Scientific Research Publishing

World Journal of Vaccines, 2026, 16(3), 45-75
https://www.scirp.org/journal/wjv
ISSN Online: 2160-5823
ISSN Print: 2160-5815

Assessing Kenya's Readiness for Vaccine and Biotherapeutics Manufacturing by BioVax: Challenges, Strategies, and Stakeholder Insights

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How to cite this paper: Brian, A., Wanjala, C., Odhiambo, J. and Muteru, S. (2026) Assessing Kenya's Readiness for Vaccine and Biotherapeutics Manufacturing by BioVax: Challenges, Strategies, and Stakeholder Insights. *World Journal of Vaccines*, **16**, 45-75.
https://doi.org/10.4236/wjv.2026.163003

Received: May 14, 2026
Accepted: August 3, 2026
Published: August 6, 2026

Abstract

In Kenya, there is a need to assess readiness for vaccine manufacturing, given the challenges in affordability and availability of vaccines and biotherapeutics. Through stakeholder mapping, this study aimed to evaluate the potential of Kenya BioVax Institute in producing vaccines and biotherapeutics and the implications for the health sector. The objectives were to identify the key enablers and barriers influencing local production and provide actionable policy recommendations for a sustainable biopharmaceutical industry. The research used a scenario planning methodology, concentrating on the four stages of defining the scenario question and time frame, determining the main drivers of change, and creating and using possible scenarios. The health systems strengthening framework informed this methodology. The findings reveal twelve critical drivers of change, with regulatory support and financial investment emerging as the most significant. Other drivers include technological capabilities, supply chain resilience, and intellectual property policies. Based on these drivers, four plausible future scenarios were outlined: Full-Scale Local Manufacturing, Limited Production, Prolonged Dependency on Imports, and Manufacturing Failure. Key opportunities encompass achieving self-sufficiency, fostering economic development, and establishing Kenya as a regional manufacturing hub. Conversely, some challenges identified are regulatory constraints, high startup capital, a shortage of skilled personnel, reliance on imported raw materials, and public skepticism regarding vaccine safety and efficacy. In conclusion, while the potential for a viable local manufacturing industry exists, its realization is highly contingent on strategic interventions. Thus, there is a need to capitalize on opportunities and mitigate significant barriers. The study recommends that the Kenyan government rationalize the

regulatory process to accelerate approvals, increase research and development investment, put incentives to lead foreign and private investment in place, improve public-private partnerships, and enhance trust in the public by raising awareness and communicating transparently.

Keywords

Vaccine Manufacturing, Biotherapeutics, Public Health, Pharmaceutical Industry, Regulatory Frameworks, Healthcare Innovation

1. Introduction

Local vaccine and biotherapeutics manufacturing as a transformative healthcare solution has been evolving for decades and is now gaining momentum with advancements in biopharmaceutical technologies. Initially explored for pandemic preparedness and immunization programs, local vaccine production has rapidly emerged as a crucial component of national healthcare strategies in many developing countries [1]. Nations like Japan, Brazil, and India have invested significantly in biopharmaceutical infrastructure and have attained key milestones in healthcare self-sufficiency by establishing large-scale vaccine manufacturing facilities by 2024. The production offers significant benefits, including enhanced healthcare security, reduced dependency on imports, improved response to health emergencies, and economic growth [2]. Emerging technologies such as mRNA vaccine platforms, automated bioprocessing systems, modular production facilities, and artificial intelligence (AI)-driven optimization tools are redefining vaccine and biotherapeutics manufacturing [3] [4]. These innovations improve scalability, enhance quality assurance, and reduce production and distribution inefficiencies, enabling wider and more equitable access to lifesaving vaccines.

Kenya is strategically positioned to harness this technological wave to expand its biopharmaceutical capacity, stimulate economic growth, and establish itself as a hub for vaccine innovation in Africa [5]. To realize this ambition, deliberate investments in advanced infrastructure, conducive regulatory and fiscal policies, and strong collaboration between government, academia, and industry are essential [6].

Building a resilient vaccine manufacturing ecosystem will also require addressing systemic challenges such as outdated infrastructure, limited skilled personnel, and lingering public mistrust of vaccines [7]. Revisiting key legislation particularly the Health Act of 2017 and the Biosafety Act of 2009 has been critical to aligning Kenya's regulatory landscape with contemporary biomanufacturing standards. These reforms should embed principles of transparency in clinical research, equitable vaccine distribution, and rigorous biosafety oversight to support ethical, efficient, and sustainable vaccine production [8].

Kenya is undergoing a pivotal transformation in its healthcare sector through

investments in medical research, public-private partnerships, and regulatory reforms [9]. Manufacturing vaccines and biotherapeutics has the potential to better Kenya's healthcare resilience by enhancing access to essential medicines, cultivating regional pharmaceutical development collaborations, and lessening import reliance. It also offers the chance for job creation in the biopharmaceutical industry and to explore export opportunities with other countries.

Some of the challenges experienced in Kenya's healthcare sector are, for instance, supply chain vulnerabilities and restricted access to high-quality and affordable medicines. The time-sensitive shift to local manufacturing aims to diminish the dependence on the importation of vaccines and biotherapeutics. With Vision 2030 as a guiding framework, local vaccine production presents an opportunity to bridge healthcare gaps, enhance public health security, and position Kenya as a regional pharmaceutical hub.

This research study analyzed the key drivers of change influencing Kenya's readiness for vaccine and biotherapeutics manufacturing. By evaluating these factors, the study provided insights into the pathways for scaling production and integrating local manufacturing into Kenya's healthcare system.

2. Research Objective

The objectives of this study were to identify the key enablers and barriers influencing local production and provide actionable policy recommendations for a sustainable biopharmaceutical industry.

3. Research Questions

This study sought to answer the following research questions: (1) What are the key drivers of change for local vaccine and biotherapeutics manufacturing? (2) How do these key drivers influence production potential? (3) What is the future of vaccine manufacturing in Kenya's healthcare landscape?

4. Literature Review

Country examples with aspirational public and private partnerships and policy framing include India, South Africa and Brazil, which have developed manufacturing capabilities that contribute significantly to the global vaccine and biotherapeutics landscape. India is now a top exporter of vaccines, South Africa has invested in local mRNA production, and Brazil has incorporated vaccine production into its national health strategy [10]. Such movements underscore the need for government support, infrastructure investment, and collaboration among the industry to create a sustainable biopharmaceutical sector.

Beyond production, local vaccine and biotherapeutics manufacturing can transform various sectors within the healthcare industry. It enables rapid response to emerging diseases, reduces dependency on global supply chains, and supports clinical research and pharmaceutical innovation [11]. The availability of locally produced vaccines can help prevent outbreaks, increase coverage of vaccination,

and play a role in achieving universal health coverage. In addition, the establishment of a domestic biopharmaceutical industry encourages job opportunities, skills accumulation, and economic growth [12].

With its global position, there exists great potential in Kenya, where local vaccine and biotherapeutics manufacturing can provide significant solutions to the healthcare challenges faced in the country and aid in achieving sustainable development. Utilizing the existing medical research institutions and expanding on pharmaceutical infrastructure will ensure accessibility and affordability of healthcare for Kenyans. Locally manufactured vaccines could improve disease prevention efforts, reduce dependency on international donors, and strengthen national pandemic preparedness [13].

The production of vaccines and biotherapeutics in Kenya could transform the country into a more self-sufficient healthcare system to the better men and the society as a whole [14]. Its uses include disease prevention, disease treatment and pandemic preparedness, and it is the cornerstone of a nation's health security. By developing local manufacturing capacity, Kenya can significantly reduce vaccine shortages, improve accessibility, and strengthen healthcare resilience [15].

Despite its potential, local manufacturing of vaccine and biotherapeutics in Kenya faces numerous challenges such as limited production infrastructure, expensive initial investment, regulatory bottlenecks, and a shortage of skilled professionals. To overcome these barriers, Kenya must invest in pharmaceutical research and development, establish policies that incentivize local manufacturing, and foster public-private partnerships to attract investment [13]. Additionally, comprehensive training programs for healthcare and biopharmaceutical professionals are also critical drivers of innovation ensuring the successful implementation of vaccine production.

Developing the manufacture of vaccines and biotherapeutics in Kenya would foster sustainable economic growth, contribute to healthcare security, lower dependence on imports and create more job opportunities.

5. Foresight Methodology

5.1. Overview

This section outlined the foresight methodology employed to achieve the research objectives. The study utilized a mixed-method approach, combining both quantitative and qualitative designs. As a foresight methodology framework, we used the Political, Economic, Social, Technological, Environmental, and Legal (PESTEL) analysis for uncertainty analysis and scenario development [16]. Through the PESTEL framework, the key drivers that are likely to bring about change were identified using this information relating to Kenya's preparedness for vaccine and biotherapeutics manufacture. By splitting the study into two different sections we were able to explore the topic in much more detail to extract informed insights from multiple angles. The PESTEL dimensions of sustainable vaccine and biotherapeutics manufacturing in Kenya are illustrated below, highlighting its role in

shaping the nation's healthcare future (Figure 1).

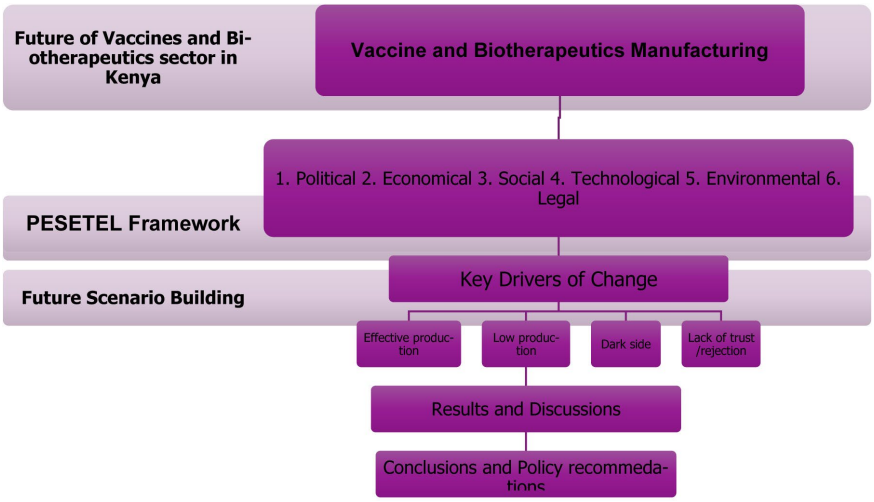


Figure 1. Proposed future foresight design under PESTEL dimensions.

Foresight Methodology design offers a structured approach to predicting future trends and scenarios by examining key influencing drivers of change for manufacturing.

5.2. Data Sample and Collection Methods

The derived secondary data was from a systematic literature review, and the PESTEL framework was used to select the twelve Change Drivers. Insights were collected from stakeholders using purposive sampling. The data were collected from 50 professional experts, including health policymakers, pharmaceutical industry experts, and regulatory specialists, through Google Forms. **Appendix 1** presents the distribution of expert opinions, and the sample questionnaire is given in **Appendix 2**.

5.2.1. Systematic Literature Review Procedure

The twelve PESTEL drivers were derived from a structured literature review aimed at identifying political, economic, social, technological, environmental, and legal factors associated with vaccine and biotherapeutics manufacturing readiness. Searches were conducted in Google Scholar, Web of Science, PubMed (MEDLINE), ScienceDirect, Scopus, and supplemented by institutional and policy sources from WHO [17], Africa CDC, the Medicines Patent Pool, and relevant Kenyan health-sector policy documents. The search covered publications from 2014 to 2025 and used combinations of the following terms: "biotherapeutics manufacturing," "vaccine manufacturing," "local pharmaceutical production," "biomanufacturing readiness," "regulatory preparedness," "supply chain resilience," "biosafety," "technology transfer," "public trust," "intellectual property," "Africa," "Kenya," and "low- and middle-income countries."

Eligible records included peer-reviewed articles, technical reports, policy pa-

pers, or regulatory guidance documents written in English that directly addressed at least one readiness issue pertinent to vaccine or biotherapeutics manufacturing, such as infrastructure, financing, regulation, technology transfer, research and development capacity, workforce, supply chains, public acceptance, ethics, environmental management, or intellectual property. Exclusion criteria comprised commentaries unrelated to manufacturing readiness, documents without accessible full text, duplicates, and papers focused solely on clinical efficacy without implications for manufacturing or system readiness. Titles and abstracts were initially screened, followed by full-text review of potentially relevant records. The final synthesis included 42 unique sources mapped to the twelve PESTEL drivers presented in Table 1. These drivers were subsequently refined through expert review prior to scoring.

5.2.2. Expert (Respondent) Recruitment and Stakeholder Sample

In this study, the experts (respondents) were recruited purposively through stakeholder mapping of institutions involved in vaccine and biotherapeutics policy, production, research, regulation, procurement, and health-sector planning. Eligible respondents were adult professionals with at least five years of relevant experience, current or recent involvement in vaccine, pharmaceutical, or biotherapeutics policy or implementation, and sufficient familiarity with Kenya's health manufacturing ecosystem to score the drivers. The final analytical sample comprised 50 completed questionnaires.

The respondent's distribution was as follows: Policymaking/Public Health Programmes (n = 14; 28%), academia/research (n = 18; 36%), Pharmaceutical/Biomanufacturing Industry (n = 10; 20%), and Regulation/Quality Assurance (n = 8; 16%).

5.3. Impact Uncertainty Analysis

Impact-Uncertainty Analysis was used as a foresight technique to prioritize the 12 drivers. Each respondent evaluated every driver on two dimensions: (i) expected impact on Kenya's readiness for vaccine and biotherapeutics manufacturing by 2040, and (ii) uncertainty regarding the evolution and influence of the driver on implementation. Both dimensions were rated on a 1 - 5 scale. For impact, 1 indicated negligible impact, 2 low impact, 3 moderate impact, 4 high impact, and 5 very high or transformative impact. For uncertainty, 1 represented very predictable or settled, 2 low uncertainty, 3 moderate uncertainty, 4 high uncertainty, and 5 very high uncertainty. Mean impact and mean uncertainty scores were calculated for each driver and plotted as (I, U) coordinates.

To interpret the scores, tendency levels were classified as low (1.00 - 2.49), moderate (2.50 - 3.99), and high (4.00 - 5.00) for impact, and as very low (1.00 - 1.99), low (2.00 - 2.60), moderate (2.61 - 3.40), high (3.41 - 4.20), and very high (4.21 - 5.00) for uncertainty. The Google Form was reviewed for completeness prior to analysis; incomplete responses for any impact or uncertainty item were excluded from the calculation of driver-level means. A consistency check was performed by

comparing the mean scores with the direct influence ranking to ensure that the scenario axes reflected drivers that were both substantively important and systemically influential.

Combining Impact-Uncertainty and Influence Results

Scenario-axis selection was based on a two-stage process. First, the impact-uncertainty matrix was used to identify drivers with the highest potential effect on readiness. Second, the direct influence analysis identified which drivers exerted the strongest systemic influence on other PESTEL factors. SO1 and TO2 were chosen as the scenario axes due to their highest impact scores (4.115 and 4.155, respectively) and their ranking as the most influential drivers. SO1 represents the demand and trust axis, reflecting whether society and health professionals accept locally manufactured vaccines and biotherapeutics. TO2 represents the supply and capability axis, indicating whether Kenya possesses robust research and development capacity, manufacturing infrastructure, quality systems, and a skilled technical workforce. Legal and intellectual property factors exhibited higher uncertainty but were considered enabling or constraining conditions rather than primary axes, as their effects are mediated through policy and technical implementation.

5.4. Future Scenarios Building

Future scenario building is a strategic planning tool that enables stakeholders to envision and prepare for potential future developments [18]. In the context of vaccine and biotherapeutics manufacturing, scenario building provides insights into possible pathways, challenges, and transformative impacts of establishing and scaling local production capabilities in Kenya's healthcare system.

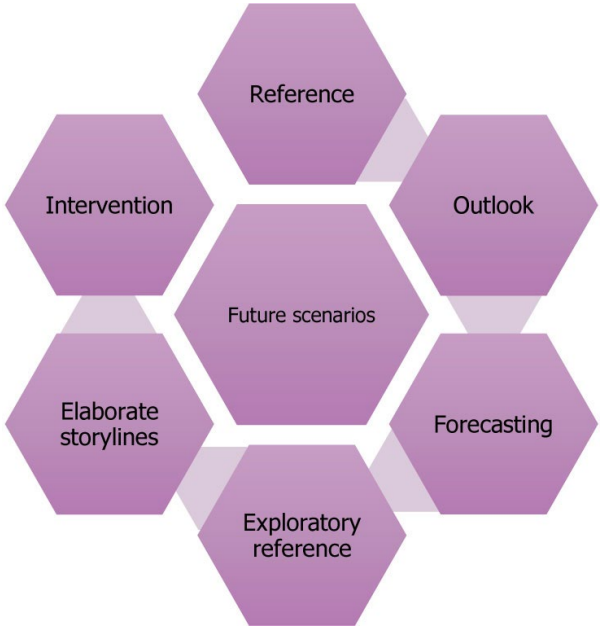


Figure 2. Frames for future scenarios of vaccines and biotherapeutics manufacturing.

The illustration above shows how the study employed a scenario-based approach to understand the key drivers of change for successful vaccine and biotherapeutics manufacturing in Kenya. It was the analysis of the current state, projecting forward the potential impacts into the future and a planning process (detailed storytelling) [19] (**Figure 2**). Predictive or forecasting, exploratory innovation, and integrated implementation through targeted interventions to ensure effective integration were among the aspects of the study indicated in **Table 1**.

6. Findings and Discussion

This section examines the findings and discussion in terms of outcomes for each driver of change, plausible scenarios, opportunities, and challenges, with a focus on impact and uncertainty analysis. These insights are essential for building future scenarios for assessing Kenya's readiness for vaccine and biotherapeutics manufacturing.

6.1. Identification of Drivers of Change

The PESTEL analysis approach identified the drivers of change with the greatest impact and highest uncertainty in this study. It focused on two critical areas—impact and uncertainty—for scenario analysis. According to [20], scenarios were constructed based on these two key elements. "Impact" measured the significance of each driver and challenge, while "Uncertainty" assessed the likelihood of various scenarios influencing the future readiness of Kenya for vaccine and biotherapeutics manufacturing.

Table 1. PESTEL Dimensions for Kenya for vaccine and biotherapeutics manufacturing.

Foresight Framework	Indicators/driver of change	Short label	Source
Political (PO)	Government legislation, policies, and regulations on vaccine and biotherapeutics manufacturing in Kenya's healthcare sector.	**PO1**	[9] [21]-[23]
	Political global collaboration for standardized and safe development and use of vaccine and biotherapeutics technologies.	**PO2**	[24]-[27]
Economic (EO)	Cost of investments required for vaccine and biotherapeutics manufacturing infrastructure and technologies.	**EO1**	[28]-[31]
	National budget allocations for pharmaceutical and biotechnology development in Kenya.	**EO2**	[32]-[35]
Social (SO)	Level of societal acceptance of locally manufactured vaccines and biotherapeutics.	**SO1**	[30] [33] [36]-[38]
	Healthcare sector experts' awareness and acceptance level of vaccine and biotherapeutics technologies.	**SO2**	[23] [39] [40]-[43]
Technological (TO)	Compatibility levels of vaccine and biotherapeutics manufacturing technologies with existing pharmaceutical infrastructure.	**TO1**	[44]-[48]
	Robustness of research and development capabilities to support vaccine and biotherapeutics production.	**TO2**	[23] [49]-[54]

Continued

Environmental (EN)	Level of recyclability and sustainability of vaccine and biotherapeutics production by-products and waste.	**EN1**	[17] [53] [55] [56]
	Environmental impact of vaccine and biotherapeutics manufacturing on waste management, emissions, and resource utilization.	**EN2**	[37] [48] [57]
Legal (LE)	Compliance with intellectual property rights, liability issues, and international standards for vaccine and biotherapeutics technologies.	**L01**	[35] [58]-[61]
	Ethical considerations such as equitable access to vaccines, clinical trial transparency, and biosafety regulations.	**L02**	[35] [42] [62]-[64]

Table 2 indicates drivers of change elicited from the systematic literature review and using expert opinion from the stakeholder mapping meeting conducted with healthcare policy makers, biopharmaceutical experts, and regulatory analysts.

6.2. Descriptive Analysis of Drivers of Change

This section analyzes the outcomes for each driver, focusing on two critical dimensions: impact and uncertainty. The aim is to identify the drivers with the greatest levels of both impact and uncertainty. An impact-uncertainty analysis approach was utilized to pinpoint the key drivers of change that are likely to have a significant influence and present the potential for uncertain occurrences in the future.

6.2.1. Mean of Drivers of Change Corresponding with Impact

Table 2 outlines average values and the tendencies per essay of each driver effect. "Among all drivers, T02 was the most powerful, with a mean score of 4.1550." Just behind it was "S01," which achieved a mean score of 4.115. Both "E01" and "E02" closely followed each other, attaining a mean score of 3.770 and 3.550, respectively. Conversely, "P01" was identified as the driver with the least impact, reflected by its lower mean score of 3.080.

Table 2. Mean of drivers on impact.

No	Drivers of Change	Mean	Tendency Level
1	**PO1**	3.08000	Moderate
2	**PO2**	3.23500	Moderate
3	**EO1**	3.77000	Moderate
4	**EO2**	3.55000	Moderate
5	**SO1**	4.11500	High
6	**SO2**	3.49000	Moderate
7	**TO1**	3.46000	Moderate
8	**TO2**	4.15500	High
9	**EN1**	3.25000	Moderate
10	**EN2**	3.30500	Moderate
11	**LO1**	3.29500	Moderate
12	**LO2**	3.33000	Moderate

6.2.2. Mean of Drivers of Change Corresponding with Level of Uncertainty

Table 3 presents the mean values and tendencies pertaining to the uncertainty associated with each driver. "L01" was identified as having the highest level of uncertainty, with a mean score of 2.3050, followed by "L02" at 2.2400. "E02" also showed a notable level of uncertainty, scoring 2.1150. On the other end of the spectrum, the drivers with the lowest degree of uncertainty were "T02" and "P02" which had a mean score of 1.8250 in both cases.

Table 3. Mean of drivers on uncertainty.

No	Drivers of Change	Mean	Tendency Level
1	**PO1**	2.0000	Low
2	**PO2**	1.8250	Low
3	**EO1**	1.9650	Very Low
4	**EO2**	2.1150	Low
5	**SO1**	1.8850	Low
6	**SO2**	2.0100	Low
7	**TO1**	2.0900	Low
8	**TO2**	1.8250	Very Low
9	**EN1**	2.1000	Low
10	**EN2**	2.1750	Low
11	**LO1**	2.3050	Low
12	**LO2**	2.2400	Low

6.2.3. Analysis

Above is an illustration of the Impact-Uncertainty Analysis, highlighting that the robustness of biopharmaceutical manufacturing infrastructure and societal acceptance of locally produced vaccines play a crucial role in realizing Kenya's readiness for vaccine and biotherapeutics manufacturing (Figure 3). These key drivers of change are essential for building a future healthcare strategy that incorporates vaccine and biotherapeutics production as a sustainable solution.

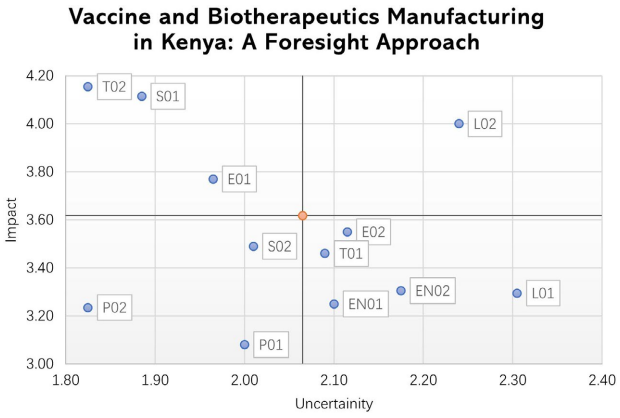


Figure 3. Impact-uncertainty analysis.

"Direct Influence Graph," shows that "S01" and "T02" have the strongest influence on the manufacturing and vaccine and biotherapeutics production solutions (Figure 4). Other drivers of change have a relatively strong influence on the key drivers of change such as "P01", "E01", and "S02".

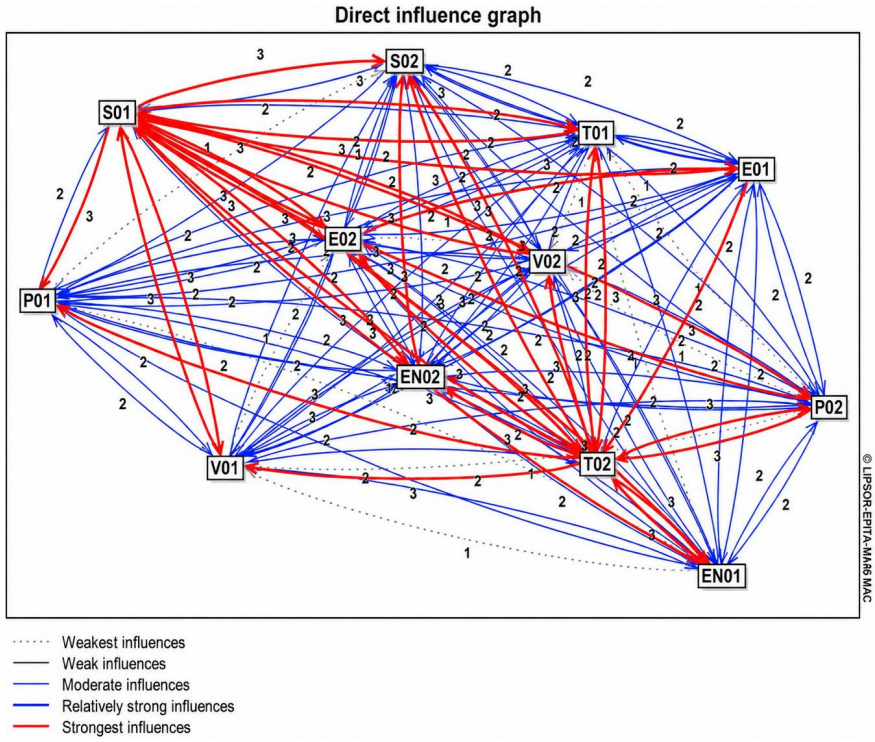
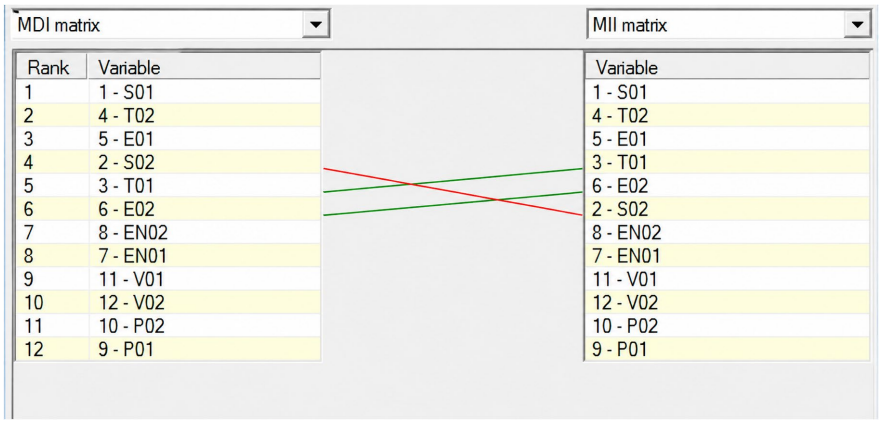


Figure 4. Direct influence graph.

The figure below (Figure 5) demonstrates that "S01" and "T02" (Levels of societal acceptance of locally produced vaccines and the robustness of biopharmaceutical manufacturing infrastructure) are the highest-ranked drivers of change. These factors are crucial in shaping and building future scenarios for Kenya's readiness for vaccine and biotherapeutics manufacturing.



Rank	Variable	Variable
1	1 - S01	1 - S01
2	4 - T02	4 - T02
3	5 - E01	5 - E01
4	2 - S02	3 - T01
5	3 - T01	6 - E02
6	6 - E02	2 - S02
7	8 - EN02	8 - EN02
8	7 - EN01	7 - EN01
9	11 - V01	11 - V01
10	12 - V02	12 - V02
11	10 - P02	10 - P02
12	9 - P01	9 - P01

Figure 5. Rank of drivers of change by influence.

The illustration below (Figure 6) shows future Scenarios for vaccine and biotherapeutics manufacturing in Kenya by 2040; indicting aspects under each scenario from scenario 1 to 4.

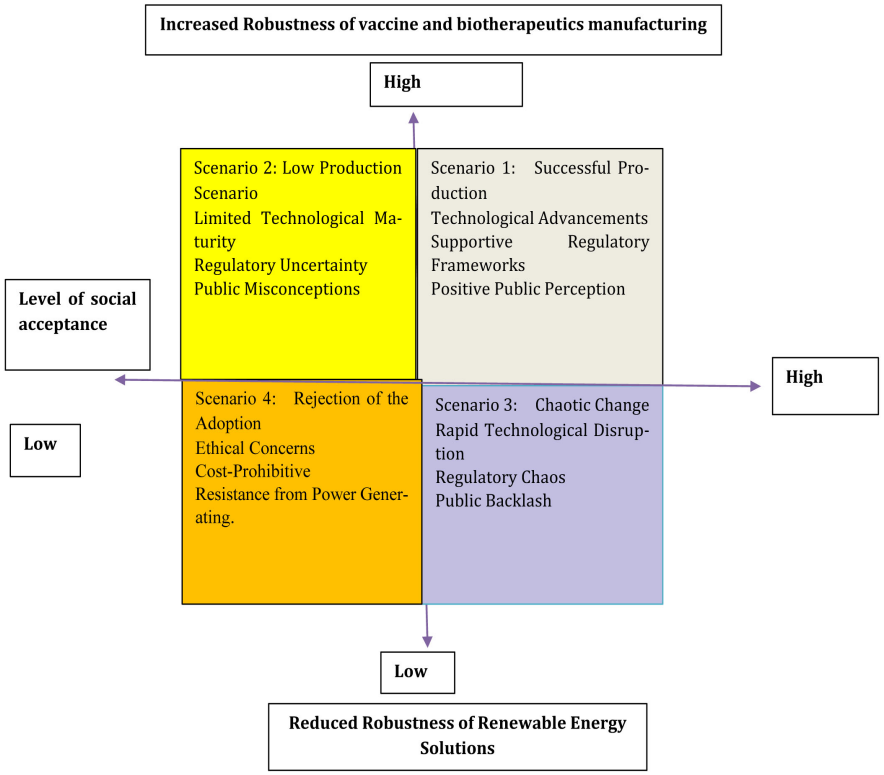


Figure 6. Future scenarios for vaccine and biotherapeutics manufacturing in Kenya by 2040.

Scenario 1: Successful vaccine and biotherapeutics manufacturing

Under this scenario the high acceptability by society together with a well-established biomedical infrastructural underpinning has seen Kenya successfully adopt the manufacturing of vaccine and biotherapeutics. Stakeholders such as government agencies, healthcare institutions, and private investors play an active role in local production, ensuring they have a robust supply chain for local healthcare providers, while decreasing reliance on imports [64].

Supported by institutions and with regulatory alignment, BioVax can scale its production to deliver vaccine in line with domestic demand, placing Kenya as a regional centre for biopharmaceutical manufacture. Advanced bioprocessing technologies improve efficiency by making production and distribution cost-effective. In investment, cold chain logistics and quality assurance systems help ensure compliance with international standards, thereby promoting international partnerships and creating the possibility of exporting [16].

However, for adoption to happen, the locally produced vaccines must be widely trusted. The trust inspired through targeted public awareness campaigns and transparency in regulatory processes, and the sustainable uptake of vaccines after

the pandemic will pave the way for the success of vaccination programmes. Moreover, working with BioVax provides an inspiration for novel research from research institutes, which will improve the production process of next-generation vaccines for being responsive to local disease pressures. This illustrates the transformative potential of Kenya's developing vaccine and biotherapeutics production sector. With a focus on infrastructure investments, policy support, and public engagement, Kenya can become self-sufficient in vaccine production, improve healthcare resilience, and play a role in global health security. Adopting this route is in line with the objectives of Vision 2030 and contributes to making Kenya a leader in pharmaceuticals in Africa.

Scenario 2: Low vaccine and biotherapeutics manufacturing

In this specific scenario, strong biomedical infrastructure does exist in Kenya but the manufacturing for vaccines and biotherapeutics is not adopted owing to regulatory issues and low societal acceptance. The public perception about the safety, efficacy and reliability of domestically produced vaccines is unfavorable, which may impede mass acceptance and progression towards self-sufficiency [16].

Misinformation or a lack of adequate public awareness around BioVax's production capabilities can breed a lack of trust in BioVax, and lead to resistance from healthcare providers and the general population. In addition, hesitation from international drug companies and import-dependent stakeholders may pose additional challenges as they try to preserve existing market interests. [BW 39] Regulatory bottlenecks and slow policy implementation may slow adoption even more, making investments in local manufacturing less attractive [65].

The complexity of making and disseminating vaccines might also dissuade widespread use. Healthcare institutions may become hesitant because of limited technical know-how, lack of proper workforce training, and compliance issues with global standards. Additionally, financial limitations and perceived high costs may dissuade government and private sector interest in scaling up local vaccine production [66].

Overcoming these barriers, however, would necessitate a multi-faceted approach of comprehensive public education campaigns, transparent regulatory processes, and other incentives to instill confidence in domestic vaccine production. Eradication of any reaching misconceptions and collaboration between the government, industry and healthcare providers will secure success in the long term.

Scenario 3: Chaotic Change in Vaccine and Biotherapeutics Manufacturing

This scenario represents a future with high societal acceptance but low robustness in research, development, and manufacturing capabilities. The trigger is strong public, political, and health-sector demand for locally manufactured vaccines and biotherapeutics, even though the production ecosystem is technically immature. Supportive narratives, procurement pressure and public trust create momentum, but the capability base (qualified facilities, validated processes,

trained workforce, quality systems, regulatory readiness, and reliable supply chains) remains insufficient.

The pathway is therefore unstable: BioVax and partners may move quickly into pilot production, technology transfer, or fill-and-finish activities, while upstream process development, GMP validation, cold-chain integration, raw-material sourcing, and post-market surveillance lag behind. This mismatch can lead to implementation delays, higher costs, repeated regulatory queries, dependence on imported inputs, and an uneven distribution between urban and underserved areas.

The likely outcome is a chaotic transition rather than full manufacturing readiness. Kenya may retain strong demand for local products but remain dependent on imports in the short to medium term, with a risk that delays or quality concerns damage public confidence. The strategic response is a phased manufacturing roadmap: prioritize technology-transfer milestones, GMP certification, workforce development, transparent regulatory review, realistic procurement commitments, and public reporting of progress so that high acceptance is converted into credible production capability.

Scenario 4: Rejection of Vaccine and Biotherapeutics Manufacturing

This scenario represents the low-acceptance and low-capability quadrant. The trigger is a combination of weak public and professional trust in locally manufactured vaccines and biotherapeutics, slow infrastructure development, uncertain financing, and fragmented policy or regulatory implementation. In this setting, neither demand-side confidence nor supply-side capability is strong enough to sustain a viable domestic manufacturing programme.

The pathway is stagnation: misinformation, safety concerns, limited awareness of quality assurance systems, and preference for imported products reduce demand, while investors and technology partners hesitate because production facilities, research and development systems, regulatory capacity, and procurement guarantees are not yet mature. Skilled personnel may move to better-established markets, and local activities may remain limited to planning, packaging, importation, or small-scale pilots rather than scaled production.

The outcome is rejection or prolonged non-adoption of local vaccine and biotherapeutics manufacturing. Kenya would continue to rely heavily on imported vaccines and biotherapeutics, losing opportunities for pandemic preparedness, regional market participation, skills development, and health security resilience. Avoiding this scenario requires early trust-building, transparent communication on safety and quality, demonstration batches, independent regulatory oversight, sustainable financing, and partnerships that demonstrate measurable progress from readiness planning to actual manufacturing capability.

7. Analysis of Participant Responses

Using the expert opinions from 50 stakeholders, which included health policy makers, researchers, and experts in the pharmaceutical industry as study partic-

ipants rated two driving forces as most crucial for vaccine and biotherapeutics manufacturing in Kenya: technological capabilities (TO2) and societal acceptance (SO1). These aspects had the highest impact and influence scores, with the highest mean score (4.155) for TO2 (robustness of R&D and manufacturing infrastructure), followed closely by SO1 (extent to which society accepts locally manufactured vaccines), with a score of 4.115. This consensus emphasizes that, in the view of the expert community, the two cornerstones of an advanced, trustworthy fabrication platform and national public confidence are indispensable for building a workable local industrial base. The other influential factors, including the investment (EO1) and national budget allocations (EO2), were also identified among significant economic motivators weighted with larger financial investments.

The expert analysis also showed that although regulation (PO1) and law, such as intellectual property issues (LO1), were perceived as primary enablers, they were regarded as less immediate uncertainties than social and technological issues. This is underlined by the fact that participants consider paths to regulatory improvement more predictable. At the same time, this is not the case for making progress on complex infrastructure development and transforming public perception. The direct influence graph and driver ranking results together provide an overview of expert consensus: to be prepared, Kenya's success heavily relies on both forging technical strength with a focus on substantial R&D and manufacturing capabilities, and then rolling out comprehensive public engagement campaigns that build trust while also driving uptake of locally produced vaccines or biotherapeutics.

8. Conclusion, Policy Gaps and Recommendations

8.1. Conclusion

The study aimed to assess Kenya's readiness for vaccine and biotherapeutics manufacturing by BioVax, identifying key drivers of change influencing local production. A systematic literature review highlighted twelve critical factors, including regulatory frameworks, infrastructure capacity, financial investment, research and development capabilities, global partnerships, intellectual property considerations, public trust, supply chain robustness, workforce expertise, and ethical concerns such as equitable vaccine access and pricing. Stakeholders and experts ranked these drivers using impact-uncertainty and Cross Impact analysis methodologies.

The combined impact-uncertainty and direct influence analyses identified SO1 and TO2 as the primary scenario axes: public and professional acceptance of locally manufactured vaccines and biotherapeutics, and the robustness of research, development and manufacturing capabilities. Regulatory preparedness, investment, legal and intellectual property factors remain critical enablers, but the scenario logic shows that Kenya's readiness will depend most directly on whether technical manufacturing capability develops in parallel with public and profes-

sional trust. This interpretation aligns the conclusion with the selection rule applied in Sections 6.2.3 and 7.

Using SO1 and TO2 as the organizing axes, the study constructed four potential future scenarios: Successful Production, Low Production, Chaotic Change, and Rejection of Adoption. Opportunities include technology development, regional market expansion, skilled job creation and improved health security. However, policy bottlenecks, funding gaps, weak R&D capability, supply-chain vulnerability and public skepticism must be managed deliberately. These findings provide a roadmap for strengthening Kenya's vaccine and biotherapeutics manufacturing readiness while keeping policy claims proportionate to the evidence generated through expert elicitation and scenario planning.

8.2. Policy Gaps

Analysis of the implications of these two key drivers of change highlighted several policy gaps that must be addressed to enhance Kenya's readiness for vaccine and biotherapeutics manufacturing.

First, is the public willingness to get locally produced vaccines is still low due to lack of awareness and trust. Vaccine hesitancy in Kenya is due to fears about vaccines safety, efficacy, and a lack of Regulatory oversight. It requires extensive public education campaigns to instill confidence in local manufacturing, and the virtue of self-reliance in vaccine production. Furthermore, other ethical considerations such as equitable distribution of vaccines, transparent pricing models, and accessibility for marginalized communities need to be prioritized to drive fair, and sustainable adoption. Furthermore, the awareness strategies should take into account cultural perceptions of biotechnology and traditional healthcare practices to increase acceptance.

Second, the viability of local vaccine manufacture is contingent upon the robustness of infrastructure and regulatory frameworks. Poor production capacity, fragility of supply chains, and a lack of expertise in biomanufacturing make scalability a challenge. Rural and underserved areas present real barriers to the distribution of vaccine and limit access and impact. But having holes in regulatory oversight slows approvals and creates uncertainty for investors. Addressing these challenges requires strengthening Kenya's pharmaceutical regulatory framework, investing in research and development, and promoting public-private partnerships. By making strategic investments in infrastructure and skilled workforce development, BioVax is going to be able to efficiently scale programmatic production of vaccines and biotherapeutics while improving national health security and self-sufficiency.

8.3. Policy Recommendations

8.3.1. Improving Public Confidence and Acceptance of Locally Made Vaccines

i. Public Awareness Campaigns: Initiate nationwide awareness campaigns on the safety, efficacy, and benefits of locally produced vaccines. Nip myths in the but

by using social media, traditional media, and community outreach programs.

ii. Community Engagement: It is important to work with community leaders, healthcare professionals and civil society organizations to build trust. Hold public forums, workshops and vaccination drives, so people can experience local vaccines firsthand.

iii. Stakeholder Education: Create specific interventions for healthcare workers, policymakers, and the general public about how local vaccine manufacturing can enhance health security and bring down dependence on imports.

iv. Openness and Confidence building: To inform the public about safety and quality standards followed in national vaccine manufacturing, share success stories, research grants and regulatory developments.

8.3.2. Strengthening Vaccine Manufacturing Infrastructure and Regulatory Frameworks

i. Investment in Manufacturing Facilities: Additional investments in expanding and modernizing vaccine production plants routinely around the world to satisfy national and local desires. Public-private partnerships have better funding and expertise, so pave the way for them.

ii. Strengthening Regulations: Codify vaccine clearances that satisfy safety norms and levels consistent with global standards. Enhance regulatory agencies' capacity for swifter, more effective oversight.

iii. Capacity Building and Training: Create programs to train scientists, healthcare workers, and biopharmaceutical professionals to build local expertise.

iv. Support for Research and Development: Target greater federal investment in R&D to promote crushing vaccine and biotherapeutics innovation.

v. Collaborate with universities, research institutions and Industry players.

vi. Regular assessments: Develop continuous monitoring use cases to evaluate progress towards vaccine development milestones, public uptake rates and regulatory efficiency, identifying barriers and enablers to sustainable vaccine sector growth and self-sufficiency in Kenya.

8.4. Policy Implementation Strategies and Further Research Recommendations

Full capacity of Kenya in vaccine and biotherapeutics manufacturing rests on overcoming key challenges related to unlocking infrastructure investment, public confidence, regulatory frameworks, and technological progress. Table 4 outlines the key implementation strategies for achieving self-sufficiency in vaccine production and strengthening the biopharmaceutical sector.

Further studies need to determine Kenya's readiness for vaccine manufacturing which can highlight the relative advantage by establishing the areas of bioprocessing, automation, policies, and investment opportunities. Societal perceptions, supply chain challenges, and cost-benefit analyses are key areas. Insights will inform long-term strategies to boost healthcare security and establish Kenya as Africa's biotherapeutics hub.

Table 4. Policy recommendations and implementation strategies.

No	Policy Recommendation	Action Framework	Strategy	Timelines	Stakeholders
1	Investment in Biopharmaceutical Manufacturing Infrastructure	Prioritize investment in vaccine and biotherapeutics production facilities, ensuring compliance with Good Manufacturing Practices (GMP). Collaborate with private sector partners and international organizations to secure funding.	Form a regulatory task force to oversee facility development and ensure adherence to international production standards.	4 - 6 years	Ministry of Health, BioVax, private investors, international donors.
2	Development of Research and Development (R&D) Centers	Establish state-of-the-art R&D hubs focusing on vaccine formulation, testing, and biotherapeutics innovation. Encourage local and international research collaborations.	Develop national R&D guidelines and provide financial incentives for innovation. Conduct periodic audits to ensure research integrity.	3 - 5 years	Ministry of Science and Technology, universities, BioVax, research institutions.
3	Regulatory Framework for Vaccine Production and Distribution	Implement comprehensive policies for vaccine manufacturing, safety, and equitable distribution. Streamline approval processes for local production.	Amend legislation to include specific provisions for biopharmaceutical manufacturing, quality control, and post-market surveillance.	4 - 6 years	Ministry of Health, Pharmacy and Poisons Board, legal experts, policymakers.
4	Training and Capacity Building	Develop specialized training programs for biopharmaceutical professionals, regulatory officers, and researchers. Enhance curricula in higher education institutions to include vaccine production and biotechnology.	Partner with universities and technical institutions to implement degree and certification programs in vaccine manufacturing.	5 - 8 years	Ministry of Education, universities, BioVax, technical institutes.
5	Support for Research and Development	Provide grants and incentives for vaccine innovation and biotherapeutics research. Promote collaboration between academia, industry, and government agencies.	Appoint a national committee to establish research priorities and funding allocations.	5 - 10 years	Ministry of Science and Technology, research institutions, pharmaceutical companies, BioVax.
6	Public-Private Partnerships	Encourage private sector investment in vaccine manufacturing through incentives such as tax breaks and regulatory support. Facilitate joint ventures with global biopharmaceutical firms.	Develop policies that promote investment in local vaccine production and ensure fair competition.	5 - 8 years	Ministry of Finance, BioVax, private investors, international pharmaceutical companies.

Continued

7	Monitoring and Evaluation	Establish mechanisms to track progress in vaccine production, safety standards, and distribution efficiency. Conduct periodic impact assessments.	Implement a national vaccine regulatory framework and safety monitoring system.	4 - 8 years	Ministry of Health, BioVax, regulatory bodies, international health organizations.
8	Public Awareness Campaigns	Launch awareness campaigns to build public confidence in locally manufactured vaccines. Address misinformation through media, community outreach, and healthcare professional engagement.	Develop targeted public education programs and share success stories from local vaccine production initiatives	4 - 7 years	Ministry of Health, BioVax, public health organizations, community leaders.
9	Training and Capacity Building, Public Awareness and Engagement	Engage local communities in the planning and adoption of vaccine and biotherapeutics manufacturing initiatives. Ensure transparency in implementation by sharing data, regulatory updates, and progress reports. Collaborate with healthcare professionals, policymakers, and local organizations to address concerns and build trust in BioVax's capabilities.	Conduct nationwide public awareness campaigns highlighting the importance of local vaccine production and its role in improving healthcare security. Organize workshops and forums to educate stakeholders on the benefits, safety, and regulatory aspects of biopharmaceutical manufacturing. Share pilot project outcomes and research advancements to demonstrate progress and address misconceptions.	2 - 6 years	Ministry of Health, BioVax, healthcare professionals, regulatory agencies, research institutions, local communities, and public relations firms.

8.5. Study Limitations

The findings should be interpreted with three limitations. First, driver prioritization relied on expert judgment, so results may reflect the knowledge, institutional positions, and expectations of the sampled stakeholders. Second, the analysis focused on Kenya and BioVax's operating context; while the scenarios may be informative for other African manufacturing initiatives, they should not be generalized without considering local policy, market, and regulatory conditions. Third, the scenarios assess readiness pathways and strategic preparedness, not demonstrated manufacturing feasibility. Actual feasibility will require separate technical validation, GMP qualification, technology-transfer performance, product-specific regulatory review, cost modeling, and market-access assessment.

Data Availability

Data is available on request.

Ethics Statement

This study involved human participants through an expert opinion survey; however, it did not involve clinical participants, patient records, biological samples, clinical trials, or experimental procedures. The survey collected professional judgments on vaccine and biotherapeutics manufacturing readiness and did not collect sensitive personal data.

Participation was voluntary and based on informed consent. The Google Form included an introductory statement explaining the study purpose, expected time commitment, voluntary participation, confidentiality, anonymized reporting, and the right not to answer any item. Consent was documented electronically after respondents completed and submitted the survey, having read the information statement. Responses were anonymized during analysis, stored securely, and reported only in aggregate form. Ethical considerations such as equitable access, clinical trial transparency, and biosafety were incorporated into the scenario planning and policy interpretation.

Acknowledgments

We thank the Kenya BioVax Institute Limited fraternity for their invaluable support and resources in developing this research study. Special appreciation is extended to the esteemed professors at EDHEC Business School for sharing expertise in Building Strategic Foresight Capabilities, which has significantly shaped this study.

Conflicts of Interest

The authors declare no competing interests and state that this manuscript adhere to the principles of responsible research and publication.

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Appendix 1: Distribution of Expert Opinions

Response_ID	Stakeholder Category	Manuscript Sample Group	Readiness Score	Challenge: Regulatory barriers	Challenge: Limited funding/ investment	Challenge: Lack of skilled workforce	Challenge: Market demand and acceptance	Challenge: Competitive pricing against imported products	Challenge: Supply chain/ logistics issues	Challenge: Limited research and innovation capacity	Strategy: Strengthening regulatory frameworks	Strategy: Government incentives e.g. Advanced Purchase Agreements	Strategy: Increasing investment and funding opportunities	Strategy: Enhancing research and innovation partnerships	Strategy: Developing a skilled workforce through training programs	Strategy: Improving infrastructure and supply chains	Partnership Involvement (1 = Yes)	Future Engagement Interest (1 = Yes)
1	Government Agency Representative	Policymaking/ Public health programmes	3	0	1	0	1	1	0	1	0	0	1	1	1	0	1	1
2	Government Agency Representative	Policymaking/ Public health programmes	2	0	1	0	1	1	0	0	0	1	1	1	0	0	0	0
3	Academic	Academia/ Research	3	0	1	0	0	0	0	0	0	0	0	1	0	0	1	1
4	Academic	Academia/ Research	3	1	0	0	1	1	0	0	1	1	0	1	0	0	1	1
5	Academic	Academia/ Research	2	1	1	1	1	0	1	1	1	1	1	0	0	0	1	1
6	Regulator	Regulation/ Quality assurance	4	1	0	0	1	1	0	0	1	1	1	0	0	0	0	1
7	Academic	Academia/ Research	3	1	1	1	1	0	0	1	1	1	1	0	0	0	1	1
8	Pharmaceutical/ Biotech Company	Pharmaceutical/ Biomanufacturing industry	3	1	1	1	1	1	0	0	0	1	0	1	1	0	1	1
9	Government Agency Representative	Policymaking/ Public health programmes	3	0	1	1	0	0	1	0	0	0	1	1	1	0	1	1
10	Researcher	Academia/ Research	4	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1
11	Academic	Academia/ Research	3	0	1	0	1	1	0	0	0	1	1	1	0	0	0	1
12	Academic	Academia/ Research	2	0	1	0	0	1	1	1	0	0	1	1	1	0	1	1
13	Academic	Academia/ Research	3	1	1	0	1	0	1	0	0	1	1	0	0	1	0	1
14	Academic	Academia/ Research	3	1	1	0	0	0	0	0	1	1	1	0	0	0	1	1
15	Government Agency Representative	Policymaking/ Public health programmes	2	1	1	0	0	0	0	1	1	0	1	1	0	0	1	1

Continued

16	Pharmaceutical/ Biotech Company	Pharmaceutical/ Biomanufacturing industry	3	0	0	0	1	1	1	1	1	0	0	0	1	1		
17	Government Agency Representative	Policymaking/ Public health programmes	3	1	1	0	0	1	0	1	0	1	1	0	0	1		
18	Academic	Academia/ Research	2	1	1	0	1	0	1	0	1	1	1	0	0	1		
19	Researcher	Academia/ Research	3	0	0	0	0	0	0	1	0	0	1	0	0	1		
20	Pharmaceutical/ Biotech Company	Pharmaceutical/ Biomanufacturing industry	2	1	1	1	0	0	1	1	1	0	1	1	0	0		
21	Researcher	Academia/ Research	2	1	1	1	0	0	1	1	1	0	1	0	0	1		
22	Researcher	Academia/ Research	2	1	1	1	0	0	1	1	1	0	0	1	0	0		
23	Researcher	Academia/ Research	2	1	1	1	0	0	1	1	1	0	1	1	0	0		
24	Regulator	Regulation/ Quality assurance	2	1	1	1	0	0	1	1	1	0	0	1	0	0		
25	Government Agency Representative	Policymaking/ Public health programmes	2	1	1	1	0	0	1	1	1	0	1	1	0	1		
26	Pharmaceutical/ Biotech Company	Pharmaceutical/ Biomanufacturing industry	2	1	1	1	1	0	0	1	1	0	0	1	0	1		
27	Government Agency Representative	Policymaking/ Public health programmes	2	0	1	1	1	0	1	1	1	0	1	0	1	1		
28	Quality Control/ Standards Body	Regulation/ Quality assurance	1	1	1	1	0	0	1	1	0	0	0	1	1	0		
29	Researcher	Academia/ Research	2	0	1	1	1	1	0	1	1	0	1	0	0	1		
30	Government Agency Representative	Policymaking/ Public health programmes	3	1	1	1	0	0	1	1	0	0	1	1	0	0	1	
31	NGO Representative	Policymaking/ Public health programmes	2	0	1	1	1	1	0	1	1	0	0	1	1	0	1	

Continued

32	Regulator	Regulation/ Quality assurance	2	1	1	1	0	0	1	1	1	0	1	0	0	1	1	1				
33	Pharmaceutical/ Biotech Company	Pharmaceutical/ Biomanufacturing industry	2	0	1	1	1	1	0	1	0	0	0	1	1	1	1	0				
34	Researcher	Academia/ Research	2	1	1	1	0	1	1	0	1	0	1	0	1	0	0	1				
35	Investor	Pharmaceutical/ Biomanufacturing industry	3	1	0	1	1	0	1	1	0	0	1	1	0	1	0	1				
36	NGO Representative	Policymaking/ Public health programmes	1	0	1	1	1	1	0	1	1	0	0	1	1	0	1	1				
37	Pharmaceutical/ Biotech Company	Pharmaceutical/ Biomanufacturing industry	2	1	1	1	0	1	1	0	1	0	1	0	0	1	1	1				
38	Academic	Academia/ Research	2	1	0	1	1	0	1	1	0	0	0	1	1	1	0	1				
39	Regulator	Regulation/ Quality assurance	3	0	1	1	1	1	0	1	1	0	1	0	1	0	1	0				
40	Government Agency Representative	Policymaking/ Public health programmes	2	1	1	1	0	1	1	0	0	0	1	1	0	1	1	1				
41	Government Agency Representative	Policymaking/ Public health programmes	1	1	0	1	1	0	1	1	1	0	0	1	1	0	1	1				
42	Quality Control/Standards Body	Regulation/ Quality assurance	2	0	1	1	1	1	0	1	1	0	1	0	0	1	1	1				
43	Pharmaceutical/ Biotech Company	Pharmaceutical/ Biomanufacturing industry	2	1	0	1	0	1	1	0	0	1	0	1	1	0	1	1				
44	Regulator	Regulation/ Quality assurance	1	0	1	1	1	0	0	1	1	0	1	0	0	1	1	1				
45	Pharmaceutical/ Biotech Company	Pharmaceutical/ Biomanufacturing industry	1	1	0	1	0	1	1	0	0	1	0	1	1	0	1	1				
46	Quality Control/Standards Body	Regulation/ Quality assurance	2	0	1	1	1	0	0	1	1	0	1	0	0	1	0	1				
47	Investor	Pharmaceutical/ Biomanufacturing industry	3	1	0	1	0	1	1	0	0	1	0	1	1	0	1	1				
48	Government Agency Representative	Policymaking/ Public health programmes	2	1	1	0	1	0	0	1	1	0	1	0	0	1	0	1				
49	Researcher	Academia/ Research	2	0	1	1	0	1	1	0	0	1	0	1	1	0	0	1				
50	Government Agency Representative	Policymaking/ Public health programmes	2	1	0	0	1	0	1	1	1	0	1	0	0	1	1	0				

Category/Group	n	% of 50
Researcher	8	16%
Academic	10	20%
Regulator	5	10%

Continued

Government Agency Representative	12	24%
Investor	2	4%
NGO Representative	2	4%
Pharmaceutical/Biotech Company	8	16%
Quality Control/Standards Body	3	6%
Policymaking/Public health programmes	14	28%
Academia/Research	18	36%
Pharmaceutical/Biomanufacturing industry	10	20%
Regulation/Quality assurance	8	16%

Appendix 2: Assessing Kenya's Readiness for Vaccine and Biotherapeutics Manufacturing

Questionnaire

Dear Respondent,

You are invited to participate in this questionnaire. The objective of this survey is to gather data that will inform evidence-based assessment of Kenya's readiness for vaccine and biotherapeutics manufacturing.

Participation in this questionnaire is entirely voluntary. You may decline to answer any question that causes discomfort, and you may withdraw from the questionnaire at any time without penalty or negative consequence.

All information that you provide will be treated with strict confidentiality. Responses will be used solely for the intended purpose of this study and will be reported in summarized form. Personal details will not be disclosed in any report or publication without your explicit permission.

Collected data will be managed responsibly and securely. Access will be restricted to authorized individuals involved in analysis and reporting. Any personal information will be protected according to applicable data protection and privacy principles.

There are no direct risks associated with participation in this questionnaire. Some questions may request personal views, experiences, or institutional information. You are encouraged to respond honestly and objectively.

By proceeding to complete this questionnaire, you confirm that:

- You have understood the purpose of the questionnaire.
- Your participation is voluntary.
- You consent to the collection and use of your responses for the stated purpose.
- You understand that your responses will be kept confidential and used only for analysis and reporting.

Consent Statement:

☐ I have read and understood the above information and voluntarily agree to participate in this questionnaire.

Filling the questionnaire will take approximately 6 minutes

Section 1: General Information

1) **Name/Organization (Optional):**

2) **Stakeholder Category (Select one):**

- Researcher
- Academic
- Regulator
- Government Agency Representative
- Investor
- NGO Representative
- Pharmaceutical/Biotech Company
- Quality Control/Standards Body
- Other

Section 2: Vaccines and Biotherapeutics Manufacturing: Readiness, Challenges and Priorities

3) How would you rate Kenya's readiness for vaccine and Biotherapeutics manufacturing?

Select one.

Response type: Single choice

- Excellent
- Good
- Average
- Poor

4) What do you consider the main challenge(s) in vaccine manufacturing and commercialization in Kenya? (Select all that apply)

- Regulatory barriers
- Limited funding/investment
- Lack of skilled workforce
- Market demand and acceptance
- Competitive pricing against imported products
- Supply chain/logistics issues
- Limited research and innovation capacity
- Other (Please specify): _____

5) What strategies should be prioritized to strengthen Kenya's vaccine manufacturing sector? (Select up to 3)

- Strengthening regulatory frameworks
- Government incentives e.g. Advanced Purchase Agreements
- Increasing investment and funding opportunities
- Enhancing research and innovation partnerships
- Developing a skilled workforce through training programs
- Improving infrastructure and supply chains
- Other (Please specify): _____

Section 3: Partnerships and Future Engagements

6) Are you currently involved in partnerships related to vaccine or biotherapeutics manufacturing?

Select one.

Response type: Single choice

- Yes
- No

7) If yes, what type of partnership(s) are you engaged in? (Select all that apply)

- Pre-clinical research collaborations
- Clinical Trials/Bridging studies
- Regulatory and policy engagement
- Investment and funding partnerships
- Technology transfer and licensing agreements
- Manufacturing and production partnerships

8) What support or resources do you believe are most critical for fostering successful partnerships in the sector?

9) Would you be interested in participating in future stakeholder workshops or collaborations with BioVax?

Select one.

Response type: Single choice

- Yes
- No

Section 4: Feedback to Kenya BioVax

10) What areas do you think Kenya BioVax can improve in?

Response type: Long answer

_____

_____

_____

11) Any additional comments or recommendations?

Response type: Long answer

_____

_____

_____