachers on how to administer and interpret



assessments, as well as ensuring that assessments are aligned with curriculum goals. Regional collaboration on assessment development can be beneficial.

#### 4. Investing in Data Infrastructure:

Developed nations have invested heavily in building the infrastructure needed to collect, store, and analyse education data.

For Africa while large-scale infrastructure projects can be expensive, there are cost-effective solutions. Cloud-based data storage can be more affordable than building local servers. Prioritizing data interoperability (making sure different systems can communicate) is also essential.

#### 5. Building Capacity for Data Analysis:

Many universities and research institutions offer programs in data science and educational statistics. Investing in training programs for educators, researchers, and policymakers on data analysis and interpretation is crucial. Partnerships with universities and international organizations can be valuable in this regard. Focusing on practical skills (e.g., how to use data to improve teaching practices) is essential.

#### 6. Protecting Data Privacy:

Developed nations have strict regulations in place to protect student data privacy. Developing clear data privacy policies and guidelines in Africa is essential. This includes ensuring that data is anonymized when necessary and that students and parents are informed about how their data is being used.

#### 7. Engaging Communities:

While not always perfect, there's often more community involvement in education data use in developed countries.

Engaging parents, communities, and local leaders in data collection and interpretation can help ensure that data is relevant to local needs and that it is used to improve educational outcomes for all students. Community-based monitoring systems can be very effective.

#### 8. Fostering Collaboration:

Collaboration between governments, NGOs, international organizations, and research institutions is essential for overcoming data gaps in education. Sharing resources, expertise, and best practices can accelerate progress.



By learning from the experiences of advanced continents and adapting these lessons to the African context, significant progress can be made in overcoming data gaps in education and improving educational outcomes for all children.

## Agriculture

Africa can leverage lessons from advanced continents to bridge data gaps in its agricultural sector, while acknowledging the unique challenges on the continent.

### 1. Embracing Technology, but Appropriately:

Advanced Continents practice precision agriculture, using GPS, sensors, and drones, is common. Large-scale data platforms integrate diverse information.

While these technologies hold promise, affordability, infrastructure (internet, electricity), and digital literacy are crucial. Mobile-first solutions are key. Examples include:

- Mobile apps for farm record-keeping: Simple apps can help farmers track planting dates, yields, input costs, and sales, generating valuable data.
- SMS-based agricultural extension services: Farmers can receive timely information on weather forecasts, pest alerts, and best practices via SMS.
- 3. Drone technology for targeted applications: Drones can be used for localized mapping, crop health monitoring, and livestock management, even in areas with limited internet connectivity.

### 2. Strengthening Data Collection and Management Systems:

Governments and private sector actors invest heavily in agricultural data collection in advanced continents and could be emulated in African countries as well.

Building robust, locally relevant systems is crucial. This includes:

- Investing in national agricultural statistics offices: These offices need resources and training to collect reliable data on crop production, livestock, land use, and other key indicators.
- Developing standardized data collection protocols: This ensures that data is consistent and comparable across different regions and over time.
- Creating open data platforms: Making agricultural data publicly available (while protecting farmer privacy) can promote transparency and encourage innovation.

### 3. Empowering Smallholder Farmers:

While large-scale farming is prevalent, there's increasing focus on supporting smaller operations with data.

Smallholder farmers are the backbone of African agriculture. Data solutions must be tailored to their needs and resources. This includes:

- Participatory data collection: Involving farmers in data collection ensures that the data is relevant and useful to them.
- Simplified data tools: Tools should be easy to use and require minimal training.
- Data ownership and control: Farmers should have control over their own data and be able to benefit from it.

### 4. Fostering Public-Private Partnerships:

Collaboration between governments, agribusinesses, and research institutions is a common practice among the advanced countries. These partnerships are crucial for addressing data gaps. Examples include:

- Working with agribusinesses to collect data on supply chains and market prices.
- Partnering with technology companies to develop innovative data solutions.
- Collaborating with research institutions to analyse agricultural data and develop evidence-based policies.

### 5. Learning from Regional Successes:

Many African countries have made progress in improving agricultural data. Sharing these best practices is crucial. For example, countries with successful agricultural information systems can share their experiences with others.

### 6. Prioritizing Data for Food Security:

Data should be used to improve food security and nutrition. This includes collecting data on food production, distribution, and consumption, and using this data to develop policies and programs that address hunger and malnutrition.

### 7. Ensuring Data Accessibility and Inclusivity:

Data should be accessible to all stakeholders, including women, youth, and marginalized communities. Data collection methods should be inclusive and ensure that the voices of all farmers are heard.



## 8. Building Trust and Data Literacy:

Building trust in data systems is essential. Farmers need to understand the benefits of data and be confident that their data will be used responsibly. Investing in data literacy programs can help farmers make informed decisions based on data.

By adapting lessons from advanced continents to the specific context of African agriculture, while prioritizing local needs and resources, significant progress can be made in bridging data gaps and improving agricultural productivity and food security.

## **Infrastructure**

While advanced continents have made strides in leveraging data for infrastructure, Africa can learn valuable lessons while adapting strategies to its unique context.

Advanced continents have made progress in addressing infrastructure data gaps through various strategies, which Africa can adapt:

1. **Smart Infrastructure:** Integrating sensors and other technologies into infrastructure allows real-time data collection on condition, performance, and usage. This enables predictive maintenance and optimized operations [7]. While the widespread adoption of smart infrastructure may be some time away in many African contexts, pilot projects in key areas can demonstrate the benefits and pave the way for wider implementation.

2. **Building Information Modelling (BIM):** BIM creates digital representations of infrastructure projects, facilitating comprehensive management throughout the lifecycle and data collection on performance [8]. While BIM adoption may require significant investment in training and software, its potential for improving project efficiency and data availability makes it a worthwhile long-term goal.

3. **Geographic Information Systems (GIS):** GIS maps and analyses infrastructure data, enabling visualization of networks and identification of areas for improvement [9]. GIS is highly adaptable and can be implemented even with limited resources. Open-source GIS software and freely available satellite imagery can be leveraged to create valuable infrastructure maps.

4. **Open Data Initiatives:** Making infrastructure data publicly accessible promotes transparency, accountability, and innovation [10]. Open data portals can be established at national and local levels to share infrastructure data with stakeholders.

5. **Public-Private Partnerships (PPPs):** Collaboration between governments and



private sector actors can leverage expertise and resources for data collection and analysis [11]. PPPs can be structured to incentivize data sharing and collaboration.

### **Adapting Strategies to the African Context:**

While learning from advanced continents is crucial, it's essential to adapt strategies to the specific challenges and opportunities in Africa:

1. **Prioritize Data for Critical Infrastructure:** Focus on collecting data for the most critical infrastructure sectors, such as transportation, energy, and water, where data gaps have the greatest impact.
2. **Leverage Mobile Technology:** Mobile phones are ubiquitous in Africa and can be used for cost-effective data collection. Mobile apps can be developed to allow communities and local authorities to report infrastructure issues and collect data on usage.
3. **Build Local Capacity:** Invest in training programs to develop local expertise in data collection, analysis, and interpretation. Partnering with universities and research institutions can be beneficial.
4. **Promote Data Sharing and Collaboration:** Establish data sharing agreements between government agencies, private sector actors, and research institutions. Creating a culture of data sharing is essential for effective infrastructure management.
5. **Ensure Data Quality and Reliability:** Develop standardized data collection protocols and quality control mechanisms to ensure that data is accurate and reliable.
6. **Address Data Privacy Concerns:** Implement data privacy policies and guidelines to protect sensitive information.
7. **Foster Community Engagement:** Engage communities in data collection and monitoring to ensure that data is relevant to local needs and priorities.

Conclusively, bridging the infrastructure data gap in Africa requires a concerted effort from governments, the private sector, and communities. By learning from the experiences of advanced continents and adapting strategies to the local context, Africa can improve infrastructure planning, management, and development, ultimately contributing to sustainable economic growth and social progress.

### **Adaptable Strategies to Bridge Data Gap in Africa**

Africa's development is significantly hampered by a pervasive data gap across



various sectors. This gap hinders evidence-based policymaking, effective resource allocation, and informed decision-making. Bridging this gap is crucial for achieving sustainable development goals.

Here are some strategies that can be adapted to address this challenge:

### 1. Investing in Foundational Data Infrastructure:

Prioritizing investment in foundational data infrastructure is crucial [6]. This involves:

- Strengthening electricity grids: Reliable power is essential for data centres and other data-related activities.
- Expanding internet access: Broadband connectivity is necessary for data transfer and online data platforms.
- Developing robust data centres: Secure and reliable data storage facilities are needed to house and manage data.
- Investing in hardware and software: Providing the necessary tools for data collection, analysis, and visualization is essential.

### 2. Building Capacity for Data Management and Analysis:

Investing in education and training programs is crucial to build local capacity in data management and analysis [12]. This includes:

- Developing university programs: Offering degrees and certifications in data science, statistics, and related fields.
- Providing training for government officials and researchers: Equipping them with the skills to collect, analyse, and interpret data.
- Supporting data literacy initiatives: Promoting data literacy among the general population to foster a culture of data use.

### 3. Strengthening Data Governance Frameworks:

Weak data governance frameworks can lead to data misuse, privacy violations, and a lack of trust in data systems. Establishing clear data governance frameworks is essential. This includes:

- Developing data privacy laws: Protecting individuals' sensitive information.
- Creating data sharing policies: Facilitating data sharing between government agencies, researchers, and the private sector while protecting privacy.
- Establishing data quality standards: Ensuring the accuracy and reliability of data.
- Promoting transparency and accountability: Making data publicly available (while protecting privacy) to foster trust and encourage data use.

#### 4. Leveraging Technology for Data Collection and Analysis:

Traditional data collection methods can be time-consuming, expensive, and inefficient. Adopting innovative technologies can streamline data collection and analysis [14]. This includes:

- Mobile technology: Using mobile apps for surveys, data entry, and real-time data collection.
- Remote sensing and satellite imagery: Monitoring land use, environmental changes, and other phenomena.
- Big data analytics: Analysing large datasets to identify trends and patterns.
- Artificial intelligence and machine learning: Automating data analysis and generating insights.

#### 5. Fostering Public-Private Partnerships:

Addressing the data gap requires significant resources and expertise, which may not be available within the public sector alone. Forging public-private partnerships can leverage the resources and expertise of the private sector [15]. This includes:

- Collaborating with technology companies: Developing data solutions and providing technical expertise.
- Working with data analytics firms: Analysing data and generating insights.
- Engaging with private sector data providers: Accessing data that may not be publicly available.

#### 6. Promoting Open Data Initiatives:

Data is often siloed within government agencies, hindering data sharing and collaboration. Promoting open data initiatives can make data more accessible and usable [16]. This includes:

- Creating open data portals: Providing a centralized platform for accessing government data.
- Developing data sharing policies: Encouraging government agencies to share data with the public.
- Promoting data use by researchers, journalists, and civil society organizations: Encouraging data-driven research and advocacy.

#### 7. Engaging Communities in Data Collection and Use:

Data collection efforts may not always capture the needs and priorities of local communities. Engaging communities in data collection and use can ensure that data is relevant and useful [17]. This includes:

- Participatory data collection methods: Involving communities in the design and implementation of data collection activities.
- Community-based monitoring systems: Empowering communities to collect and monitor data on issues that are important to them.
- Data feedback mechanisms: Providing communities with access to data and allowing them to provide feedback on data quality and relevance.

This literature review explicitly connects data gaps to Africa's development challenges, reinforcing the necessity of this research. The reviewed material provides evidence on how addressing data gaps can improve policy decisions, economic development, and social welfare.

#### Summary of Key Gaps in Existing Literature:

- Incomplete and Fragmented Data: Many studies highlight the absence of unified, high-quality datasets, yet few provide solutions tailored to Africa's context.
- Limited Focus on Local Successes: There is insufficient emphasis on successful, homegrown initiatives that have effectively bridged data gaps in African settings.
- Adaptation of Global Practices: While global best practices exist, there is a lack of research on how these can be adapted to overcome Africa's unique infrastructural and economic challenges.
- Systematic Feedback and Policy Impact: Few studies analyse how real-time data and feedback mechanisms can be integrated into policymaking to drive tangible improvements.

Our literature review supports our research objectives in the following ways:

- Establishing the Importance of Data: It clearly demonstrates that reliable, comprehensive, and timely data are essential for effective governance, resource allocation, and sustainable development. This underlines the need for improved data collection and management systems, which is central to our research.
- Highlighting Sector-Specific Challenges: By detailing data gaps across healthcare, education, agriculture, and infrastructure, the literature provides evidence that these deficiencies directly hinder policy formulation and implementation. This supports our focus on identifying and addressing sector-specific data challenges.



- **Showcasing Successful Initiatives:** The inclusion of African success stories (like Kenya's EMIS in education or South Africa's Smart Cities initiative) illustrates that practical, locally tailored solutions can work. These case studies serve as models and benchmarks that guide our exploration of scalable strategies.
- **Identifying Key Research Gaps:** The literature points out the lack of unified datasets, fragmented data collection methods, and limited adaptation of global best practices to the African context. By identifying these gaps, our research is directly aimed at proposing targeted strategies to bridge these shortcomings.

## **Conclusion**

In conclusion, we have established the presence and effect of data gap in various sectors of Africa. We have seen how it affects, impedes and caused underutilisation of data. This challenge has been picked up by Dataverse Africa by empowering African youths with the right knowledge and methods for analysing data in order to empower Africa.

Bridging Africa's data gap is not merely a technical challenge, but a fundamental requirement for unlocking the continent's vast potential. By strategically investing in infrastructure, capacity building, robust governance frameworks, and innovative technologies, while prioritizing community engagement and open data principles, African countries can transform data from a constraint into a powerful catalyst for sustainable development.

This concerted effort will empower evidence-based decision0making, drive targeted interventions, and ultimately improve the lives of millions across the continent, paving the way for a more prosperous and equitable future.



## References

- @Educationnewshub.co.ke, M. T. (2024, November 24). *Educationnews*. Retrieved from Educationnewshub.co.ke: <https://educationnewshub.co.ke/kenya-education-management-information-system-kemis-full-guide/>
- (2025). Retrieved from Management Sciences for Health: <https://msh.org/resources/the-rwandan-health-management-information-system-improving-collection-and-management-of/>
- Agency, E. A. (n.d.). Retrieved from Ethiopian Agricultural Transformation Agency: <https://www.ata.gov.et/our-approach/our-approach-overview/#>
- Blumenthal D, T. M. (2010). The "meaningful use" regulation for electronic health records. *N Engl J Med*.
- FUC E-Learning. (n.d.). Retrieved from Federal Ministry of Education: <https://education.gov.ng/>
- Ghana Agriculture and Agribusiness Platform (GhAAP)*. (n.d.). Retrieved from Ghana Agriculture and Agribusiness Platform (GhAAP): <https://ghaap.com/>
- Kenya Agriculture Reforms and Innovation*. (n.d.). Retrieved from KARI.org: <https://www.kari.org/>
- Oliver J.M. Chinganya, M. N. (2016). *The Africa Data Revolution Report*. Addis Ababa, Ethiopia: ECA Printing and Publishing Unit.
- Otieno, O. &. (2021, 04). Incorporating mHealth Interventions into Kenya's Health Infrastructure to Augment Universal Health Coverage, Service Delivery Improvement Ap-proach (review). p. 9.



Paris 21, M. I. (2021). *Bridging the data policy gap in Africa*.

Rajhamundry, D. (2025, January 21). *Bridging Healthcare Gaps Through Data Innovation*. Retrieved from International Business Times:  
<https://www.ibtimes.co.in/bridging-healthcare-gaps-through-data-innovation-878325>

Sulaiman Muhammad Musa, U. A.-P. (2023). Paucity of Health Data in Africa: An Obstacle to Digital Health Implementation and Evidence-Based Practice. *Public Health Rev*.

OECD (Organisation for Economic Co-operation and Development). (2019). Recommendation of the Council on Access to Digital Government Data. OECD

GODAN (Global Open Data for Agriculture and Nutrition). (n.d.). GODAN Initiative. Retrieved from [GODAN website]

IDS (Institute of Development Studies). (2018). Community-led data: What is it and why does it matter?

Helldén D, Weitz N, Nilsson M, Alfvén T. Situating Health within the 2030 Agenda-A Practical Application of the Sustainable Development Goals Synergies Approach. *Public Health Rev* (2022) 43:1604350. 10.3389/phrs.2022.1604350 [DOI] [PMC free article] [PubMed] [Google Scholar]

<https://theconversation.com/why-fixing-africas-data-gaps-will-lead-to-better-health-policies-111869>

[https://www.educ.cam.ac.uk/centres/real/downloads/Policy%20papers/AERD\\_Report.pdf](https://www.educ.cam.ac.uk/centres/real/downloads/Policy%20papers/AERD_Report.pdf)

Foster, V., & Khandker, S. R. (2009). Overhauling the engine of growth: Infrastructure, innovation, and governance in Africa. World Bank Publications

Calder, A. (2007). Data management for social research. Sage

UNECA (United Nations Economic Commission for Africa). (2017). Assessing progress in implementing the programme for infrastructure development in Africa (PIDA). UNECA

Harrison, C., Donnelly, I., & Hanna, P. (2010). Foundations for smarter cities. IBM

Eastman, C., Teicholz, P., Sacks, R., & Liston, K. (2011). BIM handbook: A guide to building information modeling for owners, managers, designers, engineers, and contractors. John Wiley & Sons

Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). Geographic information science and systems. John Wiley & Sons

Janssen, M., Zuiderveen Thoenes, P., & Tummers, L. (2012). Innovation in open data: What do governments do and why?. *Government Information Quarterly*, 29(4), 446-





Grimsey, D., & Lewis, M. K. (2004). Public-private partnerships for infrastructure: Principles and practice. Edward Elgar Publishing

World Bank. (2021). Data for Better Lives: A Global Call to Action. World Bank

Open Data Charter. (n.d.). Open Data Charter Principles. Retrieved from [Open Data Charter website]

UN Global Pulse. (n.d.). Big Data for Development. Retrieved from [UN Global Pulse website]

