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FROM EMERGING TO SUSTAINABLE SPACE PROGRAMS IN AFRICA

Abstract

Many emerging space countries struggle to establish sustainable space engineering programs due to a lack of economic viability. While some nations invest in space infrastructure, the measure of success lies in long-term employment and societal or commercial benefits. Despite international training programs for engineers, national space programs often falter, resulting in infrequent satellite launches. The challenge is to create space programs that provide continuous employment opportunities, hindered by a lack of commercialization.

Investment in space not only advances human capital but also offers long-term employment opportunities. However, sustainable space programs must grow economically through the products and services they provide.

Efforts like the CubeSat standard allow small teams to build and launch satellites, but coverage is limited. Some countries invest in geostationary communication satellites, while others focus on human capital development through training programs or collaborative projects like the African Resource Management Constellation (ARMC).

Our solution centers on leveraging space technology to address challenges in key sectors, starting with agriculture, Africa's largest employer. High-resolution satellite data can improve agricultural productivity, contributing to food security and economic growth. By sharing operational data sets through a satellite constellation, engineers can gain experience in building, launching, and operating satellites while ensuring continuous employment opportunities.

The paper begins with an overview of the importance of sustainable space programs for emerging countries, focusing on Africa. It introduces the ARMC as a case study and explores how space technology can benefit socio-economic development, with a focus on agriculture, natural resource management, and disaster response. Ensuring long-term sustainability involves collaboration, capacity building, and policy recommendations. Lessons learned and best practices are discussed before establishing principles for a sustainable space program, building on the ARMC's experience and technological advances. The conclusion summarizes key findings and offers recommendations for future initiatives in Africa's sustainable space programs.