

33RD UN/IAF CONFERENCE • ANTALYA

The Transformative Value of Space Applications in Developing Countries

The NASRDA Case Study

Space Applications' Economic Value Proposition in Developing Countries



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Why Space Applications?



Space Applications is a bridge between the upstream section of the space ecosystem and the common man, who is plagued with a myriad of problems that need to be solved.

The National Space Research and Development Agency (NASRDA) is tasked with the mandate to use space science and technology for the socioeconomic development of the common man, and has a vibrant space applications department.

Below are some of the projects which the space applications department has achieved:



Lake Chad Monitoring



ACReSAL Land Reclamation



Space Regulation



Crop Watch



UN-SPIDER Disaster Response



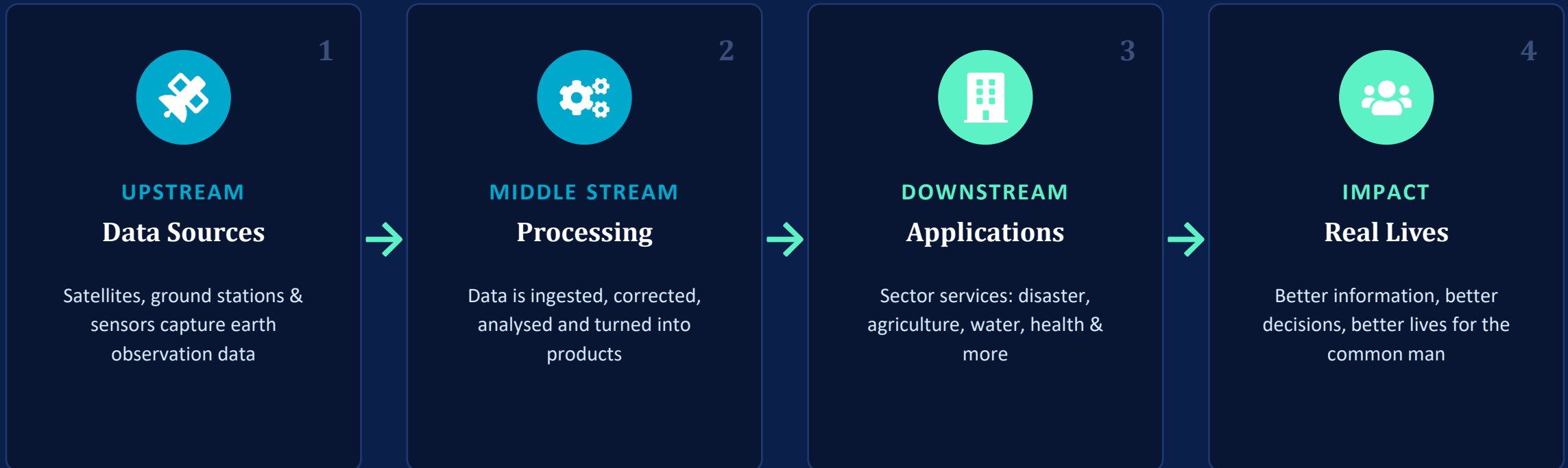
Telemedicine Programme



GRID3 Geodatabase Hosting

Space Data Value Chain

From space, to solving real-world problems



Enabled throughout by: policy & governance · cybersecurity · capacity building · partnerships · funding

Leveraging Space Technology in Developing Countries

(Looking after the big picture)



Slow, costly legacy methods

Traditional methods of acquiring data are rather too slow and costly.



Macroscale over microscale

Why focus on microscale data, when you can acquire macroscale data and validate with microscale data, even when its availability is limited?



A vantage view of Earth

Satellites provide a vantage view of the earth, providing data for areas which are inaccessible.



Daily satellite data

With the advancement of space technology, numerous moderate- to high-resolution satellite data are produced daily.



Powering deep learning

This data, when used to train deep learning models, can provide solutions to pressing problems.



A growing economic benefit

In developing countries, space application is still evolving, and its economic benefit is seen in the form of earth observation data.

Hosting the GRID3 Geodatabase

NASRDA serves as the geodatabase host for GRID3 — the Georeferenced Infrastructure Data for Demographic Development project. This platform provides the sovereign data infrastructure that underpins decision-making across sectors.

By giving government and investors a shared, authoritative view of population and infrastructure gaps, GRID3 optimises risk reduction, economic efficiency, and capital allocation.

This foundation is guiding the proposed deployment of new telecom and off-grid solar infrastructure to connect and power underserved communities nationwide.



Risk Reduction



Cost Efficiency



Capital Allocation



Sovereign geodata for national planning

3,700

NEW TELECOM TOWERS PLANNED
Connecting 20M+ underserved people

1,350

OFF-GRID SOLAR STATIONS
Expanding electricity generation access

The Lake Chad

The Lake Chad is an important economic resource that provides immense value to the four countries surrounding it — Niger, Chad, Cameroon and Nigeria. It supports fishing, agriculture, and livestock rearing.

There has been conflict in the region, and the Lake is said to be shrinking. This has led to an economic decline in the region.

However, our study using Landsat 7 and 8, MODIS, and CHIRPS climate data confirmed that there is a gradual recharge, especially from the year 2020. This finding contributes to restoring socioeconomic confidence.



Fishing



Agriculture



Livestock Rearing



A shared resource across the Sahel region

4

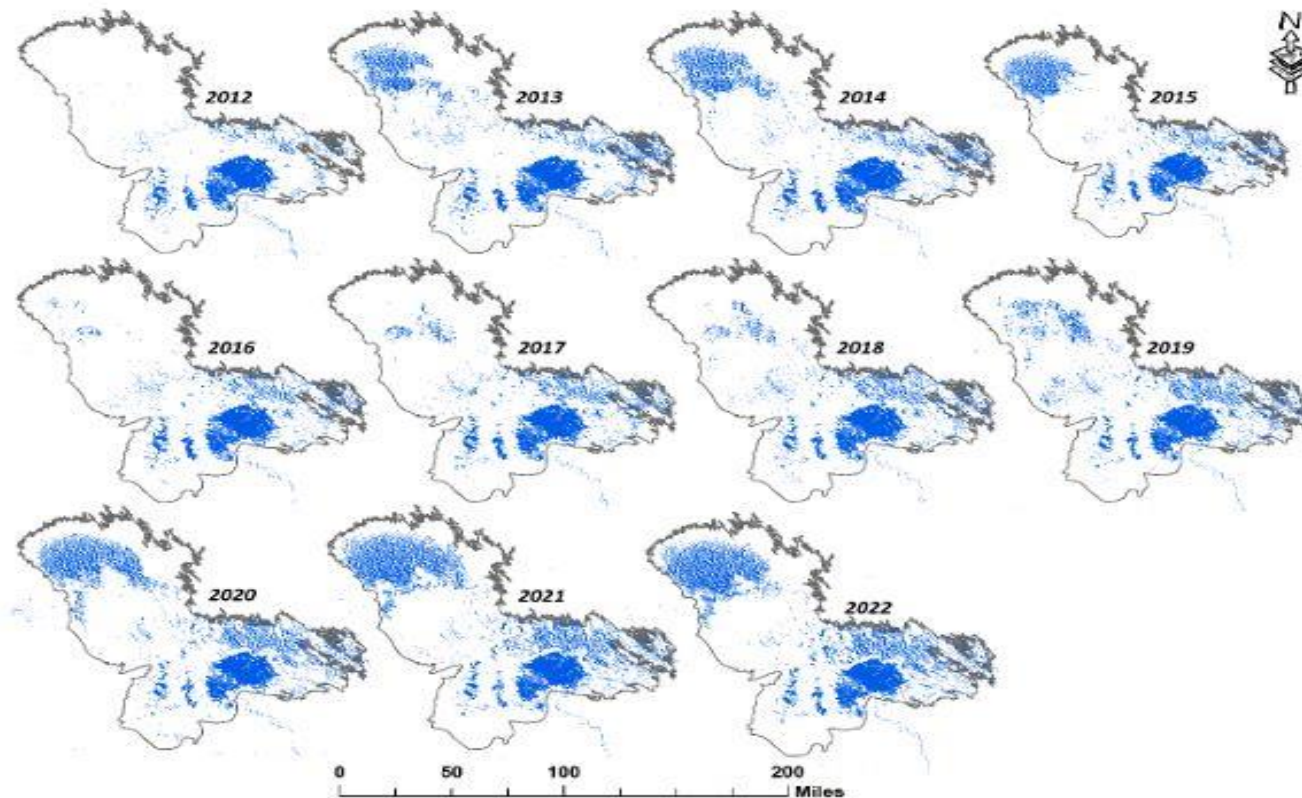
COUNTRIES SUPPORTED

Niger · Chad · Cameroon · Nigeria

2020

GRADUAL RECHARGE
OBSERVED FROM THIS YEAR

Lake Chad Surface Water, 2012–2022



What the imagery shows

Extracted Lake Chad surface water area changes from 2012 to 2022, using the AWEI (Automated Water Extraction Index) formula.

The dark blue portion marks the water body's extent for each year.

Source: Landsat 7/8, MODIS & CHIRPS climate data analysis, NASRDA

Extracted Lake Chad surface water area changes from 2012 to 2022 using the AWEI formula; the dark blue portion

ACReSAL Project

The ACReSAL project is funded by the World Bank, in collaboration with several other organisations, and aims to reclaim degraded lands in the semi-arid northern region of Nigeria.

Space technology has helped create a catchment management plan; it has also helped track land recovery over time, plant trees, and fix severely eroded gullies.

NASRDA has constantly provided geospatial data to support all aspects of the project in achieving the goal stated above.

~1M

HECTARES OF DEGRADED
LAND RECLAIMED

*A World Bank–funded initiative restoring
Nigeria's semi-arid north*



Catchment management



Land-recovery tracking



Tree planting



Gully rehabilitation

Space Regulation and Spectrum Management



While not directly under the space applications department, this unit licenses space operators, regulates space activities, and issues relevant permits to institutions working in the upstream, midstream and downstream sections of the space industry. It also allocates and controls the radio frequency used for satellite communications.



Rising demand for bandwidth

There is high demand for reliable internet bandwidth across the African continent, motivating companies to explore space to provide the much-needed service.



Licensing to operate

These companies require proper licensing to operate effectively within the regulatory framework.



A legal, income-generating market

Together, licensing and spectrum management build a legal income-generating space market for the country.

Crop Watch

The CropWatch project is a joint project led by AIRCAS, some international organisations, and NASRDA. It is an earth observation and AI-based monitoring system which monitors crop health and overall condition, predicts yield, and assesses environmental threats such as pest infestation and droughts to support global food security.

This has led to the production of quarterly bulletins to support accurate crop production forecasts, in addition to early-warning risk mitigation.

Ultimately, this maximises harvest outputs and net household income, while cutting out repeated manual field inspection.



Yield prediction



Pest & drought
alerts



Quarterly bulletins

46%

RAINFALL IN NIGERIA BELOW
THE 15-YEAR AVERAGE

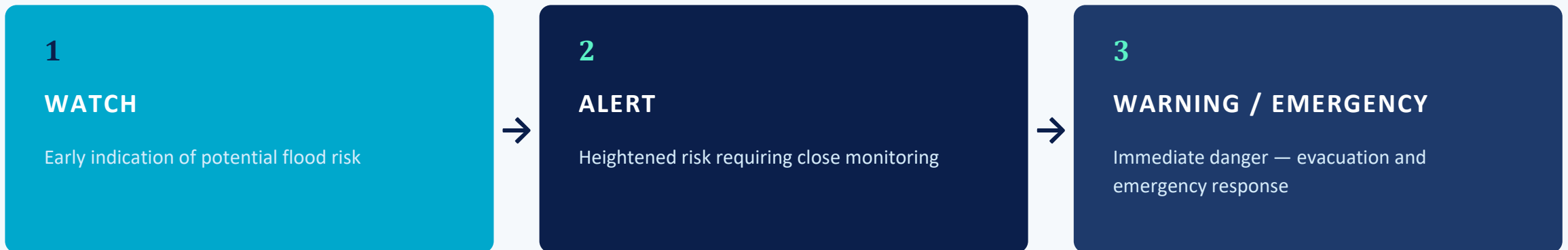


Findings from the recent bulletin also revealed a decline in cropped area, informing early warning and risk mitigation.

UN-SPIDER

NASRDA hosts the regional support office for UN-SPIDER, adding value when a charter is activated in the event of a natural disaster. This value addition is in the form of map production from images derived from satellite constellations when disasters occur.

NASRDA has created an operational Early Warning System (EWS) and rainfall forecast for up to seven (7) days to help during flood disasters. The EWS is automated to function in three categories:



350,000
RESIDENTS PROTECTED ACROSS PRIORITY LGAs



This satellite-triggered EWS is set to protect residents across priority Local Government Areas from flood disasters.

Telemedicine Programme

The telemedicine programme is an initiative by NASRDA that uses Nigerian communication satellites to connect patients to medical professionals in remote rural areas.

Specialised mobile medicine transit buses were deployed across the six (6) geopolitical zones, ensuring quality healthcare reaches underserved communities irrespective of their location.

Partnerships are being explored with university teaching hospitals, such as the recent one with Thumbay University Hospital, UAE, to scale up access to specialist care in remote areas.

Hundreds of patients from remote areas have received diagnoses remotely, reducing the financial burden of accessing tertiary healthcare for those in rural communities.

6

GEOPOLITICAL ZONES
REACHED BY MOBILE UNITS

Hundreds

OF PATIENTS DIAGNOSED REMOTELY



Partnership: Thumbay University Hospital,
UAE

How Can Developing Countries Increase Their Profit Potential in Space Applications?



Build upstream & midstream capability

Increase capabilities in space technology, especially in the upstream and midstream sectors of the space industry.



Deploy AI on open data

Utilise numerous open-source earth observation data, with machine learning and deep learning, to train and deploy predictive models that create solutions specifically for developing countries.



Collaborate for cloud & compute

Leverage collaborations with established organisations to provide computing needs, such as cloud services, a must-have for effective utilisation of earth observation data.



Commercialise into IP

Massively implement space-based research, commercialisation, and conversion of sovereign solutions and innovations into IPs and patents to create products and services.