IBBIS

International Biosecurity and Biosafety Initiative for Science

Safeguarding Nigeria's Bioeconomy

Background

The International Biosecurity and Biosafety Initiative for Science (IBBIS), in partnership with the National Biosafety Management Agency (NBMA) of Nigeria, convened a two-day strategic meeting in Abuja on 26-27 August 2025 under the theme Safeguarding the Nigerian Bioeconomy. The meeting convened government officials, regulators, scientists, security experts, and representatives from academia and industry to examine how Nigeria's bioeconomy can be advanced in a manner that fosters innovation while ensuring security. The discussions reflected Nigeria's ambition to harness biotechnology for national development while embedding safeguards that meet both domestic needs and international obligations. Particular attention was paid to DNA synthesis screening as a cornerstone measure to prevent potential misuse of emerging biotechnology, strengthen governance, and build public trust.

This report captures the key themes and recommendations from the meeting, providing a foundation for continued dialogue and collaboration.

Emerging technologies and the future of synthetic biology in Nigeria

Over the course of the meeting, participants explored the wide range of applications that biotechnology and synthetic biology can bring to Nigeria. The National Biotechnology Research and Development Agency (NBRDA), together with industry representatives, steered these discussions. NABRDA delivered a comprehensive briefing on unlocking Nigeria's biotechnology potential, outlining the current landscape and highlighting key areas of ongoing research. Agribiotechnology was highlighted as essential for food security and for supporting smallholder farmers who underpin Nigeria's agricultural economy. Health-related applications featured prominently, including decentralized vaccine and diagnostics manufacturing in the wake of the COVID-19 pandemic, which could help Nigeria respond more rapidly to future pandemics and improve access to medical countermeasures across the country. Discussions also covered advanced technologies such as genome editing, gene drives and precision medicine, emphasizing Nigeria's need to keep pace with global responsible innovation while seizing opportunities to leapfrog technological stages where feasible. Biofuels and biodiversity protection were also identified as priority areas where biotechnology can contribute to sustainable growth. Throughout these conversations, participants underscored the importance of Nigeria's bioeconomy as a driver of economic growth and job creation, with the potential to expand industries, generate employment across value chains, and stimulate broader development. They further stressed that this growth and any regulatory approach must remain grounded in the One Health approach, recognizing the interconnection between human, animal, and environmental health.

The rise of artificial intelligence (AI) was discussed as a transformative factor in this landscape. AI tools can accelerate scientific discovery in areas such as vaccine

design, empower early warning systems for disease detection, and reduce costs associated with manufacturing, but they also increase the risk of misuse by lowering barriers to accessing powerful technologies. This includes expanding the risk landscape for pathogen engineering by malicious non-state actors, especially when combined with advances in synthetic biology. Participants described this as a double-edged development that requires new forms of governance not only in Nigeria but also globally. Participants agreed that all countries are struggling to regulate technologies that advance far faster than regulatory cycles can adapt. Balancing access to innovation with the need for security was identified as a central challenge, one that will require both strong national strategies and strengthened international cooperation.

Strengthening Nigeria's bioeconomy ecosystem

The meeting emphasized the importance of strengthening the structures and systems that underpin Nigeria's bioeconomy and ensuring that sustainable growth across the entire value chain. Participants highlighted that Nigeria is well-positioned to harness emerging biotechnology as a driver of economic growth, job creation, and national development, but doing so requires deliberate investment in infrastructure, partnerships, and policies that can translate scientific research into real-world impact.

A recurring theme was the need to expand the country's biotechnology ecosystem through public-private partnerships. Participants from industry and academia emphasized that these collaborations are critical for establishing biofoundry hubs that can act as engines of bioinnovation. These hubs would not only serve as centres for cutting-edge research but also provide the infrastructure and networks needed to bring discoveries out of the laboratory and into the market. By linking academia, industry, and government, biofoundries could reduce Nigeria's dependence on imports, accelerate research and development timelines, and ensure that products and

solutions are developed locally to address both everyday needs and urgent health or agricultural emergencies.

Participants from industry stressed that for Nigeria's bioeconomy to deliver on its promise, greater emphasis must be placed on intellectual property, return on investment, and the translation of science into market-ready products. Participants from industry stated that too often, research remains confined to academic publications without being developed into tools or services that can generate economic value or improve lives. Participants agreed that building a stronger innovation pipeline will require training scientists to work at the interface of research, industry, and markets, equipping them with the skills to identify commercial opportunities, secure intellectual property, and scale their innovations.

Participants stated that, by focusing research on pathways that prioritize intellectual property protection and commercialization, Nigeria can unlock new industries, attract investment, and create a more self-reliant innovation system. This shift in approach will help ensure that scientific progress contributes directly to economic growth, reduces reliance on imports, and positions Nigeria as a competitive player in the global bioeconomy. Participants noted that the benefits of this approach go beyond economics, as a stronger domestic bioeconomy would also enhance resilience to future health crises, strengthen food security, and build public trust in biotechnology as a sector that delivers tangible value to society. Participants also noted the need for further collaborations between the government, universities and industries to help create more self-reliant innovation systems.

Participants also highlighted how weaknesses in infrastructure, customs bottlenecks, and unreliable supply chains continue to slow research and manufacturing, limiting the ability of institutions to conduct timely and effective scientific work. Procurement

challenges, including high customs costs and long delays, were flagged by members of industry as a recurring obstacle that undermines both innovation and emergency response.

Strengthening Nigeria's governance and regulatory landscape

The National Biosafety Management Agency (NBMA) led the meeting by providing a clear overview of Nigeria's regulatory frameworks, outlining priority action areas, and clarifying the roles of government agencies and institutions in the regulatory space. NBMA traced the evolution of its mandate, noting the important shift in 2019 to formally incorporate biosecurity into its responsibilities alongside biosafety. This shift was presented as a significant milestone that broadened the scope of Nigeria's preparedness and oversight. Central to the discussion was the National Biosecurity Policy and Action Plan (2022–2026), which participants widely recognized as a forward-looking framework that positions Nigeria as a proactive actor in the global biosecurity landscape. Nigeria's recent improvements in its Joint External Evaluation (JEE) were noted as evidence of progress, bringing the country into stronger alignment with the International Health Regulations (IHR) and the Global Health Security Agenda (GHSA).

At the same time, participants acknowledged the challenges that persist. Implementation of the Action Plan has been slowed by insufficient funding, limited political will, and fragmented awareness among key stakeholders, including some present at the meeting. These gaps have hindered the full operationalization of Nigeria's biosecurity ambitions. Participants agreed that improved advocacy is needed to elevate biosecurity on the political agenda and to strengthen the authority and influence of agencies with the mandate for oversight. They recommended forming a new steering committee within the National Technical Working Group to drive

implementation of the Biosecurity Action Plan. Such a body would help sustain political will, secure funding, and ensure that biosecurity remains visible on the national agenda.

During the meeting, NBMA walked participants through specific sections of the Action Plan, highlighting how existing provisions could address areas of concern raised by stakeholders at the meeting. This process reinforced the understanding that Nigeria already has significant infrastructure and mechanisms in place but that improved synergy between departments and agencies, together with enhanced stakeholder awareness of available tools and frameworks, will be critical to success. Participants agreed that one essential area for regulatory clarification was harmonization of national biorisk standards across institutions to build consistency and public confidence, while certification systems must be expanded to align national practices with international standards. Improving the reach of certification, developing clearer processes for harmonization of SOPs, and securing ISO certification for more laboratories, especially those working with high-consequence pathogens, were seen as crucial steps to build credibility and open avenues for collaboration and funding.

The mandate of NBMA was viewed as a solid foundation for national oversight. Participants also welcomed the supporting role of the existing frameworks under development by the Office of the National Security Adviser (ONSA) and National Authority on Chemical and Biological Weapons Convention (NAC & BWC) related to chemical and biological preparedness, which could help strengthen Nigeria's security posture. Participants acknowledged Nigeria's strong capacity for regulation and enforcement at the federal level, but agreed that resources and infrastructure remain unevenly distributed, with many states under-resourced even though health security threats are often most focal at the local level. Capacity-building and training were

therefore also highlighted as insufficient to embed biosecurity best practices across laboratories, universities, and industry settings.

Participants stressed the urgent need to improve governance of emerging technologies and to align Nigeria more closely with global best practices in biosafety and biosecurity. Some participants argued that policymakers have limited awareness of the dual-use risks inherent in emerging technologies, leaving gaps in preparedness for both deliberate misuse and accidental incidents. Strengthening compliance with international frameworks such as the Biological Weapons Convention (BWC) and UN Security Council Resolution 1540 was identified as an important priority, not only to reinforce national biosecurity governance but also to demonstrate Nigeria's commitment to global non-proliferation obligations. Participants recommended that Nigeria adopt and domesticate the WHO's dual-use policies, expand focus on dual-use research in the upcoming review of the National Biosecurity Policy and Action Plan, and develop frameworks and indicators for monitoring biosecurity policy more systematically. These steps would provide regulators with more precise tools for risk assessment and would help industry and researchers comply more easily with national requirements. DNA synthesis screening was repeatedly cited as a key safeguard that could help fulfil these obligations that must be embedded into Nigeria's regulatory frameworks.

Participants discussed how regional dynamics complicate Nigeria's biosecurity efforts. Several neighbouring countries are not signatories to key multilateral agreements such as the BWC, creating vulnerabilities that extend across borders. Participants emphasized that biological risks transcend national boundaries national boundaries and that stronger regional cooperation is essential. They also noted that the Global South, including Nigeria, is often disproportionately affected by biological risks yet is underrepresented in international cooperative bodies. Participants noted that Nigeria

is working with neighbouring states to join the BWC and submit confidence-building measures. Participants emphasized the importance of strengthening cross-border cooperation and intelligence sharing. Collaboration with Interpol to build law enforcement capacity in neighbouring countries was recommended, along with the development of SOPs for reporting incidents to security agencies at home. At the global level, Nigeria should deepen collaboration with WHO and other international platforms, both to domesticate frameworks like the IHR and GHSA and to ensure Nigerian laboratories and scientists are connected to global networks of practice and standards. These steps will not only enhance security but also increase Nigeria's attractiveness as a trusted partner in international science and innovation.

Finally, public trust emerged as both a challenge and an opportunity. Participants stressed the importance of transparent communication that demonstrates how technologies such as vaccines and genome editing are regulated. Participants argued that people need to see that safeguards exist to build confidence in biotechnology. Participants stated that strategies to address misinformation and disinformation will require cross-departmental collaboration, as this responsibility does not fall within the mandate of regulators alone. Effective communication strategies, co-development of research priorities with communities, and efforts to address risk perception will all be essential to ensure uptake of bioinnovation. Standards and certification were again emphasized as trust-building tools, providing the public with assurance that practices meet both national and international expectations.

Safeguards and DNA synthesis screening

Safeguards were the central theme of the meeting, with participants underscoring that governance issues lie at the heart of building a resilient bioeconomy. Participants agreed that Nigeria, like other countries worldwide, faces the challenge of balancing access to innovation with the need to ensure security and sustainable economic

development. Safeguards must therefore not only protect against biological risks but also support Nigeria's obligations under international non-proliferation frameworks such as UN Security Council Resolution 1540 and the BWC, while at the same time strengthening national and regional security as well as public confidence. These efforts also interact directly with broader health security cooperation agendas, including the International Health Regulations (IHR) and the Global Health Security Agenda (GHSA), highlighting the interconnectedness of biosecurity with public health, trade, and development.

Risk management was highlighted as a critical policy tool in this regard. Participants noted that Nigeria requires improved risk design processes to better guide risk assessments, ensuring they capture issues of governance in a way that is both robust and precise. Such precision is essential to make policies actionable and targeted for regulators, industry, and institutions alike. The National Biosecurity Policy and Action Plan already include sections that empower risk assessment greatly, but some participants highlighted that some of these sections lack granularity and sustainable funding for effective implementation. Institutional biosafety committees were identified as vital actors in operationalizing risk management, provided that their accreditation systems can be harmonized nationally and aligned with international standards. To further empower risk assessment, participants recommended developing a harmonized national biorisk database that maps laboratories and their activities. Participants further called for the development of a biosecurity research regulation agenda that would define how oversight applies differently to researchers and industry, ensuring tailored but consistent safeguards.

Capacity-building and culture change were highlighted as equally important. Participants recommended strengthening institutional biosafety committees and expanding bioethics education for scientists. A national code of conduct for scientists

was proposed, alongside calls to make responsible research the norm through better science communication. Improved training in global best practices and alignment with international laboratory standards was seen as a mechanism to raise the credibility of Nigerian research institutions while also attracting international funding and partnerships.

Throughout the meeting, DNA synthesis screening emerged as a key safeguard, consistently described as central to effective biosecurity governance. Participants acknowledged that recent developments in synthetic biology and artificial intelligence underscore the urgency of adopting of such safeguards. Regulating the digital-physical interface with DNA synthesis screening was seen as more immediately achievable than regulating AI itself, making screening an important area to advance without delay. Participants emphasized that screening is not an overreach of regulation but rather a practical mechanism that strengthens risk management and enhances attribution, accountability, and transparency in scientific work. It was noted that once new U.S. guidelines come into effect, DNA synthesis screening will become mandatory for federally funded recipients, creating a precedent that may also influence Nigeria's Joint External Evaluation (JEE) and future confidence-building measures under the BWC. Participants recommended embedding screening requirements into existing policy frameworks such as the National Biosecurity Policy and Action Plan, Synthetic Biology Regulation in line with NBMA Act 2015 (as amended), institutional biosafety committees, and innovation incentives such as grants.

Finally, the importance of aligning national and international standards was underscored. Harmonizing risk management practices with global frameworks and streamlining accreditation processes were identified as practical steps to facilitate adoption and compliance. The role of ISO standards in quality harmonization was highlighted as particularly valuable, providing Nigeria with a mechanism to align with

international norms while also supporting the global reach of its laboratories and industries. By adopting such standards, Nigeria can position itself not only as a proactive actor in international biosecurity but also as a reliable partner for scientific collaboration and investment.

Shared commitment and next steps

The meeting underscored a shared commitment among participants to strengthen Nigeria's biosecurity and biosafety architecture in ways that are both ambitious and achievable. Looking ahead, the upcoming review of the National Biosecurity Policy and Action Plan (2022–2026) was identified as a timely and strategic opportunity. Integrating new safeguards, including DNA synthesis screening, into the revised framework would help ensure that Nigeria's regulatory systems remain at the forefront of international best practice. The meeting closed with a reaffirmation of IBBIS and NBMA's joint commitment to advancing Nigeria's bioeconomy in a way that is safe, secure, and globally responsible.

Nigeria is well-positioned to build on its existing infrastructure, strong federal capacity, and proactive regulatory mechanisms to advance a resilient bioeconomy that creates jobs, improves health, and strengthens national security. Participants agreed that realizing this potential will require deliberate investment, increased capacity building, harmonized regulation, and safeguards that inspire public confidence while meeting international obligations. Priorities identified include embedding safeguards across the innovation value chain, developing biofoundry hubs, reinforcing public trust through transparent communication, and aligning policies with global standards. The meeting highlighted a wide range of opportunities to strengthen systems already in place and outlined a practical, inclusive, and forward-looking roadmap. By cultivating a culture of responsible research and ensuring innovation is matched with robust governance,

Nigeria can secure its bioeconomy and position itself as a regional and global leader in safe and responsible biotechnology and biosecurity.

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