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Potency of Space-Dependent Technology in Elimination of Corruption, Promotion of Good Governance and Public Accountability

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Full text of the lead paper delivered at the
2020 National Space Media Dialogue, organised by the National Space Research & Development Agency, Obasanjo Space Centre, Abuja, Nigeria,
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Rabiu, A. B. 2020. Potency of space-dependent technology in elimination of corruption, promotion of good governance and public accountability, Centre for Atmospheric Research, National Space Research and Development Agency, Federal Ministry of Science and Technology, Anyigba, 18

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'Technology is the most powerful medium that the government has to utilise to ensure good governance, transparency and accountability. There should be no "space" between the common man and space technology" -Narendra Modi, The Prime Minister of India, September 7, 2015.

Protocols

1.0. Opening Speech

It's with great pleasure and deep sense of responsibility that I stand to give this lead paper in this auspicious meeting. The theme of this conference 'Prospects of Space-dependent technology in good governance and elimination of corruption' is quite timely and reveals the thought of a proactive bunch of patriotic and concerned citizens clamouring for positive repositioning of our naturally-destined to-be-great Nation. A meeting like this is a service point for a nation on transit like ours to garner facts and required knowledge to attain lofty heights expected of great nations. I take the liberty of this moment to make my modest submission towards the development of our nation.

The scenario in the world today has validated the statement made by Socrates (469-399 BC), a philosopher par excellence, even before the space age: "Man must rise above Earth to the top of the atmosphere

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and beyond, for only then will he fully understand the world in which he lives" (Vernikos, 2008). I chose to paraphrase this statement to imply that: “Until humans rise above the earth and explore space, the challenges confronting men on earth cannot be solved completely”. Philosophically, the statement corroborates the Holy Scriptures: “I will lift up mine eyes unto the hills, from whence cometh my help” (Psalm, 121:1). If great help comes from the hills, then greater help comes from the space which is far above the hills. Obviously great visionary leaders often act like sages and seers, they see ahead of their contemporaries and followers and project into the future. Their statements and actions find relevance across generations even centuries after they are no more. Our Nation has been blessed with such and today we are witnesses to the actions of few of such leaders, in various sectors of human endeavours including governance, even among the multitudes of sycophants in our leadership class. In the category of such visionary leaders were rulers such as Chief Obafemi Awolowo, a one-time premier of Western Region in Nigeria; Mandiba Nelson Mandela, former president of South Africa; Lee Kuan Yew of Singapore among others. A scientist by name ‘Nikola Tesla’ qualified for this call of visionary leaders when he, in 1926 concluded with great audacity that: "when wireless is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole. We shall be able to communicate with one another instantly, irrespective of distance. Not only this, but through television and telephony we shall see and hear one another as perfectly as though we were face to face, despite intervening distances of thousands of miles, and the instruments through which we shall be able to do all of this, will fit in our vest pockets." Today, space technology has made this dream a reality.

The main focus of this lecture is to demonstrate the potency of space dependent technologies in elimination of corruption, promotion of good governance and public accountability.

2.0. Explanation of Terminologies

For the purpose of this lecture, I chose to explain the basic terms involved in this discourse as follow:

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Technology: the use of science in industry, engineering, etc., to invent useful things or to solve problems.

Space-dependent technologies are technologies which depend on the use of satellites that are in orbits (Rabiu, 2018b). These include satellite technology, navigation technology, information technology, drone technology, and communication technology among others. Products of space-dependent technologies include tropospheric weather report, GSM telephony, transaction of business with credit/ATM cards, online/mobile banking, navigation by GNSS – personal, air, sea, land, surfing the Internet, cable (Satellite) television services, and modern military warfare. This technology has changed the landscape of human endeavours and mode of operations as well as daily living styles. Today's world is driven by technology of which space-dependent technology is a major player. It is obvious that human ability to harness the space technology has made the present day man more comfortable than any of his ancestors (Rabiu, 2015)

Governance: has to do with the establishment of policies, and continuous monitoring of their proper implementation, by the members of the governing body of an organization. It includes the mechanisms required to balance the powers of the members, and their primary duty of enhancing the prosperity and viability of the organization.

Corruption: dishonest or fraudulent conduct by those in power, typically involving bribery. Transparency International defined corruption as the "abuse of entrusted power for private gain". In order to ensure that not only public corruption but also private corruption between individuals and businesses could be covered by the same simple definition, Corruption.org (2020) refined the definition as: "Corruption is the misuse of entrusted power (by heritage, education, marriage, election, appointment or whatever else) for private gain".

Public accountability means the obligation to answer publicly- to report, to an acceptable standard of answering, for the discharge of responsibilities that affect the public in important ways (Essays, 2013). Public accountability is considered as the complement of public management (Bovens, 2007).

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3.0. Space-dependent technology and elimination of Corruption

Effective patronage of Space-dependent technology is capable of eliminating corruption in our country. Rabiu (2016) has observed that leakages, corruption and under-productivity are triple afflictions confronting our fragile economy. In recent time, effective application of ICT, a space-dependent technology, in banking sector actually led to the recent discovery of fraud in the appropriation of government fund in various X-gates around us.

For example, through the effective application of biometric-based Bank Verification Number (BVN) scheme, a product of technology, to the Integrated Payroll and Personnel Information System (IPPIS) the Federal Government in February 2016 detected unbelievable size of 23,846 ghost workers and saved monthly recurrent losses to the tune of N2.293b! (Ogidan and Okwe, 2016). Some economically sensitive State Governments are now following this trend to control financial leakages.

By combining satellite imageries and Global Navigational Satellite System GNSS data, users have been able to engage the GIS to effect incorruptible land administration system even here in Nigeria. This has the capacity to eliminate problem of land grabbing, improper land taxation, multiple allotment and unauthorized use/sale of land.

Space technology is the main driver of today's global economy including e-commerce. Doing financial transaction has never been a fun! The financial transparency we see on GIFMIS today are products of space technology. This makes mis-appropriation of public funds difficult and easy to detect at the press of a button [Rabiu, 2016].

According to Corruption.org (2020), fighting corruption takes place in many 'theatres':

(I). political reforms, including the financing of political parties and elections;
(ii). economic reforms, regulating markets and the financial sector;
(iii). financial controls: budget, bookkeeping, reporting;
(iv). Public supervision: media, parliament, local administrators and councils, registration;

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(v). free access to information and data;
(vi). maintenance of law and order;
(vii). improving and strengthening of the judicial system;
(viii). institutional reforms: Tax systems, customs, public administration in general;
(ix). whistleblowers and civil society organisations (NGO's).
Each of the above theatres can be clinically administered by space dependent technology.

4.0. Space-dependent technology and promotion of good governance

On 30th June 2014, shortly after he assumed office as the 14th Prime Minister of India on 26 May 2014, Narendra Modi mandated the Indian Department of Space to pro-actively engage with all stakeholders to maximise the use of space science in governance and development (SpaceRef, 2019). Consequently, the then Cabinet Secretary asked all Secretaries of all Central Ministries/Departments to assess the current utilisation of Space technology-based tools in their Ministry/ Department and explore new potential application areas. Further, Indian Space Research Organisation, ISRO, constituted 18 expert teams within ISRO and conducted proactive one-to-one interactions with the Ministries/ Department. A joint action plan on "Effective Use of Space Technology" was prepared with 60 Central Ministries/Departments. About 170 projects across various Ministries/Departments were identified in the areas of Natural Resources Management, Energy & Infrastructure, Disaster & Early Warning, Communication & Navigation, e-Governance & Geo-spatial Governance, Societal Services, and Support to Flagship programmes.

After about a year, a one-day 'National Meet' was organised on September 07, 2015 at Vigyan Bhavan, New Delhi to deliberate on the action plans of various Ministries/Departments. The 'National Meet' received an overwhelming response with participation of the Prime Minister and more than 1200 delegates across 60 Central Ministries/Departments, 28 States and 5 Union Territories. Secretaries, Additional Secretaries, Joint Secretaries to Government of India, Chief Secretaries, Principal Secretaries of the States and senior functionaries

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of Central and State Governments, officials from Prime Minister Office & Cabinet Secretariat, young administrators, experts from academia and institutions actively participated in this Meet. The meet comprised of nine thematic sessions (Agriculture, Energy & Environment, Infrastructure Planning, Water Resources, Technology Diffusion, Developmental Planning, Communication & Navigation, Weather & Disaster Management and Health & Education) addressing different domains of national development. At the forum, the Prime Minister emphasised that 'technology is the most powerful medium that the Government has to utilise to ensure good governance, transparency and accountability'; and that 'there should be no "space" between the common man and space technology'.

In the USA, Postman (2019) reported that environmental agencies use satellite imageries over time to determine shifts in ecological activity, like a swampland drying up or a lakebed flooding. Tax officials leverage data gathered by satellites to make more accurate assessments of land type use—shots from space help auditors differentiate farmland from commercial to residential without having to travel. Transportation departments rely on real-time satellite imagery to help them understand traffic flow patterns to alleviate congestion. For city economic advisors, processed satellite imageries of parking lots in front of large retailers before major shopping holidays help the local government more accurately predict sale surges. For troops abroad, increased AI computing power has made it possible to combine highly detailed images over large areas, mapping the "before" and "after" shots to provide real-time insight to outsiders as events unfold. Today's satellites—armed with high-powered sensor technology powered by AI and machine learning—are helping agencies at both the federal and state level make smarter decisions for their citizens

The essence of governing a nation like ours is to ensure 'sustainable development'. In other words, the ultimate goals of a good governance is to achieve sustainable development. The United Nations General Assembly gave a new contemporary face to the term 'sustainable development' when on 25 September 2015, the 194 countries of the UN General Assembly UNGA adopted the 2030 Development Agenda

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titled 'Transforming our world: the 2030 Agenda for Sustainable Development'. As a way of building on the successful 'Millennium Development Goals MDG' (United Nations, 2015), the UNGA announced the 17 Sustainable Development Goals and 169 targets (United Nations General Assembly, 2015). They are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental. The 17 Sustainable Development Goals SDG adopted by the UNGA are thus shown in Table 1.

Table 1: The 17 SDGs (Source: United Nations General Assembly, 2015).

Goal 1: No Poverty: End poverty in all its forms everywhere

Goal 2: Zero Hunger: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Goal 3: Good Health and Well-being: Ensure healthy lives and promote well-being for all at all ages

Goal 4: Quality Education: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Goal 5: Gender Equality: Achieve gender equality and empower all women and girls

Goal 6: Clean Water and Sanitation: Ensure availability and sustainable management of water and sanitation for all

Goal 7: Affordable and Clean Energy: Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 8: Decent Work and Economic Growth: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Goal 9: Industry, Innovation and Infrastructure: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Goal 10: Reduced Inequalities: Reduce inequality within and among countries

Goal 11: Sustainable Cities and Communities: Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 12: Responsible Consumption and Production: Ensure sustainable consumption and production patterns

Goal 13: Climate Action: Take urgent action to combat climate change

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and its impacts

Goal 14: Life Below Water: Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Goal 15: Life on Land: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Goal 16: Peace, Justice and Strong Institutions: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Goal 17: Partnerships for the Goals: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

The bottom line is that space-dependent technology has critical roles to play in the accomplishment of virtually all the 17 Sustainable Development Goals. We therefore illustrate how space-dependent technologies are currently being applied in areas relevant to some of the key sectors of SDGs:

Goal 1: No Poverty: End poverty in all its forms everywhere

It is obvious that the poverty being witnessed in the land today is not as a result of lack of abundance, but due to tripod affliction of corruption, wastages and economic leakages among other factors (Rabiu, 2018a). In the absence of these triple afflictions, the wealth in the land can actually be appropriated in such a manner that poverty can be upturned. Space-dependent technologies has proven to be effective in taming corruption and control of economic Leakages. Knowledge is also a vital key to overcome poverty of all kinds. Space-dependent technologies has also advanced the propagation of knowledge more than ever.

Goal 2: Zero Hunger

Precision farming, a farming technique more advanced than mechanized farming, now embrace the use of autonomous vehicles, automated machines, real time network surveillance cameras, satellite

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imageries of farmland and Global Navigational Satellite System based operations to handle farm operations (Rabiu, 2018a). This space-dependent technique has numerous advantages which include easy techniques, less tedious, improved yield, makes farming attractive, optimal use of resources – no wastages, machines can work day and night – extra time, effective farm surveillance, and long term cost effective. This ensures food security and sufficiency. Imagine the huge farm yield possible for us, if precision farming can be applied to large expanse of land lying fallow across our nation.

Specifically, Marshall (2017) reported that 'satellite imagery can provide crop yield on a pixel by pixel basis – enabling farmers to better decide when to add water or fertilizer and when to harvest. By imaging the land using special spectral bands (such as near infra-red) we can develop a vegetation index that represents crop vigour and productivity. Agricultural land represents 37% of the land area of earth and satellites are uniquely capable of collecting this data across such a vast territory'. For example, Planet satellite images the whole land mass of Earth daily to help with these efforts (Marshall, 2017).

Nowadays, drone technology which is being coupled with a measure of artificial intelligence and equipped with near infra red NIR Sensors and thermal imaging cameras; has gained wide applications in precision farming applications in fighting crop diseases; food security; track livestock; administration of fertilizer, herbicide, insecticide, pollination; assess damage; mapping fields at high-resolution; and planting of seeds (Popescu, 2019; Sibley, 2019). Developed nations of the world such as United States, the United Kingdom, Japan and Australia have increasingly embraced precision farming.

In the domain of food security, improved scientific knowledge of plant biology and breeding techniques are being achieved via experiments being conducted in zero gravity conditions at International Space Station. This has led to better seeds and cultivation practices that drastically increased yields (Rabiu, 2016).

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Goals 3: Good Health and Well-being

Telemedicine, a medical practice that utilizes product of space technology and ICT in health care delivery, makes it possible to treat disease or injury by consultation with a specialist in a remote area by means of a computer or satellite link. It makes health care readily available at all levels of demand irrespective of the remoteness of the location. Telemedicine readily makes the service of competent medical practitioners available to their patients irrespective of the distances between them (Rabiu, 2018b).

Goals 4: Quality Education

Rabiu (2018a) observed that 'E-learning, a space technology product, has transformed the way we learn and promote literacy more than ever. ICT and space technology have combined to make the world a global village. More knowledge is being acquired outside the walls of classrooms and teaching/learning is getting better than ever with effective teaching/learning aids which had hitherto eluded the world. Advanced nations make these aids readily available to their citizenries. Underdeveloped nations need to adapt e-learning to improve quality of education being dispensed within their borders. Nations like India has embraced tele-education several years ago'. In Nigeria, some state governments are freely making secondary school textbooks available on ipads, laptops and even on webpages for easy access to pupils and teachers.

Goal 6: Clean Water

Satellite images enable broad and efficient monitoring of reservoir water levels, providing early warning of shortages and uniform data across different countries that share water sources, increasing transparency and consistency in water delivery (Marshall, 2017).

Goal 11: Sustainable Cities and Communities: Make cities and human settlements inclusive, safe, resilient and sustainable

Public safety is of great economic concern when it comes to investment in any nation. Patronage of space research and technology hold the key to solving our present security crisis in Nigeria. Smart cities are now

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equipped with effective surveillance system that is space dependent. Public infrastructures and streets of such smart cities come under real time watch in effective manners such that traffic situation, hideous crimes, and even sporting activities are captured on videos that are accessible to security operatives. Japan has many of such smart towns. It is unfortunate that in Nigeria today, none of our commercial and administrative hubs is smart. Even, Abuja is not a smart city.

Our porous public safety was highlighted by the high level of social menace experienced within our borders during the recent '#endsars' protests and attendant crisis that has thrown us into this present black moment in our history which is comparable to post-war experience.

Our government must be ready to enforce scientifically established security solutions to the present crisis in our country. Kidnappings, armed robbery, vandalization of public infrastructure and terrorism are menaces that space technology has solutions to. For instance, an effective aerial surveillance which can be achieved with constellation of high resolution Earth Observation Satellites EO's in network with some Unmanned Aerial Vehicles UAV, distributed surface mounted cameras, some ground control rooms equipped with customised ICT garnished with IoT and experts, are all we need to effectively man our country land and borders. This kind of system would complement our security outfits and build confidence in any investor. It is obvious that our public safety is at moment nothing to write home about, posing great risk to investment and economic development.

Again, policing in smart nations have gone beyond carrying pistols, AK47 or cans of tear gas. In addition to physical weapons, security operatives in those nations now wear gadgets that are adorned with chips that are compliant with Internet of Things. This is applicable to civil police officers, immigration officers, traffic wardens and such like. Every conversation (audio and video) with such officer is recorded and transmitted, courtesy of space-dependent technologies, at real time to a file in the cloud. The geolocation and every environmental data are naturally archived for further necessary action.

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Goal 13: Climate Action

Often the earliest and clearest indications of climate change can be observed in very remote regions of the world. Earth-observation satellites enable global monitoring of deforestation, pollution levels in bodies of water, status of ice caps and desertification, and enable early and immediate action to prevent these events (Marshal, 2017). In Nigeria, manifestations of climate change, which can be managed via space dependent technologies, include sea level rise in the south, desert encroachment in the north, increasing flood experience, shrinking of Lake Chad and some other observations. The attendant problems are numerous to be exhausted in this presentation. The farmers-herdsmen conflict in the central and southern Nigeria has been linked to the herdsmen's forced southern migration away from their traditional grazing grounds, mostly in the northeast of Nigeria including Chad basin, owing to drought, in search of greener pasture (Rabiu, 2019). The lake has decreased in size from 22,000 square kilometers in the 1960s to fewer than 1,500 today; and it may even completely dry up within 20 years according to the Nigerian government (Obaji, 2018).

5.0. Space-dependent technology and public accountability

Essays (2013) affirmed that public accountability has moved further beyond its bookkeeping origins and has become a symbol for good governance, both in the public and in the private sector. Accountability does not refer to rulers holding their subjects to account, but to the reverse, it is the authorities themselves who are being held accountable by their citizens. The recent presidential order for the Office of Accountant General of the Federation (AGF) to publish a Daily Treasury Statement which will provide information about what came into the national treasury and what went out every single day. "The AGF and all Accounting Officers must publish Daily Payments Reports. With these reports, the Treasury will publish payments of at least 10 million naira while all MDAS must publish payments above 5 million naira made out of all public funds under their purview. The information to be published must include the MDA responsible, the beneficiary, the purpose and amount of each payment Accounting Officers are

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responsible for providing answers to any questions from the public relating to transactions completed by entities under their charge" (Saanyol, 2019). This fiscal accountability is made possible because the Federal Government has already rolled out the Government Integrated Financial Management Information System (GIFMIS), an electronic repository which is space dependent, capturing over 800 Ministries, Departments, and Agencies (MDAS).
In similar manner, accountability of public projects can be achieved via regular monitoring of sites and infrastructures via space technology without physical inspections. Sitting in the corner and comfort of an office within the Centre of Abuja, it is possible, via space technology, to monitor thousands of road construction projects all around Nigeria within a day without making a single phone calls or spending extra one naira on transportation.

If a network of real-time surveillance cameras had been available at the Federal High Court, Abuja, premises on 6th December 2019 when a person standing trial was re-arrested, the true story of the day would have been played by the recorded movie. In which case, all parties involved would have judged themselves publicly. Same would have prevented the dark scenarios we experienced in the wake of #endsars protests accompanied by attendant nationwide wanton destruction and killings.

The implementation of Freedom of Information Act being anticipated by the present regime can only be possible with the patronage of space technology. "Today communication satellite technology, is an essential component of the information age, enabling the global gathering, distribution and use of data and information, creating and sharing knowledge about the world and its environment on an unprecedented scale. All forms of broadcasting had become space dependent. Television services are now satellite based. Today we have DSTV, GOTV, TSTV etc operating in our space market. Even television service providers that cannot afford to own satellites are now aligning with satellite TV service providers. The implication is enormous. Information now comes to us at real time and news - voice or print - are no longer stale anymore!" (Rabiu, 2018b).

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6.0. Recommendations

The following are hereby recommended:

- There is a need for the Federal Government to promulgate an executive order mandating all MDAs including judiciary to identify and maximise the use of appropriate space application in discharging their responsibilities towards solving our numerous national socio-economic and national security challenges
- NASRDA needs to seek appropriate executive approval to organise a national meet of extra-ordinary inter-ministerial stakeholders to introduce products of space technology in day-to-day operation of all MDA at federal levels.
- Introduction of relevant courses that can enhance manpower development in space science and technology into our curriculum at tertiary education levels – space physics, aeronautical engineering, space geodesy, remote sensing and GIS, etc
- Review of our existing laws to permit patronage of space dependent products at all levels of development
- Review of present budgetary systems and procurement laws to favour Space science and allied technologies.

7.0. Conclusion

Capabilities of space technology products include good governance, inhibition of corruption, creation of job opportunities, advancement of wealth creation, promotion of quality of living and public accountability, Security of society/public safety, control of emigration, engagement of active mind, and provision of platform for sustainable national development

Permit me to end with the very first statement I made in today's presentation credited to the 14th and incumbent Prime Minister of India, Narendra Modi: 'Technology is the most powerful medium that the Government has to utilise to ensure good governance, transparency and accountability. There should be no 'space' between the common man and space technology".

Thank you and wishing you all of God's blessings.

Professor Babatunde Rabiu

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