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NIGERIAN SPACE POLICY: A CASE OF BUILDING A STRONG SPACE FUTURE FOR THE REGION OF AFRICA

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Nigeria became a major Space player in 1999, when her Space Agency, the National Space Research and Development Agency (NASRDA) was established. Since then, the country has made space research and development activities the centre-piece of her sustainable development in particular and that of Africa in general, balancing her interest with that of the region of Africa. Her approval of the National Space Policy and Programs was to create an enabling environment for space science and technology development not only for the nation itself but for the continent of Africa. This document, today, serves as a roadmap for the attainment of self-reliance for Nigeria as a Nation and by implication, for Africa as a Continent. This work focuses on Nigerian Space Policy as a case of building a strong space future for Africa. It gives a synoptic view of the Nigerian Space Sector and Projects. It then discusses the application areas of the Country's Space Policy and Programs, from the development of human resources and capacity building to the promotion of international cooperation. It further talks on the project of African Regional Centre for Space Science and Technology Education in English (ARCSSTEE), the role of NASRDA in it and its benefit to the continent of Africa. It summarizes and gives some recommendations.

INTRODUCTION

The Nigerian Space Policy and Programmes document, is a transformative document that has definitive and authoritative statements, roadmaps and signposts, which direct the National Space and Research Agency of Nigeria (NASRDA) in its activities as they relate to space and allied fields. It establishes principles governing the conduct of space activities in Nigeria. Since 2001 that the policy document was formulated, the country's space programme has be channelled towards the driving principles of the policy document.

NIGERIAN SPACE SECTOR AND PROJECTS

National Space Research and Development Agency (NASRDA) was established by the Government of the Federal Republic of Nigeria on 5 May 1999, with the Mandate of 'gearing its organizations and activities towards the implementation of National Space Research and Development Programmes which shall be directed towards the goal of self reliant use in space technology for national development. Before the establishment of NASRDA, space activities were going on in the country. For instance, the National Centre for Remote Sensing (NCRS), Jos, was established in 1996 under the National Agency for Science and Engineering Infrastructure (NASENI) and charged with the responsibility of harmonizing research and development in space science and technology application for sustainable socioeconomic development in Nigeria. It acquired and applied remote sensing, geographic information system and other related space technologies for the inventory, development and management of the nation's natural resources and environmental protection for the benefit of humanity.[*] More so, the African

[*] See Boroffice R.E and Akinyede J.O, 2005, Space Technology and Development in Africa and the Nigeria's Experience, Abuja: National Space Research and Development Agency, p. 45. See also G. I. Agbaje, "Nigerian Space Policy, Satellite Technology and NGDI Programmes", in A. T. Salami (ed), 2006, Imperatives of Space Technology for Sustainable Forest Management in Nigeria, Ile-Ife: Space Applications and Environmental Science Laboratory, pp. 118 – 145; Tare Brisibe, "Outer Space Activities and Intellectual Property Protection in Nigeria", in Journal of Space Law, Volume 32, Number 2, Winter 2006, pp 229 – 251; John O. N., Eguaroje E. and Mohammed S. O., "Legal Regime of Remote Sensing and Geographic

Regional Centre for Space Science and Technology Education in English (ARCSSTE-E) was inaugurated on 24 November 1998, under the auspices of United Nations Office for Outer Space Affairs (UN-OOSA), to increase indigenous capability in Space Science and Technology applications through education and training at the post-graduate level in core disciplines of Remote Sensing and Geographic Information System, Satellite Communications, Satellite Meteorology and Global Climate, and Basic Space and Atmospheric Sciences. NASEDA was, therefore, established to consolidate all the space activities going on within the country. In addition, Cooperative Information Network (COPINE), an initiative articulated at the United Nations Regional Conference on Space Technology for Sustainable Development in Africa held in Dakar, Senegal in October 1993. It was envisaged to be a satellite based information exchange network with interactive capability linking urban and rural centres in Africa.[†] Other institutions that were involved in space-related programmes were Regional Centre for Training in Aerospace Surveys (RECTAS), Obafemi Awolowo University, University of Nigeria Nsukka, University of Lagos, Bayero University Kano, University of Ilorin, Federal University of Technology Akure, Federal University of Technology Minna and University of Ibadan. These institutions are still today not under NASRDA.

The establishment of NASRDA automatically brought National Centre for Remote Sensing (NCRS) and Centre for Space Science and Technology Education (CSSTE) under it. COPINE was incorporated into NASRDA later in 2011. Apart from these three Centres that are today operational in NASRDA, others are: Centre for Satellite Technology Development (CSTD) responsible for all facet satellite technology – building, launching, telemetry, tracking and control; Centre for Space Transport and Propulsion (CSTP) responsible for advances in science and technology of Rocketry; Centre for Basic Space Science (CBSS) responsible for the provision of sound education, research and knowledge in basic science, astronomy/astrophysics, solar terrestrial physics, cosmology and origin of life, ionospheric physics, rocketry and balloons, geomagnetism, etc as well as designing and fabricating systems, instruments and telescope; Centre for Geodesy and Geodynamics (CGG) responsible for the facilitation of capacity for geodetic surveying and mapping, as well as monitoring of crustal deformation and subsidence due to excessive oil and gas exploitation, floods and global mean sea level rise and other related seismic and geodynamic phenomena, including implementation of international agreements with respect to satellite Laser Ranging (SLR), Very Long Baseline Interferometry (VLBI) and Cooperative International GPS network.

Other centres exist within NASRDA. They are offshoot of some of the major centres under NASRDA. The Centre for Atmospheric Research is an offshoot of Centre for Basic Space Science; it is mandated to coordinate research in meteorology, climatology, ionospheric physic and solar physics all over Nigeria. Others are Advance Space Technology Application Laboratories, which are offshoot of National Centre for Remote Sensing; they are located in Ife, Kano and Uyo, and are mandated to perform some activities relating to remote sensing and geographic information activities in South/West, North/West and South/South Geopolitical zones of Nigeria.

Since 1999 that NASRDA was established, it has executed many projects. These are basically Satellite projects – Remote sensing and communication satellite projects. To achieve NASRDA vision, NigeriaSat-1, an Earth Observation micro-satellite, was launched into Low Earth Orbit on 27. NASRDA has further launched into the orbit, NigeriSat-2 (a high resolution Earth Observation satellite), and NigeriaSat-X (a small satellite built by Nigerian engineers to provide data continuity and interface with NigeriaSat-1, and to enhance national human resources to use space applications and to develop Nigeria capability in space). These two satellites were launched 17 August 2011.

APPLICATION AREAS OF SPACE POLICY AND PROGRAMS

The Nigerian Space Policy and Programmes contains areas of application. The policy's first application area addresses the development of human resources and capacity building. It sees the basis of sustainable development as the development of requisite manpower within the industries, research centres/institutions and academic institutions in Nigeria. Self-reliance – technological, industrial, commercial and economic – can only be achieved if the Nigerian Government develops its citizens in the area of Space Science and technology. This means that development in space science and technology is a path to achieving self-reliance. The policy document sees making space science education mandatory through adequate funding, developing relevant infrastructures and enhancing various institutions in space-related fields, as strategies

Information System in Nigeria", a paper delivered at International Astronautical Congress (IAC) 2011.

[†] See "National Paper of Federal Republic of Nigeria", a document prepared by Members of the National Committee on the Third United Nations Conference on Peaceful Uses of Outer Space (UNISPACE III) Vienna, 19 – 30 July 1999, on behalf of the Federal Ministry of Science and Technology, A/CONF.184/NP/17, Pp.46 & 47.

for developing Nigerian Engineers, Scientists, Physicists, Chemists, Mathematicians, Environmentalists and other skills in space science and technology, and in turn developing the Nation. Other ways of achieving this are bringing education to all nooks and corners of the country through facilities for distance learning via satellite technology; bringing back many Nigerian super specialists in Diaspora; and establishing special activity centres on specialized areas of space science.

Its second application area addresses Poverty Alleviation and food security. It sees this as being attainable through efficient exploitation and management of the country's natural (renewable and non-renewable) resources. With space technology applications, the assessment and management of Agricultural resources, Land resources, water resources, Ecosystem, plants, fauna, the physical environment, education and Strategies, will be of great benefit to the country.

The third application area is on Disaster prediction, warning and mitigation. Nigeria, therefore, shall endeavour to use space technology for this purpose. It sees the development of capacity in the understanding, monitoring and measuring of flooding, landslides and erosion, winds and storms, heat waves, drought and desertification, locusts and insect infestations, bush burning, oil spillage and oil production hazards, waste management, radioactivity, climate change, earth tremors, crater lakes, and effect of mining activities, as a way of achieving this.

Forth, it is applicable in defence, national security and law enforcement through the creation of space science and technology defence command units in collaboration with the nation's space Agency and other institutions. This helps in the areas of conflict prevention through pre-emptive actions, enhancement of Regional Peace Keeping Operations and fight against crime, most especially international crime. This is achievable through production of robust, reliable and fail-safe mechanism for military, communication and navigation; training simulations in military disaster operations, search and rescue operations, and national security and defence needs; fighting financial crime through tracking and forensic information; and development of hardware and software.

Five, it is applicable in understanding the Earth and its environment from Space for National development. Through Space Science and Technology, the effects of the citizens' activities on the Earth environment are studied and sustainable development policies and programmes are being vigorously pursued. There is therefore, the need – to understand the Earth's pheres, solar-terrestrial relations, ozone layer depletion and global climate change; for national resource inventory; for weather and climate forecast to help in Agriculture and other socio-economic activities; for advanced warning for natural and man-made disasters; to create employment for scientists; and for international cooperation in Earth Sciences. These can be achieved through encouragement in the study of basic space science; development of pool of Nigerian Scientists in upper atmospheric physics and measurement of levels of metal/toxic compound; providing enabling environment for coordination of studies in basic science; coordination of monitoring activities at national and international levels; enhancement of monitoring activities through ground and satellite based monitoring system; and building of capacity to document all natural resources in the country.

Six, it is used in space communication applications. The policy sees it as the responsibility of the Nigerian Government to enhance telecommunication services and application to accelerate economic growth rate; increase the teledensity of Nigeria within few years; provide telecommunication services in rural and remote areas; provide satellite broadcast services; link Nigeria with the global information infrastructure; strengthen the development and extension of distance education; and provide satellite services like data imaging, video conferencing, multimedia and global internet access. This is achievable through the development and acquisition of indigenous capability in satellite technology, and the development and launch of communication satellite that are secure and affordable.

Seven, the policy is applicable in education and training. It puts the responsibility of ensuring the education and training of Nigerians in order to break the vicious circle of scientific illiteracy and the integration of research results in the country, on the federal government of Nigeria. These will develop Nigerians as future policy makers aware of the socio-economic benefits of space science and technology; as space science and technology product developers; as participators in international space science and technology programmes that will ensure cooperation with countries and groups. The country can achieve these through the rehabilitation of deteriorated basic space science and technology facilities in Nigeria; investment in all areas of space science research and training; ensuring continuity in policy thrust and ensuring the entrenchment of policies in National planning and their execution in national projects; mass education of policy makers, planners and decision makers; allocation of 5% of education tax to training and research in space technology; provision of scholarship in space science and technology areas; and ensuring the continuous funding of the Centre for Space Science and Technology Education (ARCSSTE-E) in Ile-Ife.

Eight, it is applicable in commercial areas and spin-off benefits. It sees venturing into space science and

technology by Nigerian Government as a way of deriving commercial and spin-off benefits like domestic and international trade, employment and other socio-economic benefits that will enhance the quality of life of Nigerians. Total commitment in space will make Nigerians cease to be only consumers of spin-off benefits of space; they will engage in research and development in the area of space science and technology; foreign industries will be attracted into the country; a pool of high technological scientists, engineers and technicians that can support Nigerian technology and industrial development will be developed; jobs will be created for Nigerians, which will alleviate poverty and guarantee food security; and it will enhance international cooperation. These can be achieved through opening of space science related industries and bringing back Nigerians in Diaspora; provision of enabling environment for growth and development of space science and related technologies; providing fund for research and development in all aspects of space science and technology; and establishing linkages with friendly developed space nations.

Nine, it can be used in promoting international cooperation. Nigeria shall not only support international cooperation for the peaceful uses of outer space for the interest of mankind, it must implement its space programme, taking advantage of cooperation with other space-related organizations in the world to promote her economic growth and development. This is to peacefully develop and use space resources for the benefit of the country and all mankind; to engage in cooperation on the basis of mutual benefit and mutual complementarity; to build up the capability of space development; adopt measures to protect the space environment and resources in the course of international cooperation; and to support the UN in its space application programmes. To achieve these, certain things must be put in place thus – multilateral cooperation on peaceful uses of outer space must be; sub-regional and regional space cooperation with in Africa must be promoted; space cooperation with developing and developed countries must be promoted; there must be support for research institutions, industrial enterprises and universities in space science issues; Nigeria's capacity for cooperating with other nations of the world must be increased.

Last, it is applicable in the area of policy implementation. The policy puts the provision of financial and other resources for the realization of the National Space Science and Technology vision in the hand of the Government of the Federal Republic of Nigeria. This is because there are immense benefit derivable from space science and technology. The purpose is to develop indigenous capabilities for space research and applications, and to use these capabilities as tools for natural resource management and environmental assessment. These are achievable through the building of capacity in space science and technology development; the building of satellites for various applications; developing and operationalizing indigenous satellite launch vehicles; encouraging private sector participation; enhancing the educational sector; seeking cooperation at regional and international levels in the implementation of this program; and establishing a Space Science and Technology Fund (SSTF) to be administered through NASRDA by National Space Council.

ARCSSTEE PROJECT AND ITS BENEFIT TO AFRICA CONTINENT

Because of the problem of low-level knowledge and expertise in the area of Space Science and Technology among the developing countries of Africa, Middle East, Latin America, Asia and Caribbean, the Committee on the Peaceful Uses of Outer Space (COPUOS), made a recommendation to the United Nations that *to* "lead, with the active support of its specialized agencies and other international organizations, an international effort to establish regional Centres for Space Science and Technology Education in existing national/regional educational institutions in the developing countries."[‡] This recommendation, having been endorsed by the United Nations General Assembly (UN-GA), was supported at the United Nations Regional Conference on Space Technology for Sustainable Development in Africa with its theme "Space Systems as Tools for Meeting Africa's Environmental, Natural Resources, Information and Management Needs" held in Dakar, Senegal from 25 to 29 October that the centre be established to promote the development of skill and knowledge in remote sensing, satellite meteorology, satellite communications, and basic space sciences, and that all African countries should support the initiative and on-going effort of the United Nations.

The United Nations General Assembly, in 1995 recommended that these centres be established on the basis of affiliation to the United Nations. Therefore, under the auspices of the United Nations, through its Office for Outer Space Affairs (UN-OOSA), four Regional Centres for Space Science and Technology Education were established for Africa (Morocco, Nigeria), Asia and the Pacific (India), and Latin America and the Caribbean (Brazil and Mexico).

The African Regional Centre for Space Science and Technology Education in English (ARCSSTE-E) was inaugurated in Lagos, Nigeria on 24 November 1998, under the auspices of UN-OOSA. The standard model education curriculum of the Centre was developed through the United Nations Programme on Space

[‡] See the Report of Expert (A/AC.105/445).

Applications that is implemented by UN-OOSA. ARCSSTE-E curriculum includes core disciplines – Remote Sensing/Geographic Information System, Satellite Communications, Satellite Meteorology and Global Climate, Basic Space and Atmospheric Science, and Global Navigation Satellite System, which will be starting in 2014. More so, curriculum for the 18month Master of Technology (MTech) degree has been finalized by ARCSSTEE and Federal University of Technology Akure. The programme will kick off in October 2013.

The goal of ARCSSTE-E is to develop, through in-depth education, an African indigenous capability for research and applications in these areas. Since the inauguration of ARCSSTEE in 1998, the Centre has graduated 275 participants from a total of 17 Anglophone African countries in the 9-Month Post-Graduate Diploma programme.

One of the objectives of Nigerian Space Policy is to support outer space application programmes of the United Nations.[§] Thus, Nigerian Government has wholeheartedly support the ARCSSTEE programme since its inception. Another objective is to develop indigenous capabilities for research and applications in major areas of space science and technology. This indigenous capability does not refer to Nigeria alone; it means African indigenous capability. The next is to undertake and encourage regional and international cooperation in Space Science and Technology programmes. The Government has followed this objective to its letters; the Nigerian Government has been cooperating with all countries of the region participating in ARCSSTEE activities. The last objective worthy to mention is to participate in international programmes in space science and technology and thus ensure cooperation with foreign countries and international groups.

One interesting strategy put forward by the policy document to achieving the above objectives is to ensure continuous funding of ARCSSTEE – a centre that trains the trainers in Anglophone African countries. Hence, the staff of the centre are on the payroll of the Federal Government of Nigeria. The Nigerian Government sponsors foreign participants by providing accommodation and monthly stipends.

SUMMARY, RECOMMENDATIONS AND CONCLUSION

Summarily, the Nigerian Space Policy and Programmes document is a document that sets a path leading to strong space future for Nigeria and other African countries. It is therefore, recommended that other African countries' policies should emulate the Nigerian Space Policy for a better space future for Africa. Also, African countries should cooperate with the Nigerian Government to make ARCSSTEE a worthwhile educational centre. Last, the countries should cooperate in major space projects that require huge sum of money.

[§] See Chapter Nine of the National Space Policy and Programmes of Nigeria.