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Establishing a Sustainable Space Technology Ecosystem in Nigeria Beyond NigComSat: A Review

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ABSTRACT **Review Article**

The launch of NigComSat-1R in 2011, spontaneously brought Nigeria's space program to global limelight as it has always been synonymous with satellite ownership ever since then. Sadly enough, the untold story behind the scene reveals the ugly but real awkward situation as the country's space program is still limited by absolute dependence on foreign manufacturing, launch, and data commercialization. This paper argues that Nigeria must move "beyond NigComSat" by building a complete space technology ecosystem that integrates upstream manufacturing, midstream ground infrastructure, and downstream data applications. Using NASRDA reports 2020-2025, policy documents, and 38 peer-reviewed studies, we assess Nigeria's current space assets, ecosystem gaps, and pathways to sustainability. Findings show Nigeria operates 5 satellites but retains <15% local content, has 3 ground stations but no commercial data market, and spends $50M-$150M per satellite on foreign launch. Drawing lessons from India's Antrix/IN-SPACE model and South Africa's SCS, we propose a 3-layer ecosystem: 1. Upstream: local satellite assembly + propulsion at NASRDA CSTP, 2. Midstream: PPP ground segment + tracking, 3. Downstream: commercialization of NigeriaSat data for agriculture, security, mining among others. Effective implementation can cut down satellite costs by 40%, generate $100M annual export revenue by 2035, and create 8,000 jobs. The paper concludes that space sustainability relies more on setting up a space ecosystem rather than mounting a single satellite unit.

Keywords: Space Ecosystem, Nigeria, NASRDA, NigComSat, Satellite Data, Antrix, Sustainability.

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Introduction

Since 1957 till date, space programs have sporadically evolved from mere "one-off satellite launches" to much more robust "ecosystem-driven space economies". A space ecosystem comprises upstream manufacturing, midstream ground operations, and downstream applications that generate significant economic value (OECD, 2022). India, as a country exemplifies this three-layer structure of a space ecosystem arrangement as its ISRO is saddled with building satellites, and Antrix commercializes data, while 200+ startups provide space-based services, thus generating $1.2B export in 2023 (ISRO, 2024).

Although Nigeria, on the other hand launched its NigComSat-1R in 2011 and NigeriaSat-2 in 2011, becoming the 3rd African country with indigenous satellites (Ogunbiyi & Adebisi, 2022), unfortunately, 13 years later, the country ridiculously still remains nothing more than a mere "satellite owner" and not close to a "space economy". NigComSat-1R was built 100% by China Great Wall, launched by China, and commercialization is limited to government VSAT (FMST, 2023). Local content <15% and no Nigerian firm earns any form of revenue from the satellite data at scale till date.

This paper attempts to address the curiosity revolving around how Nigeria can move beyond NigComSat's project-based

model to building a more sustainable, revenue-generating space technology ecosystem?

Conceptual Framework: The Space Ecosystem Model

The OECD 3-layer model (OECD, 2022) is adopted to wit:

1. **Upstream:** Satellite/launch vehicle design, manufacturing, testing.
2. **Midstream:** Ground segment, TT&C, tracking, data downlink.
3. **Downstream:** Data processing, analytics, value-added services for users.

Sustainability requires a healthy balance across all the 3 layers. Unfortunately, Nigeria is only strong in midstream ground stations but weak in both upstream manufacturing and downstream commercialization.

Nigeria's Current Space Position: Beyond NigComSat Reality

Upstream: Manufacturing Deficit

Though Nigeria has launched 5 satellites to wit: NigeriaSat-1 2003, NigeriaSat-2/X 2011, Edusat-1 + NigComSat-1R 2011, but all were built abroad. NASRDA's Centre for Space Transport and Propulsion CSTP Epe can only test rocket motors to 30kN, but cannot build full satellites (NASRDA, 2025). Local content in NigComSat-1R was limited to project management and ground operations (FMST, 2023). Each satellite costs $50M-$255M with launch, all paid in forex thus losing financial fortune to forex.

Midstream: Ground Infrastructure Strength

Nigeria has 3 NASRDA ground stations in Abuja, Kano, Port Harcourt for TT&C and data reception (NASRDA, 2025). NigComSat-1R ground control is in Abuja. This is a competitive advantage when compared with many African nations. However, facilities operate at only 40%capacity due to lack of commercial customers.

Downstream: Weak Commercialization

NigeriaSat-2 provides 2.5m resolution imagery for mapping, flood, oil spill monitoring (Akinyede, 2020). Ironically the data sales are on ad-hoc basis and not on commercialized scale. No Nigerian startup offers "Space-as-a-Service" like India's Pixxel or USA's Planet Labs. Sad enough, NASRDA data is mostly free for MDAs, generating no revenue of any kind to the country (FMST, 2023).

Benchmark: India's Antrix Corporation commercialized ISRO data and launch services, earning $280M in 2023. South Africa's SCS sells satellite imagery to 30+ countries (SANSA, 2023).

Gaps Preventing Ecosystem Sustainability

1. **Policy Gap:** No Space Act or commercialization policy. NASRDA does both regulatory and operational roles thus creating conflict of interest (FMST, 2023).
2. **Funding Model:** 100% government funding. No PPP or venture capital for space startups in the country. NASRDA's budget of ₦12.5B in 2024 was unequivocally brandished grossly insufficient for R&D (UNESCO, 2024).
3. **Industry Linkage:** Only 12% of university space projects have industry partners when compared to about 45% in South Africa (Nwosu & Okoro, 2024). Worse still there is no record of any private satellite manufacturer existing at the moment.
4. **Market Development:** No national demand policy compelling MDAs to pay for Nigerian satellite data. Oil companies that still use foreign imagery providers ought to be stopped as well.

Pathways to A Sustainable Ecosystem: The "Beyond NigComSat" Strategy

Upstream: Build Assembly and Propulsion Capability

1. **Satellite Assembly Facility:** NASRDA + private partner to build cleanroom facility in Abuja for 50-200kg smallsats. Target 40% local content by 2030, modeled on India's U.R. Rao Satellite Centre (ISRO, 2024).
2. **CSTP Scale-Up:** Upgrade Epe to test 100kN engines. Partner with NAF for dual-use rocket development (Federal Ministry of Defense, 2026).
3. **Human Capital:** TETFund to sponsor 200 MSc/PhD scholarships in satellite engineering. Require 2-year service at NASRDA or private space firm.

Midstream: PPP Ground Segment

1. **Commercialize Ground Stations:** Lease excess capacity of Abuja/Kano stations to private firms and African countries. Ethiopia paid Kenya $2M annually for ground station access (AfDB, 2022).
2. **Create "Space Port Authority":** Separate NASRDA's regulatory role from operations. Establish fictional independent regulator like Nigeria's IN-SPACe equivalent (FMST, 2023).

Downstream: Data Commercialization Engine

1. **Spin-off "NigeriaSat Data Ltd":** PPP company, 51% NASRDA, 49% private. Sells NigeriaSat imagery, drone data, weather data. Target sectors like agriculture, mining, insurance, oil & gas (Adebayo et al., 2023).

2. **National Data Policy:** Mandate MDAs to procure 50% of earth observation data from Nigerian sources. NNPC, NIMET, NEMA become anchor customers.
3. **Startup Incubation:** NITDA + NASRDA can fund 50 space startups between 2026-2030. Focus on crop yield prediction, illegal mining detection, flood alerts. Revenue model: subscription + API (NITDA, 2025).

Financing and Partnership

1. **Space Innovation Fund:** $200M fund from BOI, AfDB, private equity. 70% for startups, 30% for NASRDA R&D.
2. **Regional Hub:** Position Nigeria as West Africa's space data hub. Offer subsidized imagery to Ghana, Senegal, Côte d'Ivoire to build market (Ogunbiyi & Adebisi, 2022).

Projected Impact of Ecosystem Model 2035

The articulate implementation of the 3-layer ecosystem can reasonably deliver the following:

Metric - 2024 Baseline - 2035 Projection.

Local content in satellites (2024) <15%.

Projection (2035): 40-50%.

Satellite cost per unit (2024) at $150M foreign.

Satellite cost per unit (2035) at $90M with local assembly.

Revenue from space data (2024) <₦500M.

Revenue from space data (2035) $100M ≈ ₦80B annual export.

Jobs in space sector (2024) is 1,200.

Jobs in NASRDA by (2035) 8,000 direct + 20,000 indirect.

Private space companies - 3 drone firms, 50+ space startups

(Author: projection based on ISRO 2024; BryceTech 2024; NASRDA 2025)

Conclusion

NigComSat-1R undoubtedly proved beyond every reasonable doubt that Nigeria can own satellites. The next phase ought to logically prove further that Nigeria can sustainably build an economy capable of generating revenue around them. "Beyond NigComSat" on the other hand means shifting away from hardware procurement to sustainable ecosystem development. India took 20 years to move from Aryabhata 1975 to Antrix with $1B exports worth in 2020. Nigeria, with better equatorial location and larger market, can compress this to 12 years with deliberate, intentional and dedicated policy. enactment and compliance. A sustainable space ecosystem will not only reduce forex outflow drastically but will also position Nigeria as Africa's space technology leader with uncompromising huge revenue generation.

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