

UPSCALING MSME IMPACT ON SDG IMPLEMENTATION WITH GEOSPATIAL AND AI TECHNIQUE SUPPORT IN AFRICA

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Concept Note

Introduction

In recent years, the popularity and accessibility of geospatial data has dramatically increased, providing growth opportunities for various industries such as transportation, real estate, retail, services, and hospitality. By incorporating this resource into their business plans, companies can gather large amounts of georeferenced data. However, managing this data can be challenging, and extracting meaningful insights from it will be a significant effort. The integration of AI techniques with geospatial data analysis has the potential to change decisively the way businesses make decisions and gain insights from their data. This paper aims to examine the potential of using AI in conjunction with georeferenced data and geospatial analysis to improve decision making in industrial organizations in Africa. The scope is to discuss the challenges and opportunities in using geospatial data for business decision-making, and how AI techniques can be applied to improve data analysis and decision-making processes. (Nistor,2025).

Importance and Scope of Geospatial Technology on SDGs Implementation Geospatial tools and techniques can play a vital role in achieving targets through their decision support, planning, and monitoring capabilities, Remote sensing satellite is capable of providing a synoptic view and repetitive coverage of the earth's features. Commendable progress has been observed in the scientific world toward using geospatial data at various spectral, radiometric, temporal, and spatial resolutions enabling the usage of the data for various applications (Avtar et al. 2019; Ganguly et al. 2021; Mitran et al. 2021a, b). Hence, images provided by various satellites can be used effectively for the implementation of SDGs and monitoring of their progress. Sustainable development is possible by holistically prioritizing urban and rural development activities by capturing many complexities, constraints, and livelihood opportunities. In this context, United Nations (UN) designed a blueprint containing seventeen interlinked Sustainable Development Goals (SDGs) to address the global challenges, including climate change, environmental degradation, peace, poverty, inequality, and justice. The achievement of SDGs and their universality would be possible through readily available data from affordable sources such as remote sensing images and readily available sources. The spatial-temporal data analysis is crucial for assessing, monitoring, and decision-making and becomes integral in addressing SDG indicators.

However, the advancement and availability of an enormous amount of earth observation data increased the need for new methods and techniques. Nowadays, the integration of geospatial technologies along with information and communication technology (ICT) like the Internet of Things (IoT), big data, machine learning (ML), artificial intelligence (AI), advanced sensor

networking, and crowdsourcing has made a powerful analytic platform for Spatial Decision Support System (SDSS).

Sustainable Development Goals (Targets)

United Nations has proposed a plan entitled “Transforming Our World: The 2030 Agenda for Sustainable Development (Agenda 2030)” to address the global issues at the UN Sustainable Development Summit in 2015. The proposal sets 17 SDGs to manage the global challenges, i.e., inequality, poverty, and the effects of climate change effects. SDGs are globally recognized and adopted by many countries considering the feasibility of the plan. SDGs were set up to improve the living conditions and conservation of the environment, especially in developing countries and developed countries too. In order to reach the goal, the Sustainable Development Solutions Network (SDSN) was formed to monitor the activity of countries and regions working toward the implementation of the SDGs and also record the information related to it.

Theoretical Considerations

Geospatial data has become increasingly important for business decision making as it enables organizations to identify patterns, trends, and relationships within and between different types of data. However, the effective use of geospatial data poses several challenges, including data quality, data integration, and data visualization. Recent advancements in AI and machine learning have shown promise in addressing these challenges by improving data analysis and decision-making processes (Nistor,2025). AI techniques, such as neural networks and deep learning, have been applied to geospatial data analysis for a wide range of data that potentially have applications in many fields, such as urban planning, transportation, and environmental monitoring.

One promising application of AI in geospatial data analysis is the development of automated decision support systems (DSSsz4xd). These systems use AI algorithms to analyze large volumes of geospatial data in real-time, providing organizations with timely and accurate insights to support decision making. However, the development of effective automated DSSs using geospatial data and AI requires careful consideration of several design principles and best practices. These include the selection of appropriate data sources, the use of appropriate analytical methods, the incorporation of human expertise, and the implementation of effective visualization techniques. Several studies have also highlighted the need for effective communication and collaboration among stakeholders involved in the design and implementation of automated DSSs. This includes engaging stakeholders in the design process, ensuring the transparency and interpretability of the models used, and providing opportunities for feedback and evaluation (Nistor,2025).

MSME impact on SDG Implementation with Geospatial and AI technique support

Scaling the impact of Micro, Small, and Medium Enterprises (MSMEs) on Sustainable Development Goal (SDG) implementation can be achieved by leveraging Geospatial Information Systems (GIS) and Artificial Intelligence (AI). These technologies help MSMEs by providing data-driven decision-making, optimizing supply chains, improving resource management, and enhancing environmental monitoring, ultimately supporting the SDGs across

various sectors. However, challenges such as the digital divide and lack of skilled Labor must be addressed through government investment, public-private partnerships, and capacity-building initiatives to ensure equitable and inclusive digital transformation.

How GIS and AI support MSMEs in SDG implementation

- **Data-driven decision-making:**

AI and digitization provide insights that enable more accurate and timely decisions, helping MSMEs understand complex issues related to areas like energy, production, and consumer behaviour to achieve goals like SDG 7 (Affordable and Clean Energy).

- **Supply chain optimization:**

AI can be used to optimize supply chains, improve productivity, and enhance overall efficiency for MSMEs.

- **Resource and waste management:**

AI can help optimize stock levels, reducing waste and improving cash flow, which contributes to goals like SDG 12 (Responsible Consumption and Production).

- **Environmental monitoring:**

Remote sensing and GIS provide crucial insights for environmental monitoring and disaster response, supporting goals like SDG 14 (Life Below Water) and SDG 15 (Life on Land).

- **Improved efficiency and productivity:**

AI can automate routine tasks, reduce errors, and streamline processes, allowing MSMEs to operate more efficiently.

- **Sustainable practices:**

The adoption of AI and digitization can help MSMEs reduce their environmental footprint and enhance their implementation of sustainable growth strategies.

- **Scalability:**

Cloud computing, facilitated by digital technologies, helps foster collaboration and scalability for MSMEs, supporting SDG 9 (Industry, Innovation and Infrastructure) and SDG 17 (Partnerships for the Goals).

Challenges associated with Upscaling MSME impact on SDG Implementation with Geospatial and AI technique support in Africa

The main problems with upscaling MSME impact on SDG implementation with geospatial and AI support include the limited technical capacity of MSMEs, a lack of accessible and interoperable data, and inadequate infrastructure. These issues are compounded by challenges in data harmonization, the need for skilled human resources, and high costs, which create significant barriers to widespread adoption and consistent application.

Key problems identified

- Limited MSME capacity:

Many MSMEs, especially informal or women-led ones, lack the digital infrastructure, technical skills, and financial resources to adopt and utilize these advanced technologies effectively.

- Data gaps and interoperability:

There are significant data gaps, particularly in Africa for informal and rural MSMEs, making it difficult to aggregate data and identify trends needed for AI models. Harmonizing different types of data, such as geospatial and national statistics, is also a major challenge in the continent.

- Infrastructure limitations:

Reliable and high-quality geospatial infrastructure, along with sufficient digital infrastructure for AI, is not universally available, hindering implementation, especially in developing regions.

- Human resource and skill shortages:

A shortage of skilled personnel to develop, operate, and interpret AI-driven geospatial systems is a major bottleneck for upscaling these solutions.

- Cost and accessibility:

The cost of acquiring and maintaining the necessary hardware, software, and cloud-based platforms can be prohibitive for individual MSMEs.

- Policy and regulatory hurdles:

A lack of supportive national policies and a fragmented regulatory environment can impede the integration of these technologies and the formalization of MSMEs, which is a prerequisite for many of these interventions.

- Complexity of MSME sector:

The heterogeneous nature of the MSME sector means that "one-size-fits-all" solutions are often ineffective. Developing targeted approaches and data-driven insights that account for regional and sector-specific variations is complex.

- Technology

The adoption of these technologies is hindered by barriers such as the digital divide, high costs, data privacy concerns, and skill shortages.

Solution associated with Upscaling MSME impact on SDG Implementation with Geospatial and AI technique support in Africa

A comprehensive solution to upscale MSME impact on SDG implementation in Africa involves strengthening capacity through training, creating enabling policy environments that encourage technology adoption, and facilitating access to markets and innovative financing. Utilizing geospatial and AI techniques can improve MSME performance in various sectors, such as using AI for precision agriculture to increase crop yields or geospatial data for land-use planning. To ensure equitable outcomes, public-private partnerships are essential for investing in infrastructure and digital literacy to avoid widening the digital divide.

1. Building capacity and policy environments

- Capacity building:

Provide MSMEs with training on how to use geospatial and AI technologies for better decision-making and operational efficiency.

- Enabling policies:

Develop and implement policies that foster a supportive environment for MSMEs to adopt and replicate new technologies, which includes creating regulations that keep pace with technological advancements.

- Digital infrastructure:

Invest in digital infrastructure like connectivity and data centres, alongside educational frameworks for digital literacy, to prepare the workforce for technology-driven solutions.

2. Leveraging geospatial and AI for sector-specific impacts

- Agriculture:

Use AI for precision agriculture to optimize crop planning, irrigation, and pest control, boosting yields and food security (SDG 2). Geospatial data can assist in land-use planning and water management.

- Energy:

Implement AI for managing off-grid and mini-grid renewable energy solutions, like optimizing solar energy storage and distribution (SDG 7).

- Climate Resilience:

Utilize AI to develop early warning systems for climate-related disasters like floods. AI can also help assess climate risk at a building level for targeted adaptation efforts.

- Health:

Support the development of AI-powered solutions for monitoring health, producing diagnostic imaging, and providing virtual health appointments, particularly by developing smaller-scale, task-specific models that are better suited to African contexts (SDG 3).

3. Enhancing market access and financing

- **Market Integration:**

Support the integration of MSMEs into high-value market opportunities through technology.

- **Financing:**

Expand access to financing solutions, such as innovative mobile money platforms, and create targeted funding mechanisms for MSMEs to address financial gaps.

- **Data for Decision-Making:**

Use geospatial and AI to collect and analyze data to better understand the diverse challenges and opportunities facing different MSME groups, especially in the informal sector.

4. Fostering partnerships and collaboration

- **Public-Private Partnerships:**

Create strategic partnerships between governments, the private sector, and international organizations to invest in technology and infrastructure.

- **Cross-border cooperation:**

Accelerate regional integration under initiatives like the AfCFTA to reduce trade barriers and promote cross-border MSME cooperation.

- **Open Government:**

Amplify transparency, foster civic engagement, and promote innovation in public participation through open government practices to better support MSMEs and respond to their feedback. However, having highlighted and discussed the above solutions thus, some of these barriers, strategies include:

- Increasing government investment in digital infrastructure.
- Fostering strategic public-private partnerships.
- Implementing capacity-building initiatives for organizations and individuals.
- Ensuring ethical digital practices and environmental sustainability in AI development.

Conclusion

Based on various studies, the support of geospatial and AI techniques has the potential to significantly accelerate progress toward the Sustainable Development Goals (SDGs) in Africa, but faces substantial challenges that must be addressed for equitable implementation. The convergence of geospatial and AI techniques presents in Africa with a unique opportunity to address its development challenges and accelerate progress toward the SDGs.

The potential for positive impact is evident across critical sectors like agriculture, climate, and public health. However, realizing this potential requires a concerted collaborative efforts. Strategic investments are needed to bridge infrastructure and skill gaps, while strong

governance frameworks must be established to ensure ethical, inclusive, and equitable implementation by carefully navigating the challenges. Africa can harness these technologies to build a more sustainable and prosperous future for all its people. Lastly systematic review of the literature was used to address the raising questions pose in Africa.

Recommendations

To upscale the impact of MSMEs on African SDG implementation using geospatial and AI techniques, recommendations include strengthening national capacities for technology adoption, building supportive policy and regulatory environments, expanding MSME access to high-value markets through data, and improving digital infrastructure and data harmonization. Other key recommendations include prioritizing capacity building, ensuring data quality, developing clear roadmaps, and fostering stakeholder collaboration to ensure technology benefits are inclusive and address regional disparities.

Policy and environment

- Build enabling policy frameworks:

Support the creation of cohesive policies, regulations, and institutional frameworks that encourage MSMEs to adopt and integrate geospatial and AI technologies.

- Harmonize regulations: Work to harmonize policies and regulations across African nations to facilitate intra-Africa trade, investment, and the creation of a secure digital single market.
- Support data-driven decision-making: Encourage the use of geospatial data to identify regional disparities and tailor interventions, supporting better urban planning, environmental management, and public health strategies.

Capacity and infrastructure

- Strengthen national capacities: Provide capacity-building support to help MSMEs and national entities harness geospatial and AI technologies for transformative changes that deliver on the SDGs.
- Improve data infrastructure: Invest in and harmonize geospatial data infrastructure to overcome data gaps and build reliable baseline data for monitoring and evaluation.
- Enhance digital access: Promote affordable and accessible broadband internet across the continent to enable MSMEs to access and utilize digital services and data.

Market and innovation

- Expand market access: Support the integration of MSMEs into high-value markets by providing them with the data and tools to improve their competitiveness and reach.
- Foster innovation: Create a fertile environment for innovation by supporting initiatives like business incubators and special economic zones that help MSMEs develop and adopt new technologies.

Data and implementation

- Ensure data quality and relevance: Emphasize the need for high-quality, relevant, and harmonized geospatial data that is fit-for-purpose to ensure effective monitoring and evaluation of SDG progress.
- Develop clear integration roadmaps: Create clear roadmaps for integrating geospatial data and AI into national strategies for sustainable development.
- Promote inclusive technology deployment: Ensure that the deployment of AI and geospatial technologies is inclusive and addresses the specific needs of vulnerable groups, such as informal rural MSMEs

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