AFRICAN DEVELOPMENT BANK GROUP

EMPOWERING AND ADVANCING AFRICA'S SCIENTIFIC ENTERPRISE

Keynote speech delivered at the 15th Bi-annual General Assembly and Scientific Conference of the African Academy of Sciences (AAS).

By

Prof. Kevin Chika Urama, FAAS
Chief Economists and Vice President,
African development Bank Group

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Protocols:

1. Your Excellencies, Distinguished Scholars, Ladies and Gentlemen. Please allow me to stand on established protocols.

2. Good morning.

3. Let me start by thanking, Professor Friday Okonofua, Secretary General of the African Academy of Sciences and Professor Lise Korsten, President of the African Academy of Sciences (AAS), for the invitation extended to me to address these distinguished stakeholders and thought leaders from around the world on this very important topic: *"Empowering and Advancing Africa's Scientific Enterprise"*.

4. As a Fellow of the African Academy of Science since 2013, I did not hesitate to accept the invitation to speak on this subject which is not only timely but critical for advancing inclusive growth and sustainable development in Africa today and enhancing the global competitiveness of its Member States. By harnessing science and technology, African countries have a stronger chance of addressing poverty, disease and environmental destruction…

5. Your Excellencies, ladies and gentlemen.

6. In 2009, in this beautiful and historic city of Abuja, I was privileged to deliver a keynote paper to the Association of African Universities on the theme: "*Higher Education for Sustainable Development in Africa".* As a younger researcher at the time, I was surprised to find in my analyses, that investments in higher education and other scientific endeavors in Africa did not contribute as much to gross national incomes in African countries, as in other continents and countries including South Korea, Singapore, and other developed countries.

7. In 2010, I led the publication of the *African Manifesto for Science, Technology and Innovation*[1] – as "*a tool for shaping shared visions about science, technology and innovation (STI) in Africa, for Africans, by Africans, in a multi-lateral dialogue, with the rest of the world".*

8. Following the Sussex manifesto which called for a rejection of the idea that existing international division of labour in science is adequate for development, and for less developed countries to have their own indigenous scientific capacity[2], the African Manifesto made the case for Africa's sovereignty in science, technology and innovation. It argued for full socialization and democratic governance of STI as a pre-requisite for sustainable development in Africa.[3]

[1] African Manifesto for Science, Technology and Innovation was published by the African Technology Policy Studies Network (ATPS) P O Box 10081 - 00100 Nairobi, Kenya, under the auspices of the Science, Ethics and Technological Responsibilities in Developing and Emerging Countries (SETDEV) Project. ISBN: 9966-7434-5-6.

[2] The Sussex Manifesto was a report on science and technology for development published in 1970.

[3] Some of the materials included in the keynote speech derives from the African Manifesto for Science, Technology and Innovation.

9. The African Manifesto envisioned a new renaissance in Africa, a new world order in which there is self-rule and democratic governance of STI in Africa for African development. It sets out three core actions required to achieve this vision:

   (a) First, restoration of confidence in African STI and African experts by Africans.
   (b) Second, concerted public and private investments in building sustainable STI infrastructures, and
   (c) Third: adoption of proactive policies to fully embed African STI in African societies.

10. Your Excellencies, Ladies and Gentlemen:

11. These findings and recommendations remain relevant today, and more specifically to the theme of this conference: *"Empowering and Advancing Africa's Scientific Enterprise"*.

12. We live at a time when recurrent and overlapping shocks to global, regional, and national economies, have forced increased realization of the need for reforms at several scales.

    (a) Reforms in how we conceive and implement global governance.
    (b) Reforms in multilateralism and global development finance architecture.
    (c) Reforms in the principles of international cooperation and economic development policy at regional and national scales.
    (d) Reforms in how we harness the different forms of capital for development, including the involvement of our growing populations of youth and women in public policymaking and leadership.
    (e) Reforms in the basic assumptions that have shaped different science disciplines and knowledge systems that have underpinned development policy, planning and practice for decades.
    (f) Some argue that there is urgent need for reforms in how we think and relate with science, knowledge systems, public policy and development practice, as the current systems we have inherited has not been able to deliver lasting solutions to Africa's development challenges.

13. With years of development practice, it is now evident that the current models of development have served the world and Africa a great deal, but inequalities remain.

    (a) The rates of economic diversification and structural transformation across the African continent remain slow and uneven.

    (b) While several African countries have achieved high rates of growth in their Gross Domestic Product (GDP), the rates of growth in per-capita incomes have remained far too low in many African countries.

    (c) Levels of unemployment therefore remain unacceptably high, and majority of African citizens remain locked in low productivity sectors, and the rate of poverty is deepening in several countries.

    (d) In recent years, geopolitical tensions, trade disruptions, weak global demand, volatile commodity prices, tighter financial conditions, climate change effects and structural challenges in global supply chains have compounded development challenges globally.

(e) In Africa:

- Employment share of manufacturing sector in Africa increased by only 0.6 percentage points between 1990 and 2018. This suggests that Africa's STI is not effectively helping the continent's industrialisation effeorts.

- At current growth trends, close to 9 out of 10 of the world's extremely poor people will be in Africa by 2030.

- Most middle-income African countries could remain stuck in a middle-income trap for decades to come, and

- It could take African countries more than a century on average (108 years) to transition to a high-income status.

14. Your Excellencies, Ladies and Gentlemen,

15. It could be said that conventional forms of STI knowledge generation, circulation, monitoring and evaluation have not been able to deliver lasting solutions to Africa's development challenges.

16. As noted in the African Manifesto, "African STI still remains marginalized, locked in her rich but complex history".

(a) Science, Technology and Innovation (STI) in Africa are as old as humanity itself. STI has been an integral part of the pre-historic man and thus integral to Africa and the evolution of mankind. Documented evidence suggest that Africa is amongst the most strategic continents in the history of STI development, globally.

(b) Some of the most important technological innovations for human survival have unique origins in Africa. For instance, *development in tool making industry has its root in Africa.* About 2.3 million BC "homo habilis' residing in East Africa developed the first tool-making industry called "*Olduwan"*.

(c) Following this, *the Acheulean stone tool industry (characterized by hand axe) emerged* in *Africa in 1.5 million BC,* and spread to Middle-East and Europe around 800,000 and 600,000 BC. A significant development, which influenced all later stone tool industry, is the creation of bone tools and black blades in Southern and Eastern Africa around 90,000 to 60,000 BC.

(d) Use of iron in smelting and forging for tools appeared in West Africa around 1200 BC making it the first birth place of the iron-age. Before 1800, Africa's methods of extracting iron were employed in Brazil, until more advanced European methods were instituted, while copper smelting developed independently in West Africa around 900 AD. Investigation into space and time also began in Africa.

(e) "Paleolithic Africans" began a process of stargazing as far back as 40,000 years ago. The process transformed into a systematic observational science in the Nilotic lands

of Africa between 6,000 and 12,000 years ago. The most important result of the Nilotic stargazing was the invention of the calendar and the basis for the modern astronomy.

(f) The "proto-technology" of the modern world is traceable to the iron-ore mining 43,000 years ago in Southern Africa and the emergence of "proto-mathematics" from the Africa's Great Lakes region over 25,000 years ago.

(g) From these beginnings, science and technology underwent a steady development in Africa, with the continent reputed to be the remotest origin of formal mathematics, astronomy, engineering, architecture, navigation and map-making.

(h) The recent discovery of the Timbuktu manuscripts rekindled confidence that Sub-Saharan Africans were studying mathematics and astronomy at least over 300 years ago. Other discoveries also record that there were advanced concepts of modern physics in Mali.

(i) From the foregoing, it could be said that Africa had great beginnings in its role in shaping global science and technology. However, the current state of STI in Africa raises many questions. The tide has since tilted to a new world order in which scientific knowledge and modern technologies are largely produced in the global North and consumed by the global South, with Africa's productivity in STI ranking amongst the lowest, globally. Investments in STI also follow the same pattern with only South Africa approaching the African Union recommended target of 1% of GDP in public expenditure on research and development in the whole of Sub-Saharan Africa".

(j) Fractal geometry, the study of complex shapes, is not only a frontier in mathematics and information technology, with applications across natural sciences but also a reflection of Africa's heritage, evident in the traditional designs and settlements of Logone-Birni and Mokoulek in Cameroon, and Ba-ila in southern Zambia. North Africa, especially Egypt, was a center of excellence pioneering devices to record astronomical events such as the summer solstice. In East Africa, the Bunyoro Kingdom developed advanced medical systems to treat communicable diseases such as measles and smallpox, as reported by European travelers through the Great Lakes.

17. However, for the past 150 years", Africa's scientific contributions have been underrepresented as the profound effects of war and colonization shifted the focus of scientific enterprise from addressing local needs to serving wartime needs and resource exploitation. African centers of research were underfunded. The result is a weakening of the African scientific enterprise. According to the World Intellectual Property Organization, less than 1 percent of all patents granted worldwide in 2023 were for African individuals or enterprises, led by South Africa (8,118 patents).

18. Today, Africans continue to pursue international excellence in contemporary methodologies and apply contemporary incentive structures and tools for monitoring and evaluation often based on international standards, contexts, pedagogies, epistemologies, and needs".

19. This is on the backdrop to decades of attempts by the African governments to turn around their development fortunes through efforts to mainstream STI in Africa's development policies and actions. Some of these include: the Monrovia Strategy (1979); and the Lagos

Plan of Action, (1980); the Abuja Treaty (1991); the adoption of Africa's Science and Technology Consolidated Plan of Action (CPA) by the African Union in January 2007.

20. The past three decades have also seen the formation of dedicated STI Ministries, National Commissions, National Councils, and State Agencies as well as pan-African Governmental and Non-Governmental Institutions committed to STI capacity building and policy making in Africa.

21. Despite these efforts, as shown above, Africa remains the poorest and most economically marginalized continent in the world.

22. The politics of globalization, internationalization and regionalization of STI have defined and shaped STI in ways that effectively exclude the African voice, its knowledge systems and communities and to a large extent, the African development agenda.

23. In Africa, most of STI related Ministries and National Government Agencies are yet to be fully resourced, while most African STI institutions continue to rely largely on external funding, limiting their ability to respond to Africa's STI needs proactively and effectively.

24. Questions regarding how STI agendas are prioritized, how STI knowledge is produced and circulated, monitored and evaluated remain.

25. "On the global scale, the notion that the existing international division of labour in science and technology is adequate for development remains irrespective of calls for its rejection by the Sussex Manifesto, 1979. The self-doubt which this engendered and the associated knowledge dependence espoused monologues and binomial linear relationships between the "global North" and the "global South"; the "Knows" and the Know Nots"; and the "Haves' and the "Have Nots" in ways that hinder innovation in Africa by Africans".

26. As stated in the African Manifesto, several critical challenges limit the full operationalization of the scientific enterprise in Africa:

    (a) Historical path dependence shaped by Africa's colonial experiences, informed "*literary studies"* rather than "*pure science & technology education"* that can drive factor productivity in Africa.

    (b) The language of STI also means that the plurality of knowledge systems and traditional knowledge communities in Africa are seldom recognised and harnessed for development.

    (c) The nature and type of incentives, the institutionalization of STI and global STI leadership that re-enforces the colonial stereotypes also alienates Africa's STI from African communities and African problems.

    (d) The geopolitics of STI, the globalization and internationalization of STI and its funding and knowledge support structures exacerbate the global divide in which STI agenda setting and prioritisation remain the pre-prerogatives of the global North. Africa's STI productivity remains very low (<2% of the global output); and her investment in STI is even lower with only South Africa approaching an investment

rate of 1% of her GDP on research and development in the whole of the sub-Saharan Africa.

(e) Lack of long-term planning, policy incoherence and isolationism.

(f) Low capacity in science-policy interface and science communication.

(g) Brain-drain: - The unit cost of brain-drain in African professionals migrating to other countries represents a loss of about $184,000 to Africa per year, and the continent looses around $2 billion to brain drain in the health sector alone. Paradoxically, Africa spends around $4 billion a year in salaries of about 100,000 expatriates (foreign nationals working in Africa).

27. Your Excellencies, Ladies and gentlemen:

28. Let me speak briefly on what can be done to empower and advance African scientific enterprise in a growing multi-polar world.

29. First, there is need for mindset change. We must rebuild confidence in African Science, by Africans for Africa's development. As aptly noted by Vannevar Bush, (Science, the Endless Frontier): "*A nation which depends on others for its new basic scientific knowledge will be slow in its industrial progress and weak in its competitive position regardless of its mechanical skill".* To quote President Kagame of Rwanda: "*We in Africa must either begin to build our scientific and technological training capabilities or remain an impoverished appendage to the global economy"* (The New African, vol. 494, p. 78).

30. Second: We must mobilise resources to invest in the *Soft Infrastructure* needed to empower the African Scientists to focus on research and development for factor productivity enhancements across sectors: agriculture, health, energy, ICT and others.

31. Yesterday, we considered the different sources of funding for scientific research and development in Africa and how they can be assessed.

(a) We showed that while government budgets remain a critical source of funding for the advancement of science in societies, government financing are often conservative, risk averse and focused on short-term research that can yield quick and tangible return in investments for political expediency.

(b) The African private sector on the other hand, currently underinvests in research for development for diverse reasons. However, with their investible wealth of about $2.5 trillion, Africa's high net worth individuals present a low hanging fruit for science funding if African research is properly tailored to addressing their industry needs. The African Philanthropy Network estimates that African Philanthropies give up to $2.8 billion per year with a potential to increase to 7 billion if favourable conditions obtain.

(c) The African Diaspora funding could also be a useful source if the current remittances which is estimated at almost $100 billion each year is duly securitized. Diasporans could also support R&D in Africa through brain circulation and partnership programs.

(d) Global Philanthropy will remain a source of funding for research and development on pre-defined agenda's that match their own priorities, especially in the areas of health, education and agriculture.

(e) Foreign Direct Investments (FDI) and Official Development Assistance (ODA)funding has been declining significantly in recent years and the trend is likely to continue. Continued reliance on external funding for research and development is therefore not likely to deliver adequate funding to empower the African scientific enterprise in the coming decades.

(f) While African countries continue to face outwards for the source of financing for development including funding for scientific endeavours, the continent looses over $1.6 billion daily in illicit financial flows, international profit shifting, corruption, risk premium paid to Creditors due to information asymmetry and other forms of bias in the current systems of sovereign ratings, etc. By refocusing efforts on rebuilding institutions at home, the continent could reduce this continued haemorrhaging of scarce resources from its member States amounting to more than three times the total financial inflows into the continent annually from FDI, ODA, portfolio investment flows and remittances.

(g) Multi-lateral Development Bank (MDB) reform agenda is shifting attention to global public goods, including support for science and innovation in key areas such as climate change, energy transitions and sustainable development.

(h) Other innovative funding instruments to advance science and innovation in countries include domestic savings, public private partnerships, crowd-funding, impact investing and social entrepreneurships, diaspora funding and brain circulation, and leveraging international partnerships.

32. In all cases, the operating environment including socio-cultural, political, and business environments as well as the prevailing tax incentives could foster flow of research funding in countries.

33. Your Excellencies, Ladies and Gentlemen:

34. To conclude, let me summarise once again, the key actions that Africa needs to take to empower and advance Africa's scientific enterprise:

(a) First, we must restore confidence in Africa's science, technology and innovations and in African Scientists' capacity to provide endogenous solutions to Africa's development challenges.

(b) Second, we must accelerate public and private investments in the soft infrastructures that make science to thrive – to reach economies of scale. This should include harnessing public-private partnerships, crowdfunding, impact investing and social entrepreneurships, diaspora fundings and brain circulation. Just like birds and aircrafts, economies cannot fly on one wing. We need to balance investments in soft infrastructures (endogenous science, technologies and innovations), to make investments in hard infrastructure (roads, rails and bridges, seaports and airports, etc.,) to be productive for our economies.

(c) To achieve the second, the nature of incentives needs to change. There is need to provide the right monetary policy and fiscal incentives to promote investments in science, technologies and innovations that enhance factor productivity in African countries and make these investments bankable. These incentives may include monetary policy instruments to enhance savings rates to promote the culture of domestic savings not undeterred borrowing, fiscal policy incentives that enhances franchising and preferred procurement, and general changes in mindsets and effective demand for African products. In economic science, effective aggregate demand shapes the nature of production and supply of products.

(d) Fourth, our science must be solutions oriented not textbook focused: African Scientists must reform the agenda for science and education to refocus on factor productivity improvements, value creation, and positive social re-engineering. If African science effectively provides solutions to Africa's development challenges – it will be bankable. Both African government and the private sector will turn to African Scientists to buy solutions to the day-to-day challenges they face in running countries and building industries to make profits, either through re-elections or enhanced manufacturing pro cesses. There is no lack of resources in the world to fund productive ideas and technologies. What there is, is lack of bankable ideas and technologies. If you doubt this statement, ask Mark Zukerberg; Steve Jobs; or Elon Musk and other Founders of smart technologies that are trending in markets, etc.

(e) We must mobilize domestic savings and make Africa's capital work for science, technology and innovations in Africa. As aptly noted by Vannevar Bush, (Science, the Endless Frontier) *A nation which depends on others for its new basic scientific knowledge will be slow in its industrial progress and weak in its competitive position regardless of its mechanical skill.*

As the former, Liberian President, Ellen Johnson Sirleaf, reminded delegates at the Science in Africa Summit in 2008: *No country on earth has developed without deploying, harnessing and utilizing STI, whether through technology transfer or homegrown solutions.*

"We in Africa must either begin to build our scientific and technological training capabilities or remain an impoverished appendage to the global economy" (President Kagame of Rwanda : The New African, vol. 494, p. 78).

35. Sixth: We must leverage all sources of financing including international partnerships, bilateral funding agencies, multi-lateral development banks, development finance institutions and global philanthropies – ensuring that the underpinning agendas for such financing are fully aligned with Africa's development strategies, priorities and plans.

36. While international finance will remain a useful source of funding for empowering science in Africa, African Scientist must proactively address the long-lasting challenges of knowledge dependence and the black box effects. As noted by a CGD report that examined institutional capacity in Africa, 2019, p. 10-11:

"*Africa tends to be a child with many parents, very many parents. And unfortunately, most of the parents want their child to learn how to walk their way… and most of the*

parents do not want to hear and listen to the child when the child is asking to walk their [own] way. Our researchers, our PhDs, our patents, our ideas, we are a child, and nobody wants to allow us to walk our way. If you unpack that analogy, there's quite a bit in there." CGD, 2019, p. 10 – 11.

37. The "Black Box Effect" concept coined by Hon. Monica Musenero Masanza, Minister of STI Uganda – provides some empirical evidence on the low impact of current education curricula on factor productivity in African countries, supporting my earlier research on higher education for sustainable development in Africa.

38. To empower and advance the African scientific enterprise, African Scientists must learn to demystify science, tunnel through or break open the black box, and make science more inclusive, productive, understandable and accessible to all Africans.

39. Afterall, science is only the systematic study of the structure and behaviour of the physical and natural world through observation, experimentation, and the testing of theories against the evidence obtained. This is not the exclusive right of anyone, language, civilisation or culture.

40. We must make African Scientists work for Africa's development.

41. Because Together We Can.