



NATIONAL DEFENCE UNIVERSITY-KENYA

NATIONAL DEFENCE COLLEGE-KAREN

**SCIENCE, TECHNOLOGY AND INNOVATION IN PROMOTING
KENYA'S DIPLOMACY**

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DISCLAIMER

The information contained in this paper is the result of my Research. The views and/or observations on this issue involved is my own. They do not in any way reflect the official position of the Ministry of Defence or that of National Defence College.

DECLARATION

This project is my original work and has not been presented for a degree in any other university.

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DEDICATION

I wish to dedicate this work to all the institutions championing the course of STI and diplomacy.

I believe the future for Kenya's development path lies in Kenya's capacity to harness STI for global competition as well as cooperation.

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LIST OF ABBREVIATIONS AND ACRONYMNS

AfCFTA:	African Continental Free Trade Area
AID:	Acquired Immunodeficiency Syndrome
AU:	African Union
AU:	African Union
CDC:	Center for Disease Control and Prevention (
EU:	European Union
GERD:	Gastroesophageal Reflux Disease
GS:	Global South
HIV:	Human Immunodeficiency Virus
ICT:	Information and Telecommunication Technology
KALRO:	Kenya Agricultural and Livestock Research Organization
KEMRI:	Kenya Medical Research Institute
KENIA:	Kenya National Innovation Agency
KFSSG:	Kenya Food Security Steering Group
LA:	Latin America
MFA:	Ministry of Foreign Affairs
NACOSTI:	National Commission for Science, Technology and Innovation
NBA:	National Biosafety Authority
NEPAD:	New Partnership for Africa's Development
NRF:	National Research Fund
R&D:	Research and Development
RTP:	Research Triangle Park
S&T:	Science and Technology
SADC:	Southern African Development Community
SDGs:	Sustainable Development Goals.
SGC:	Science Granting Councils
STI:	Science, Technology and Innovation
UK:	United Kingdom
UN:	United Nations
USA:	United States of America

ABSTRACT

The potential for STI is now a critical pillar in national development, as well as foreign policy discourse. In Kenya, the advance towards various forms of diplomacy has been driven by the need to address socio-economic challenges. Yet, despite the STI Act of 2013 and the country's efforts to harness this potential, there exists possible gaps in how STI can be utilized to promote diplomacy. Determining the function of science, technology, and innovation in advancing Kenya's diplomacy was the study's overarching goal. Establishing the present trends of STI in promoting diplomacy in Kenya; examining the relationship between science, technology, and innovation and diplomacy in Kenya; and looking at the institutional and policy framework of STI in promoting Kenya's diplomacy were the specific objectives. The study offers a springboard through which the government of Kenya can review the STI policy and strengthen the links between the STI institutional programs and the diplomacy for national economic growth. The study was grounded on institutional theory and positioning theory. A cross-sectional pragmatic research approach was used in this study. 30 experts from important organizations, including NACOSTI, KeNIA, The National Biosafety Authority (NBA), Ministry of Foreign Affairs (MFA), Kenya Agricultural and Livestock Research Organization (KALRO), and Kenya Medical Research Institute (KEMRI), comprised the target population. Technical University of Kenya and Kenyatta University. Purposive sampling was used to select the study sample. Data was collected through semi-structure questionnaires and interview guides. Secondary data was obtained from cases studies, journals and STI publications based on document analysis. Descriptive statistics were used to analyze quantitative data. The narratives of the respondents were evaluated, and important themes were developed, using a qualitative inductive approach. Descriptive statistics were used to analyze quantitative data, and tables and charts were used to present the findings. The study established emerging STI trends, such as new technologies, Block-chain, IoT, AI, nanotechnology, big data and quantum technologies are being utilized under various missions and actors. In the health sector, vaccine research through bilateral relationships while GMO advances being driven by agricultural biotechnology to promote technology transfer and strategic partnerships between Kenya and other developed nations. The study also found that STI is crucial for fostering bilateral scientific collaborations that support economic development, especially in the agricultural, energy, education, and health sectors. Furthermore, through international collaborations in green energy technology, STI has provided Kenya with a roadmap for its foreign policy decisions for the exploitation of research and development initiatives. The study revealed that there are gaps in policy, despite the fact that the relationship between STI and diplomacy has been used as a strategy to support national technical transfer and innovation systems. The study found out that STI Act in Kenya has not been overly effective in promoting Kenya's diplomacy. STI policy still exist in draft format and suffers from weak collaborations across the various bodies that work in silos. The study recommended the need to launch capacity-building centers as an eye-opener for relevant government agencies to utilize the expertise and knowledge resources of the current STI trends. It also recommended the need for commissioning an STI policy agency at the MFA to support bilateral cooperation in areas, including education, energy and health. Future research regarding the spectrum of STI and diplomacy could explore the link between STI and human as well as global security dimensions and how they influence diplomacy.

CHAPTER ONE

1.0 Introduction

The 21st century has brought about a new wave on the international spheres, as states compete to re-position themselves in advancing their national and global interests. This new era, commonly referred to as the information age, or the science era of diplomacy, is not only shaping the socio-economic agenda, but also political, environmental and cultural dynamics for nations, highlighting a growing uptake of scientific, technological innovations that are now commonly referred to as STI.¹ In addition, globalization has raised the bar for states to strengthen STI frameworks and policies as critical pillars for protecting national interest. The posture of scientific and technological advances are critical pillars in diplomatic arena for Africa. Despite the progress in STI globally, the majority of African nations lack effective STI policies. In Kenya, research on the capabilities of scientific and technological capacities that drive innovations as a diplomacy strategy are lacking. As such, the role of STI to enhance Kenya's competitiveness in all areas of diplomacy is vital. This means that policy is not only given priority but also the and necessary institutional framework is well funded and align with diplomacy tools.

This chapter provides the study's background, including the global, regional and local viewpoint. It also explains the problem highlighting existing gap in STI, objectives, and the implication of the study, its scope and limitations. The literature, a theoretical analysis, a conceptual framework, an empirical evaluation, a critique of the literature, and a research gap are presented. The research

¹ Adesina, O. Foreign policy in an era of digital diplomacy. 2017.

methods utilized are covered, including the design of the research, population, population target, sampling frame of the study, data collection tools and analysis approach.

1.1 Background of the Study

Globally, there has been a widespread emergence of a new wave of scientific and technological innovations that have now become a point of discussion in diplomacy. The digital era of the twenty first century has been characterized by a set of new and dynamic phenomenon that have revolutionized foreign policy affairs. This era of STI in the conduct of diplomacy has been catalyzed by the onset of globalization. This trend, now shaping international relations, has been driven by the major challenges of the globe, from energy crisis, climate change threats, pandemics, terrorism, humanitarian crisis, wars, poverty, food crises and human security concerns that have now become international risks in nature. Ideally, the international sphere is now being re-defined as regimes seek to foster cooperations in STI, as a strategy for knowledge exchange to drive their nation's development. As states strive to seek their position in the global stage, the advances in scientific and technological discoveries are breaking the geographical and political boundaries, creating networks as scientists, even in countries that seem not to be allies, joining forces to address global issues and concerns.² In a nut-shell, the STI revolution is redefining international relations and diplomacy in a way that its global influence in a way that, states are now recognizing the fact that these challenges cannot be addressed by one state.

² Weiss, C. Science and Technology in International Affairs.2015.

Diplomacy has transformed from old diplomacy, which was frequently secretive and involved a small number of actors, to new diplomacy, which involves a larger number of actors and tools and is intended to advance foreign policy as a tool for advancing not only security interests but also political and economic gains. Beginning in the 20th century and post-World War 1, “new” diplomacy reflected the growing desire for a collective system of states; adapting to new challenges which were present after the Great War. The consequences and new challenges at the world stage were rising: transnational terrorism, human /drug trafficking), rising competition in international economy and trade and weak states. Diplomacy is now an instrument utilized in managing the goals of foreign policy focusing on new trends of globalization. This has given rise to the emerging role of STI diplomacy.³

STI has become increasingly important in international policy-making and diplomacy. Recently, high-level negotiations have been assisted by top scientists and academics, highlighting the crucial role that STI plays in solving human security issues such as poverty, climate change, public health emergencies, energy crisis and the digital divide. States are now on the path towards collective engagements through bilateral and multilateral cooperation that harness technological and scientific developments. The rising role STI as a tool for foreign policy influence is now being seen through the development of emerging technologies, vaccines, agricultural biotechnology trends such as GMOs, a growing bilateral and multilateral cooperation in R&D, renewable energy transitions through national interest as part of the national and foreign policy targets. Thus, when

³ “Old Diplomacy” to “New Diplomacy.”2020.

effectively harnessed, STI presents a strategic agenda that states, particularly in global south, can leverage to advance their national and international interests, while promoting economic growth⁴

The shift in the international sphere of diplomacy has influenced foreign policy, which has now taken a new domain, with an extension of state agencies to also include private entities like MNCs and research institutions that now influence the foreign policy space. While the key actors such as embassies, ministries based under foreign affairs ministries have for years driven this process, a new wave of actors are now facilitating foreign policy practice, thereby expanding the glamor of STI institutions involved in dilemmatic endeavours. In practice, this transformation are also re-engineering how state organs function, and creating opportunities for a review on national policies. To this end, these initiatives are covering FDI inflows through trade and investments; technological transfer technology and strategic partnerships.⁵

In order to find answers to issues of shared interest and to promote the mobility of academics and scientific, technological and industrial capacities, a variety of efforts are carried out through bilateral and multilateral agreements under the umbrella of diplomacy. The fourth industrial revolution, characterized by new applications and innovations ranging from AI, IoT, cloud computing and virtual conferencing in international affairs, has been the driving force behind this

⁴ Gutenev, M. Diplomacy, Science and foreign policy goals. Turkey. 2021.

⁵ Rana, K. Bilateral diplomacy: A practitioner perspective. Policy Papers and Brief. 2020

STI diplomacy. One of its advantages is addressing global issues like climate change, pandemics (COVID-19), the achievement of sustainable development and increasing of soft power.⁶

Progress in the utilization of STI tools can be evidence by the current EU strategy, where the EU is deepening strategic alliances under its socio-economic and technological innovations for diplomacy. Under its social innovation framework, the EU continues to champion trade, with the rise of globalization, to foster STI through research centres and treaties. A case of the EU Horizon 2020, a financial vehicle through which member states channel funding for STI, demonstrates a growing role for investments in new technologies in key sectors, including space science, electronic engineering, industrial manufacturing, ICT and nanotechnology. In addition, advances in EU diplomacy are now being negotiated in areas including smart cities, marine science, climate action, food security, human health and smart agriculture.⁷ Similarly, BRICS continue to foster their cooperation, with an intended plan of steering STI. In their grand framework, member states of BRICS, these nations have elaborate plans, on leveraging their ST power for a united alliance.⁸ This is a clear indication that STI is driving global changes in alliances that also shape diplomacy and foreign policy choices.

Scientific interactions are occurring and real scientific relationships are being developed as a result. EU STI framework programs to advance STI diplomacy include: the recently adopted

⁶ UN. Technology and Innovation Report. 2021.

⁷Karacan, D. SD and foreign policy: Experiences from Turkey, Vol 8(49), 2021.

⁸ The BRICS Framework on STI application in multilateral projects. 2021.

“Global approach to research and innovation (12301/21), training scientists and diplomats to work together on global STI community operating on shared mutual trust, research and SDGs aimed at tackling global challenges, promotion and exchange of good practices in international EU networks scientific and technological advice, regular STI diplomacy conferences and STI diplomacy funding through new joint funding schemes among EU and other developing countries, the EU Science Diplomacy Hub (Virtual Science Hub).⁹

1.1.1 Global Perspective of STI in Promoting Diplomacy

Through breakthroughs in R&D and technical competition, countries like China and USA have taken the lead in STI diplomacy on a global scale. This trend at the global stage is being driven by globalization wave, seen through the lens of migrations of people, services and knowledge sharing through information platforms and the internet space. STI is crucial for South-South and North-South ties in the quest of scientific collaboration, knowledge co-generation, and the use of new technology for socio-economic benefits. This reality shows that STI diplomacy is necessary for global south countries to develop cooperation and strengthen comparative and competitive advantages. As STI underpin solutions in an era of globalisation, it has driven a growing bilateral as well as multilateral engagements aimed at advancing foreign policy interest. Additionally, current STI concerns, such international health security, are a top priority for many multilateral forums. From the UN, through UNESCO, the pursuit towards enhancing STI into policy is evident, as new science and technology trends that connect with diplomacy are now being initiated.¹⁰

⁹ EU Science Diplomacy. 2021.

¹⁰ UNESCO: Strengthening national STI policies and governance in accordance with the UNESCO. 2021.

China has undoubtedly benefited greatly from globalization, using access to the top corporations, universities, research institutes, international scholarly organizations, and government and non-governmental international organizations; encouraging the importation of foreign machinery, tools, and technology. China represents a perfect case in STI and diplomacy. It is currently participating more actively in stepping up its technical aid to underdeveloped nations. China has made an effort, through a number of important state policies; “vaccine diplomacy” is indeed clear illustration of how adoption of STI is a tool of diplomacy.¹¹

The USA has also been keen in utilizing the STI tools in diplomatic courses. These trends have been critical in agriculture, health, trade and vaccines. The US universities and academies dedicated to scientific research have diplomacy mandate. It also established an advisory office in foreign policy department, which was passed by Congress in 2000. There have been other developments, including the commonly known Silicon Valley hubs as well as a consular centre (STAS) that plays a key role by connecting the STI fraternity to inform diplomacy. A good example of how USA’s STI community connects with foreign policy tools and priorities. With regard to STI, Japan promotes diplomacy in several fields of science and technology; such as improving professional and technical skills, fostering entrepreneurship and innovation, and constructing or modernizing research facilities and cultivating an environment that supports STI growth. In 2014, the minister of foreign affairs established a council with policy advisers mandated to steer STI diplomacy for Japanese government.¹²

¹¹Agarwala, N. & Chaundry, R. China’s case of science and technology policy and the future transitions in industrial practice. 2019.

¹² Moyer, R. & Song. Contemporary STI policy research. Trends and Future Directions. 2017.

1.1.2 Regional Perspective of STI in Promoting Diplomacy

The move towards fostering of research to promote scientific advancement is expanding innovations in Africa.¹³ Evidence in the economic literature indicates that STI is an engine of growth for emerging African economies.¹⁴ The complexity and interconnectedness of today's situations, however, necessitate that nations examine the potential of S&T&I in diplomacy. Because of this, diplomacy now requires diplomats to have a solid awareness of the development difficulties we face today and how they affect our foreign and security policy. International alliances are being developed and common problems facing humanity are being addressed through scientific cooperation across states. The United States has contributed significantly to ongoing scientific research on HIV/AIDS, TB, and malaria in Africa through various institutions such as CDC.¹⁵ Fighting COVID-19 and Ebola is an example of expanding international initiatives aimed at promoting the creation of affordable medical devices, technologies, and a common information system. One of the most notable recent instances of science aiding an international agreement is the Paris Climate Accord.

STI diplomacy in Africa is however also based on current trends in intra-African trade, which recently benefited from AfCFTA. While African countries have employed a range of diplomatic strategies to advance their foreign policy, the growth of STI diplomacy is crucial in helping the continent make breakthroughs; security, environment, education and innovations of technology in

¹⁵Kishi, T. & Turekian, V. STI in today's Foreign Policy. 2017.

the manufacturing sector, that still challenge its economic growth. STI can help tackle these global challenges in various ways. STI has opened avenues through which diaspora community is now contributing to development in financial solutions in their home countries thereby addressing socioeconomic problems. STI plays a major role in furthering strategically important technology developments in fields related to public health, such as medicine, medical electronics, and disease control, energy and food for social and economic stability.

1.1.3 Local Perspective of STI in Promoting Diplomacy

Kenya's roadmap to driving the STI engine for economic development is still work in progress. Indeed, Kenya is seen as one of Africa's strategic power in advancing STI, owing to the growing bilateral and multilateral agreements on STI with developed countries such as Japan, China, France, USA, UK, and others. At national level, it is clear that diplomacy programs within the STI framework have not been explored. However, the STI strategy is evident in the STI Act of 1 2013, and establishment of key institutions to drive the STI mandate. Thus, in its foreign policy alignment, Kenya's premise for STI can be viewed in two fronts. First, a growing international cooperation that is opening up the STI arena, with new policy shapers inducing STI in development. Secondly, Kenya is one of the East African nations with the fastest recent economic growth. The Kenyan economy expanded by 6.7% in 2021 after contracting by 0.3% in 2020, according to the ADB Report (2022). Kenya has made headway in creating policy adjustments as part of the transformation of STI diplomacy. Sector Plan for STI (2013-2017) outlines some of the strategic and bold programmes that Kenya has taken to address macroeconomic and social-

economic challenges, facing the country and its influence in foreign policy and global competitiveness.¹⁶

Additionally, strategic partnerships with academics are important for promoting STI diplomacy because of connections like those between The University of North Carolina and the Research Triangle Park (RTP), a part of the US Silicon Valley. Kenya has made some progress, but there are still several obstacles in STI diplomacy. Research is highly fragmented as a result of siloed research and knowledge institutions. Actor, policy, and framework connections remain shaky and fragmented.¹⁷

1.2 Statement of the Problem

Globally, there has been a rise in the technological, scientific and digital innovations that now shape the national foreign policy agenda for states. Indeed, the uptake of STI is now at the centre space of international relations, with the drive to harness the benefits that accrue from STI for socio-economic, environmental and political agenda, that also shape the way diplomacy is being viewed at the global stage. In the past decade, developing nations have prioritized novel STI tools and architecture, developing STI policy frameworks networks, as well as institutions responsible for national and international STI relations. These steps suggest that STI is now an emerging tool useful for addressing not only national issues, but also global concerns through international relations and foreign policy frameworks. This emerging trend is also attributed to the dramatic shift in the way states and international actors manage their bilateral and multilateral cooperation

¹⁶ UNESCO. Overview of the Science, Technology and Innovation Landscape of Eastern Africa. 2022.

¹⁷ Maluki, 2021-Centre for African Studies, 2021.

initiatives within the context of diplomacy and foreign relations. STI adoption, especially digital telecommunication tools, scientific research and innovative solutions contribute immensely in attainment of economic goals as well as trade developments in Africa.

The 21st century presents foreign policy challenges ranging from global pandemics (such as of the new coronavirus disease, COVID-19), energy crisis, environmental issues arising from devastating effects associated with fossil fuels, global rise in temperatures and climatic changes across the globe. In addition, technological disruptions, cyber security issues, growing economic inequality, inequalities in education, threaten the benefits of diplomacy and still hinder national growth. Some of these challenges are attributed to gaps related to limited STI uptake and the failure, particularly for developing countries in Africa, on exploring a new and more inclusive diplomacy that goes beyond traditional politics. These challenges require radical collaboration and institutional frameworks that spur innovative thinking as the nature of diplomacy is evolving. In an era where STI is now on the centre stage for state foreign policy goals, an effective strategy to harness STI, through a clear policy framework is needed. Given the new challenges of the 21st century, STI adoption into diplomatic course is key to promote foreign policy.

In Kenya, the goals aligned to foreign policy emanate from a united nation, under constitutional mandate, for peace and prosperity that comes from economic growth and development. The advance towards various forms of diplomacy has been driven by the need to address socio-economic challenges such as: persistent poverty, food insecurity, unemployment, hunger, diseases and poor health care systems, climate change, human-wildlife conflicts and poor infrastructure. Part of its concerted efforts to link the policy and practice domains and enhance its foreign policy

position has been through policy and institutional establishments. Kenya made a step in the creation of STI Act, 2013, which opened a way for institutional changes that brought into place NACOSTI, KENIA and NRF to support and strengthen STI activities at the national level.¹⁸ Despite these efforts, challenges still persist.

In this regard, effective legal and institutional capability, as well as strong interfaces with policy and diplomacy, are necessary for the implementation of STI diplomacy plans. However, STI diplomacy is still a new phenomenon in Kenya. Whereas STI is now recognized as the critical national pillar tool for advancing economic growth and prosperity for countries, it can be challenged by inadequacies in adoption and application of emerging STI trends, harnessing STI's role in promoting diplomacy and STI policy framework issues. In view of these concerns, the study sought to examine how STI is a vital weapon in advancing diplomacy in Kenya in light of these problems.

1.3 Research Objectives

The study was based on general objectives and specifics objectives as follows:

1.3.1 General Objective

The general objective of the study was to determine the role of Science Technology and Innovation in promoting Kenya's diplomacy.

¹⁸ Ngege, P. Best Practices in State and Regional Innovation Programs. Competition in the 21st Century. 2019.

1.3.1 Specific Objectives

- i. To determine how science, technology, and innovation are currently advancing diplomacy in Kenya.
- ii. To investigate how innovation in science, technology, and other fields helps Kenya's diplomacy.
- iii. To establish the scientific, technological, and innovative (STRI) legal and policy framework for advancing Kenya's diplomatic efforts.

1.4 Research Questions

- i. What are the current trends of Science, Technology and Innovation in promoting Kenya's diplomacy?
- ii. How do science, technology, and innovation contribute to Kenya's promotion of international relations?
- iii. How much does Kenya's diplomacy benefit from the legal and policy framework of science, technology, and innovation?

1.5 Significance of the Study

The growing role of Science, Technology and Innovations (STI), with its considerable impact on national and international economic development has underscored how national all over the world must prioritize STI to strengthen their national interests in the 21st century competitive environment. While STI can indeed provide unparalleled opportunities for states and citizens, the diplomatic link is one key area for unlocking diplomacy priorities. STI, as a concept encompasses various dynamics spanning from social economic and socio-political benefits that transcend national borders. While countries have dedicated STI within specific policy guidelines, the linkage between STI and diplomacy is explicitly mentioned, sometimes not. This means, more often than

not, that the long-term benefits necessary to steer STI and diplomatic practices towards a more coordinated and integrated pathway are narrow. The study opens up a more expanded role of how STI can advance enhancing national capabilities through projects and international cooperation within the diplomatic framework.

STI, in this context, encompasses practices that link the practice of diplomatic paradigms and the international relations, which ultimately define the way states design their foreign policy mandate. Globally, a renewed global attention on harnessing a new form of STI opportunities to address global challenges has brought about a rising call on joint science and technological innovations with different actors involved. In this sense, the STI discussion had gone beyond national policies, drawing close bilateral and multilateral debates regarding a shared global concern for common problems. However, the potential of STI is yet to be fully realized within the Kenyan foreign policy context. Thus, the need for an evidence-based foreign policy supported STI is key to unlocking diplomacy benefits, that also drive socio-economic and environmental growth.

The study provides a benchmark for the Kenyan government to examine and reinforce its STI policy. the links between the STI institutional programs and the diplomacy for national economic growth. First, by understanding current trends of STI, government agencies, such as the Ministry of Foreign Affairs can engage various stakeholders in carrying out STI initiatives in promoting Kenya's national and international interests by advancing strategies for employing STI to respond to global challenges. Second, a sound understanding of the nexus between STI and diplomacy provides policymakers with clear benchmarks on developing effective models that underpin strategies for resolving the expanding range of bilateral, regional, and global problems that

Kenya's foreign policy. Third, the study provides a guideline through which government of Kenya can revise the legal and institutional framework, while engaging stakeholders on effective utilization of STI and funding schemes through diplomatic missions and institutions. It entrenches STI diplomacy research and advances the conversation on the role of actors in diplomacy and STI, which can serve as a research foundation for global policy-making in the area of STI cooperation in Africa.

1.6 Scope of the Study

The study examined Science, Technology and Innovations and how it promotes diplomacy in Kenya. Although STI encompasses a wide range of applications, the study was restricted to STI applications in five key sectors: Agriculture, Health, Education, Energy and Communications technologies only. In addition, the study explored three main thematic areas: STI trends, the STI and diplomacy linkages that promote foreign policy and legal and institutional for diplomacy and foreign policy.

1.7 Limitation of the Study

The STI diplomacy concept is still nascent in African context, and thus provides a limited area on institutions engaged in STI diplomacy programmes. Second, the effectiveness of key STI institutions within the existing STI policy is still work in progress, and thus few institutions were able to provide reliable data and a systematic review of STI interventions within the diplomacy context. The study gravitated towards qualitative data, given the limitation of getting a large sample size, and thus the data collected was only based on institutions that have a mandate to

oversee STI and policy guidelines. This was purposely done to avoid selection bias. Despite these limitations, the researcher used mixed methods to provide a multi-dimensional analysis.

1.8 Literature Review

The literature review was discussed in two fronts. First, the theoretical review, which uncovers theories in the discipline of STI and diplomacy, along with their limitations. Second, the empirical review explored studies on STI and diplomacy, outlining evidence-based findings and possible gaps with regards to STI and diplomacy.

1.8.1 Theoretical Review

Various theories have been fronted to examine STI and diplomacy. Thus, the STI role in promoting diplomacy can be argued from various theoretical perspectives as described below.

1.8.1.1 Institutional Theory

The study's theoretical framework was grounded on Meyer and Rowan's institutional model anchored on the nature of organizations and how they are shaped by the surrounding factors. According to institutional theory, there are three ways for nations and organizations to strengthen their institutions: first, through coercive means, such as adopting changes that are in line with the larger institution in response to pressure from other organizations on which they may be dependent or whom they may be subject to regulation. The second method is the mimetic process, which allows nations to deal with internal uncertainty by adopting the methods of other institutions or

groups. Third, normative pressures that need governments to make adjustments to the new global context in order to become more legitimate.¹⁹

An analysis of the processes by which structures, such as norms, regulations, and routines, come to be recognized as authoritative standards for social behavior is known as institutional theory. This is due to the fact that various components of institutional parameters highlight the relevance of rules and regulations, and how a state can disseminate such ideals in a set of structures and institutions mandated to carry out such functions. According to institutional theory, states can push STI initiatives that serve their diplomatic objectives by utilizing an institutional lens. Institutional theory is helpful in studying diplomacy since it tackles one strategy among several to increase a nation's capacity for good influence.

Given that diplomacy is in and of itself an institution enmeshed in national and international institutions through bilateral and multilateral structures and practices, the theory offers an intriguing prism through which to study the diplomatic construct of STI. Since relations between players and entities in STI politics are governed by established rules and standards, the study of diplomacy and its function in international relations would openly acknowledge its existence as an institution. This is due to the fact that it enables the investigation of what constitutes STI Diplomacy practices while also separating this component from states and their self-interests.

¹⁹ Suddaby, R. Institutional Theory. 2021.

The institutional practice thus sees an era where new actors, outside the state, take an active role in influencing foreign policy choices. In addition, such institutions hold key strategic positions in government, in such a manner that they offer policy advice that promote national interests. Thus, this theory shifts the debate from a realist point of view (which sees military and state power as being prominent), to a new focus on adopting strategic choices and tools that do not necessarily seek hard power. Thus, since it shifts from a realistic point of view, institutional theory portrays a crucial picture to the understanding of how states are advancing diplomacy. This is because states are now adopting various dimensions in the administration of diplomacy.

The focus of diplomatic activities is currently on diplomats, scientists, and institutions that utilize techno-scientific expertise. As a result, STI diplomacy is now a widely accepted method of integrating science, technology, and innovation in diplomacy to promote communication and collaboration between countries, individuals, and organizations in order to forge international partnerships. However, the idea of STI in diplomacy goes beyond developing bilateral ties and is frequently utilized to accomplish more general goals related to issues like telecommunications, energy, agriculture, education, health, and the environment.²⁰

Institutional theory has been utilized in various studies. For example, in Germany and United Kingdom (UK), it has not only been used in assessing organizational structures and practices adopted in the internationalization of STI. Institutional theory lays ground in hypothesizing ways through which STI institutionalization is being created in development opportunities. Institutional frameworks through which STI aims at facilitating international cooperation have to be well-

²⁰ Basrus, R. & Klien, F. Covid-19 and International Cooperation in International Relations Paradigms. 2021.

established as a form of institutional power in diplomatic decisions. These institutions thus function as a form of agenda setting for socioeconomic, environmental and political interests.

1.8.1.2 Positioning Theory

Positioning as a theoretical underpinning of institutional roles in shaping foreign policy was first postulated by Davies and Harre. The theory provides one of the theoretical approaches as a paradigm in exploring international relations and foreign policy from a social constructionist approach. The central tenets of Positioning Theory include: positions are evoked and attributed to by different actors; global politics in the international sphere is invoked in specific institutional contexts; social norms shape the notion of relations, which are linked to power along a continuum, and are dynamic-each communication act results in a re-positioning of oneself and others.²¹

The development of various postures in interaction and situation-specific actions are the main topics of positioning theory. In an institutional setting, group members are prepositioned as key agents with a set of obligations due to their institutional standing and the predetermined meeting agendas. Strategic use of STI tools and state-level policy agenda decision-making create a venue for certain positioning strategies in the language of international relations. In this way, the positions are related to the institutional setting and how it serves the interests of the country.

Given an ever-increasing cooperation in STI across the globe, institutions and individuals are now on the fore-front of driving national and foreign policy through the STI interface. Through strategic

²¹ Davies. & Harre, R. Positioning Theory and the Discursive Production of Selves. 1990.

positioning, diplomacy is now becoming more dynamic, and the language of diplomatic missions is now shifting to digital tools and a range of policy actors engaged in the science-diplomacy domains. Science and Technology advancement, their application through innovations is today more than ever at the heart of diplomacy. Thus, Positioning Theory can be applied in the diplomatic chain, through acts used by actors in international relations. For example, STI diplomacy positions are now taking centre stage through entry of new players such as research institutions and multinational corporations that are shaping diplomatic agenda in promotion of foreign policy. Such key sectors include green energy transitions, vaccines, technological uptakes that are revolutionizing agricultural production and communications.

Positioning theory also challenges the conventional social constructivism, and opens a space on emerging issues in STI in foreign policy.²² Recognizing the role STI plays on national and international levels, Positioning Theory is thus relevant in identifying current trends of STI, as well as institutions and positioning role and diplomatic style being used to through STI diplomacy in addressing global issues on a massive systematic scale. The USA provides a case for Positioning Theory, through its modern science diplomacy, exhibited through the work of diplomats, liberal traditions of public diplomacy.²³

Public relations/strategic communication is one area of the social sciences and humanities where positioning theory has been extensively applied. Positioning Theory offers the possibility to look beyond common perceptions of what scientific communities contribute to and for global politics. It also recognizes the value of diplomacy and research. In addition, from a Positioning Theory

²³ Deborah Wise. Posturing or Public-spirited. Positioning Theory in Science Diplomacy. 2020.

point of view, STI diplomacy is a practice as well as a concept that is used by several stakeholders. Science diplomacy should be viewed as one method among several available for maximizing the potential benefits of development on a society.

Overall, the relationship between STI and diplomacy is examined using Positioning Theory, which is suggested as a very useful lens for doing so. This is due to the fact that it enables the examination of what constitutes STI, the institutional setting, and the actors engaged, as well as the differentiation of the ways in which governments and policy makers engage in an institutional framework to advance diplomacy in the service of their own objectives. Science, technology, and innovations are now at the center of international affairs. As a result, placement theory provides an efficient starting point for global theorizing.²⁴

1.9 Conceptual Framework

The link between independent factors and dependent variables is shown in Figure 1.1 from the conceptual framework. It also takes into account the auxiliary factors.

²⁴ James, Melanie & Langenhove, Luk. United Nations University (UNU). 2017

Figure 1: Conceptual Framework

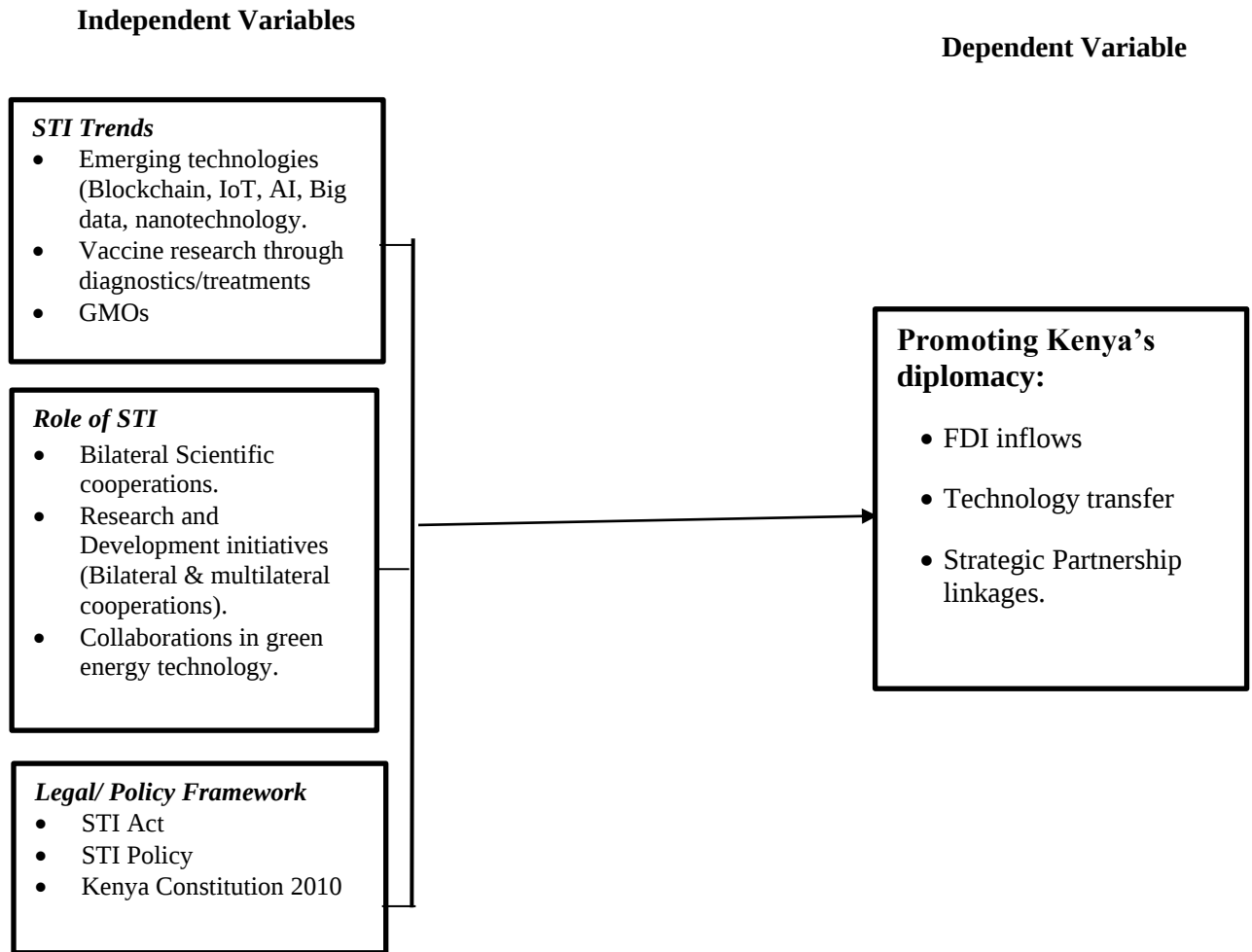


Figure 1: Conceptual Framework

The framework adopted for the study illustrates independent variables (trends, nexus between STI and diplomacy and legal/institutional framework on STI) and the dependent variable which is promotion of Kenya's diplomacy. With advancements in artificial intelligence, vaccines, and agricultural genetic engineering via Genetically Modified Foods (GMOs), STI is becoming more and more conscious in foreign policy agenda. The need of diplomatic cooperation in resolving the problems facing the globe today has increased in light of these new STI tendencies. This is due to the fact that diplomacy for STI calls on nations to interact with one another in order to advance research and facilitate resource sharing, infrastructure development, science cooperation, and the improvement of scientific capability and economic development.

Consequently, the strategic potential for STI in diplomacy is now at the centre of national development, particularly in bilateral & multilateral cooperations and collaborations in green energy technology. Examples include bilateral and multilateral cooperation on agricultural technologies and policy development, multilateral response to pandemics/diseases (COVID-19) and green technology projects in renewable energy technologies. These developments are seen in the context of international collaborations with governments, NGOs and multinational companies influencing diplomatic engagement through strategic meaningful initiatives.

1.9.1 The linkage between STI, diplomacy and foreign policy

The relationship between STI and diplomacy goes beyond the use of knowledge in fields including bilateral scientific collaborations, R&D initiatives like the Paris Climate Accord, and international discussions in the energy industrial revolution. In addition, the role of innovations in technology calls for strong legal and policy dimensions (such as STI Policy, STI Act and Constitution of

Kenya 2010). When well utilized, STI has the potential to influence economic development, FDI inflows, technological transfers and Strategic partnership linkages that are key indicators for diplomacy.

Within the foreign policy mandate, STI carries the potential to spur cross sector benefits to address the issues ranging from health, energy, agriculture and human security. Currently, countries both developed and developing are now earmarking scientific innovations to address both economic and environmental challenges, driven by research and development initiatives. Indeed, while countries in Africa are tapping on the support of developed economies, the diplomacy space centered on harnessing STI keep growing.²⁵ The conceptual framework of this thesis builds upon the premises of foreign policy, and how enhancing the synergy between STI and diplomacy can strengthen foreign policy objectives in addressing the current challenges. This new priority to harness STI is currently reengineering various dimensions including FDI trade investments, technological transitions for agricultural and industrial sectors, research and development in education, health, and bilateral negotiations in energy sectors.

Diplomacy is currently going through significant changes as a result of digitalization, the quick development of technology, the diversity of actors involved, and the advent of non-state diplomacy, along with various sub-national areas, cities, multilateral organizations, and tech businesses. International relations continue to benefit from economic globalization and increased international rivalry on markets for products and services. Concurrently, international cooperation in STI is being pushed from the bottom up (driven by researchers) and from the top down (driven

²⁵ OECD. Science and innovation policy: key challenges and opportunities. 2014.

by governmental policies and financing from international organizations), which has led to the globalization of scientific research.

By promoting participation and the free flow of ideas, science's soft power promotes development, creativity, and peace. The historical connection between scientific advancement, its applications through technical breakthroughs, and foreign policy has been recognized by studies. Similarly, research and development (R&D) efforts are now even more important as a means of fostering soft power, or the ability to attract talent, financing, and political support that can boost geopolitical players' influence and status on the international stage.²⁶

International cooperation in research and technology is now heavily emphasized in U.S. foreign policy. A scientific advisor to the Secretary of State has been nominated by the State Department, and the AAAS is creating a political science and technology scholarship program to educate future officials in the U.S. government. The core objective of the nation's science diplomacy program is to promote broad-based engagement of both public and private sector entities in issues related to science and technology. The Department for Business, Energy, and Industrial Strategy (BEIS) and the Foreign and Commonwealth Office (FCO) co-financed the Science and Innovation Network, a network of 90 experts spread over 28 nations and 47 locations. The UK's science diplomacy policy includes a number of different courses of activity. which promotes cooperation between the scientific and innovation communities of the UK and other countries; the Newton Fund, which provides funding and support for the know-how transfer for scientific projects with 15 developing countries; and the Global Challenges Research Fund, a £1.5 billion fund for global scientific

²⁶ Pierre-Bruno Ruffini, *Science and Diplomacy: A New Relationship of International Relations*, London, Springer, 2017

collaborations focused on development cooperation.²⁷ Through the Ministry of Foreign Affairs, Germany has made substantial investments in international cooperation in science and education. In order to promote German innovation and science, the government has been constructing "Science Houses" in various locations since 2009. In addition, the Ministry of Education and Science established a unit devoted to the internationalization of science in 2008.²⁸

1.10 Empirical Review

In recent years, literature on the functions of STI as diplomatic tools has drawn more and more attention. This review's main focus is on how STI might be used to advance diplomacy, which includes fostering multilateral and bilateral exchanges that advance international cooperation. The function of science diplomacy is identified by Kaltofen and Acuto, with an emphasis on how technical advancement affects diplomatic relations in the UK. The authors contend in their analysis that science diplomacy presents a special opportunity for diplomacy in bridging the gap between various socioeconomic realms. They place emphasis on the non-state players and their growing role to influence foreign policy and diplomatic significance of UK global health diplomacy. Based on this empirical data, the current study on STI aims to examine in greater detail how diplomacy in the Kenyan setting understands and uses science, technology, and innovations.²⁹

²⁷ Carolin K. *Technologies of International Relations: Continuity and Change*, London, Palgrave, 2018.

²⁸ Roig, Alexix. *Science and Technology Diplomacy*. 2020.

²⁹ Kaltofen, C. & Acuti, M. *Science Diplomacy. Introduction to a Boundary Problem*. 2018.

Fahnrich investigates the role of STI practice on international affairs and diplomacy in Germany.³⁰ According to Fahnrich, using a German science diplomacy initiative offers an outlook at goals that advance collaborations in institutions key to national development. This points to an interaction of academic science diplomacy as key collaborative tools for advancing bilateral and multilateral influence.³¹ Linkov and Basu discuss innovation technology and its effects on diplomatic goals, citing comparative analysis between the USA and Germany. The authors assert that enhanced sharing and inclusion of scientists and scientifically inclined ambassadors in diplomatic missions can have a positive effect in advancing advance shared policy goals.³²

Da-Silva, Ferreira and de Oliveira explored STI's diplomacy role in Latin-America states. Their qualitative study proposes the idea of policy-making and institutional capacity for STI in diplomatic sector. They contend that STI has expanded existing cultural and political restraints both locally and globally. Although STI is still nascent in Latin America (LA), significant accomplishments have been able to produce a positive mixture of ideas, objectives, and practices in this area.

Within the institutional roles of STI and diplomacy, Collaborations in STI are crucial to the development of Europe and the relations between the EU and the rest of the globe. However, connections between international S&T cooperation and European foreign policy are rarely made explicitly and most definitely not in a systematic manner. The various structures through which

³¹ Faahnrich, B. Science Diplomacy: Investigating Perspectives. 2017

³² Linkov, Igor & Basu, Sankar. Diplomacy for Science: Strategies to Promote International Collaboration. 2016.

the EU initiates STI International interactions are still confined to a few emerging countries, both internally and externally. However, the author comes to the conclusion that the design of more extensive scientific and political cooperation might benefit from Europe's multilateral, multicultural experience.

A recent study by Echeverria-King and Gonzalez in Colombia interrogates the function of science diplomacy in developing nations, which connects public policy, STI, and foreign policy. The study's exploration of ideas and recommendations around STI relied on policy papers, drawing inference from key policy makers in scientific fields. The study reveals the characteristics of STI initiatives and the function of actors. The author discusses the fragmentation of STI programs as a reason for STI program gaps and offers some thoughts on the demand for a new perspective and measures to contribute to effective utilization of STI. To exploit the potential advantages of STI, it suggests a general governance structure and institutionalization based on a hybrid diplomacy.³³

Griset presents the impact of innovation diplomacy, its boundaries, and the relationship between scientific diplomacy and innovation diplomacy are all discussed. His study's historical perspective demonstrates the relationship between science, technology, economy, and culture. According to Griset, innovative diplomacy can only be understood as a hybrid idea that reflects organizations and strategies that are grounded in other traditions and are tailored to the problems of the present. Given that STI is at the core of diplomatic relations, this theory logically provides the foundation for tackling current global concerns including disease pandemics, the oil crisis, food scarcity, and

³³ Echeverria-King, Luisa, & Gonzalez, Diana. Science and diplomacy for new economies in Colombia. 2021.

environmental dangers. However, there is still little scholarly research that addresses the intricate connections between STI and diplomatic efforts on a local level.³⁴

Washbourne explored science diplomacy in African context. The study highlights the pro-development role of STI in addressing poverty, unemployment and inequality by means of R&D, and programs in agricultural sector (biotechnology and bio-innovation), energy in terms of renewable energy and natural resources including space science. The study identifies key areas that provide a competitive edge through joint partnerships and investment. The institutional system cited in the study include STI agenda by NEPAD, AU and SADC sector policies that anchor STI diplomacy for bilateral and multilateral engagements. The study concludes by identifying the underlying factors that necessitate increase in how Africa states engage in trade and food security as a priority are for utilizing STI for economic interests. Thus, the empirical review provides a window for possible outcomes related to how developing countries like Kenya can balance STI tools to promote diplomacy.³⁵

Flink³⁶ looks into the science diplomacy discourse and its rising role on promoting foreign affairs. This case study examines the role of globalization related to technologies, ideas, resources and media in influencing diplomacy in Europe and beyond. Flink provides comparative cases of STI diplomacy by performers from the US, and other developed countries. These collaborations are reported to have honed the creation of foreign policy, and global STI sharing and collaboration

³⁴ Griset, P. Innovation Diplomacy: A New Concept for Ancient Practices. 2020.

³⁵ Washbourne, Carla. Science Diplomacy and Cities. Conference: Science Diplomacy in Africa: Concepts, praxis, prospects. 2016

³⁶ Flink, T. The Sensational Discourse of Science Diplomacy: A critical reflection. 2020.

have thus far facilitated diplomatic operations. A closer examination of the conceptual effort, however, indicates that some actors have overbooked the public conversation on STI, reducing the overall benefits from a North-South perspective.

In the African context, STI remains a strong enabler for African economic progress. However, STI as a diplomacy strategic tool is confronted by increasing socio-political, environmental and economic challenges. African countries must adopt a paradigm shift and take advantage of STI. In practical terms, the author posits those inadequacies in research and development present a major barrier for African countries to promote their diplomacy through STI. In order to simultaneously progress science and diplomacy on the continent, Africa needs a robust framework and a strategic position to design science diplomacy programs with clearly defined players and goals.

1.10.1 STI Trends

Emerging technologies are becoming more important in forging ties between governments as new technological advancements are increasingly considered a viable option for developing foreign policy. These cutting-edge technologies are being produced at an astounding rate, cross a variety of technical and scientific fields. These advantages do, however, include certain potential drawbacks, such as the potential to alter the global order and undermine stability, which would increase conflict. Due to economic globalization, STI, knowledge, and increased country integration with global systems, focus is increasingly shifting to technological infrastructure to deepen linkages between diasporas and their home countries while boosting global engagement.³⁷

³⁷ Ezekiel, P. Science Diplomacy Through Nanotechnology Development in Africa. 2020.

As science develops, these technologies alter throughout time. The top 40 developing technologies are divided by the OECD into four categories: digital, biotechnologies, energy and the environment, and innovative materials.³⁸ Social and institutional change can be systematically impacted by technological advancement, but the opposite is also conceivable. Many new technologies have the potential to help society by offering opportunities, solutions, and advantages that are better, more affordable, quicker, scalable, and easier to use. Therefore, developing countries can benefit much from emerging technologies, but for this to happen, the right incentives and engagement techniques must be used. In order to advance diplomacy and achieve national and international goals, science advisers are now being consulted and strategically placed in diplomatic offices to advance foreign policy matters, both the domestic and international scientific communities. Therefore, it is not surprising that new technologies are now the focus of university research, corporate R&D spending, as well as national and international governments.

A new Bureau of Cyberspace and Digital Policy has been established within the U.S. Department of State as part of the nation's endeavors to use cutting-edge technology in diplomatic settings. Since Denmark appointed the first technology ambassador in 2017, more than 20 additional nations have established positions with names ranging from "Technology Ambassador" to "Ambassadors for Cybersecurity or Digital Affairs." A large portion of these employment are located outside of national capitals, for example, in Silicon Valley, United States. This is a contentious choice more akin to establishing diplomatic relations with Big Tech businesses acting as fictitious national governments.³⁹

³⁹ Montgomery, K. & Colglazier, W. SD- for low developing countries. 2022.

Emerging technologies, which have a wide range of uses and ties to various other policy issues, cover the scientific enterprise. This makes it challenging to give precise information and guidance on specific technologies and their applications, to judge how they will impact certain people and larger societal groups, and to predict what might be expected as these technologies advance. It involves both a wide perspective and in-depth knowledge of the new scientific subjects and their scientific communities, as well as of the cutting-edge research and development being done at academic institutions, research labs, and private enterprise. Scholars demonstrate, for instance, the numerous efforts the Indian government has started to increase prospects for STEM diaspora members and exploit the technologies. Policy restrictions, meanwhile, have made this initiative difficult to implement.

A growing diplomatic row currently being witnessed between China and USA surrounds the competition on STI uptake, as this is now seen as a competitive edge, particularly on emerging technologies for super powers. Measures taken by the US government, increasingly framed in terms of competitiveness with China, including the 2022 COMPETES Act and Innovation competitiveness Act, which considerably increase financing for public research and place innovation and national security first. It is arguable that, as several nations have previously acknowledged, the conversation between scientific groups can occasionally help diplomatic development by keeping open a line of contact between estranged governments.

The development and application of vaccines represented the greatest hope for the planet. The prospect of developed economies embracing "vaccine diplomacy" to deliver injections into arms

around the world was a significant component in this approach, which aimed to use the crisis to enhance worldwide cooperative efforts to combat COVID-19. The promise of vaccine diplomacy was, in fact, largely unfulfilled, including issues with production and intellectual property. Nearly all of the main powers in the world joined the race to develop an effective vaccine. Although the rapid deployment of these vaccines gave rise to hope, it also brought about a new geopolitical dynamic of open rivalry.⁴⁰

The discovery and manufacturing of vaccines, their distribution to populations, and attempts to suspend intellectual property rights are only some of the layers on which this competition logic has shaped vaccine policy. In the recent pandemic crisis, vaccine diplomacy also distinguished the political story of COVID-19. Media portrayals of vaccine diplomacy centered on how China, Russia, and India, as well as the US and the EU, might utilize vaccines to help (and exert influence over) nations lacking the capacity to develop and supply them. Emmanuel Macron, the president of France, even linked it to broader geopolitical conflicts, imagining a "war of influence over vaccines," and he urged Western nations to oppose Russian and Chinese vaccine diplomacy in places like Africa.⁴¹

Public-private collaborations have become more common to connect and involve world leaders with new medical innovations. Public-private partnerships and state-military cooperation are being utilized by the G20 nations in advancing their military and scientific resources. Significant

⁴⁰ Pandey, N. & Deepthi, T. Emerging Trends in new technologies, science diplomacy and diasporas. A case of India. 2022.

⁴¹ Shok, N. Vaccines and the new diplomacy (COVID-19) 2022.

modifications in concepts and definitions in global public health have also been brought about by the pandemic. The U.N. and other multilateral organizations have also been in the forefront. In 2021, an important new hub for creating mRNA vaccines for the African continent through CDC, WHO and South Africa and requested that the US and Europe share the technology to produce these vaccines. Arguably, new Chinese “vaccine diplomacy” does, in fact, highlight the role of modern public diplomacy and diplomacy within foreign policy agendas.⁴²

There are numerous ways that science can be addressed in diplomacy. For instance, scientific collaboration can serve to alter a diplomatic relationship or improve security and/or trade. STI diplomacy also influences diplomatic efforts to address issues like reducing global warming and enhancing food security. An illustration of how tacit diplomacy enables this ecosystem of scientific disciplines to be used in solving the problems to food production in the face of environmental change and population expansion is provided by the global food security.⁴³ For instance, many genetically modified organism (GMO) crops contain genes that lower the need for pesticides. Such crops have a legitimate place in the scientific discussion on decreasing resource inputs in both industrial and diversified agricultural models because they can assist in the resolution of some insurmountable pest issues. GMO controversy, though, continues to rage both in Kenya and around the world.

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⁴² Bhattacharya, S. K. Science Diplomacy in Low and Middle-Income Countries. 2021.

⁴⁴ ⁴⁴ Benson, D. & Kjølsgren, R. Tacit Diplomacy in Life Sciences. 2014.

Within the context of STI and the GMOs, Multi-National Corporations (MNCs) are important players in the global arena, engaging in commercial diplomacy with governments and other non-state actors. Biotechnology firms have employed proactive, proactive, and relationship-building methods and tools to further their economic and business aims. These MNCs have used proactive tools to deal with more complicated challenges and reactive tools to respond to problems as they emerge. MNCs have also used tools for long-term relationship building, like prizes and research centers, to forge closer connections with numerous stakeholders. The examination of strategies and tools that is presented in this article fills a gap in the business diplomacy literature and adds to the topic of what commercial diplomacy entails.

As a result, MNCs have grown to be crucial allies of states when pursuing comparable objectives in the international sphere and play a vital role in enhancing governmental public diplomacy initiatives. Governments seek to open and stimulate markets for business. Since they have become closer and more similar to one another, the relationship between businesses and governments has altered. MNCs participate in some public diplomacy initiatives and incorporate business diplomacy into their corporate strategies in order to interact with governments in innovative ways that go beyond lobbying and public relations in order to foster favorable conditions in other nations.⁴⁵

⁴⁵ Pantoja, M. Business Diplomacy Strategies and Instruments in Biotechnology Companies Advancing GMOs in Mexico. 2018.

1.10.2 Role of STI

The role of STI can be evidenced by the growing bilateral cooperation between states. For example, Turkey's growing role in harnessing STI within the EU framework is strengthened by the growing significance of its role as an energy transit route, which is crucial to the security of energy in Europe and the world. The EU has acknowledged STI as a tool that is becoming more crucial for enhancing international collaboration. The EU has improved its attractiveness and competitiveness and strengthened its foreign contacts thanks to the policies and mechanisms created for wider STI collaboration. STI has developed into a significant component in Central America thanks to research and development (R&D) initiatives (bilateral and multilateral cooperations). Countries in South America are increasingly highlighting their potential for STI diplomacy by utilizing their ability to link internationally.

It is crucial to correctly integrate STI and diplomacy, take advantage of global scientific networks, and coordinate regional responses across nations. The nexus of STI and diplomacy provides tools for cooperating and competing with both allies and adversaries, making it an optimal practice for dealing with the complexity of international affairs. The increasing scientific development and the increasing global issues are pushing scientific endeavors to new frontiers. This is particularly seen at the forefront in the field of STI diplomacy. Due to the complexity of international relations and emerging global challenges, most nations are trying to interface science in their foreign policies.

Collaborations in green energy technology have seen scientific enterprise recognizing that the advancement of STI has seen numerous nations making considerable investments, the move to green energy has actually gone global and made amazing progress. For instance, EU energy

diplomacy encourages the integration of technological innovations that drive efficiency in clean energy generation. In this context, EU now has a robust framework that is now shaping diplomacy in energy transitions among states, while championing for environmental protection as part of a wider goal towards climate change action. The EU energy diplomacy discourages any additional investments in infrastructure projects utilizing fossil fuels.⁴⁶

International relations that promote business prospects in the energy sector while also protecting the country's energy security are increasingly taking the world stage. Competition for access to energy, through energy diplomacy with foreign investors is also shaping the international relations sphere. Even though Singapore, for instance, has its own energy source, energy diplomacy initiatives, like those with the United Arab Emirates, have generated debates about how to strengthen bilateral ties. India is becoming a more significant player in science and technology. Along with fostering more cooperation in science, India has stepped up diplomatic efforts to unite like-minded nations in Asia, Africa, and Latin America to form the International Solar Alliance. Public finance, including investment climate, is crucial in filling the funding gap and luring additional private sector investment into renewables by addressing important risks and impediments. Vietnam and Sweden created energy cooperation to make it possible to continue implementing RE. In the field of energy, Sweden and Vietnam have a lengthy history. In the past, hydroelectric electricity was the main focus.⁴⁷

⁴⁶ Karavan, D. Science Diplomacy in Foreign Policy in Turkey and EU Ramification. 2021.

⁴⁷ Solis, M. & Mauduit, J. Institutional Capacity for Science Diplomacy in Central America. 2021.

Recently, the two parties have concentrated on advancing technical collaboration, modernizing the power infrastructure, expanding the market for renewable energy, and enlisting Swedish financial institutions to provide loan support for RE projects. For Vietnam's RE projects, a few Swedish businesses and export credit organizations provide alluring technical and financial options. Strengthening this type of cooperation will be advantageous for both Sweden and Vietnam, but other developing nations like Kenya might also benefit from the lessons learnt and best practices.

1.10.3 STI Legal/ Policy Framework

Nina explored STI within the policy-making paradigm in UK and Germany, with a focus on how STI and policy were interlinked. The study relied on key policy analysis and showed that the role of politics in institutionalization of STI programs. The success of STI initiatives was seen to be linked to effective cooperation among the different government agencies that drive the policy framework into action. In another study, Madar assessed the reforms under STI policy framework and how these reforms informed economic development in Somaliland. His study underscored the importance of STI policies, but found out that legal and institutional policy on STI lacked proper processes and the implementation was not systematic.⁴⁸

According to Madar, STI policy was seen as weak due to limited coordination, as they were designed by stand-alone agencies, with limited engagement of stakeholders at national and local as well as international levels. His study reiterates the importance of a grassroot-level ecosystem that can benefit and also contribute towards a strong STI culture and funding. The study established

⁴⁸ Nina, K. Internalization of STI as an emerging policy field in foreign policy and science policy. 2014.

weak institutions face a greater challenge to harness STI as they are fragmented and lack capacity to boost technological transfer into development gains for their populace. Thus, for most countries in the global South, the challenge remains translating policy to practice and harnessing the legal and policy potential that align STI to economic development, and hence the need for policy reform. However, these studies are characterized by a narrow focus on economic indicators, ignoring the bigger picture of STI and diplomacy.⁴⁹

In their recent study, Park and Kim offer a compelling empirical analysis of STI and how Thailand, China and Korea. The study shows policy guidance in Thailand on STI has not been aligned to its industrial growth as compared to China and Korea. The authors assert that policy design for STI should align with R&D initiatives that promote industrial policies to be sustainable. Indeed, their study highlights how a country's policy challenges (as in the case of Thailand), can influence its economic and development plans. Their study also demonstrates how the adoption of external STI tools serves as a key pillar for unlocking growth and development. However, the need for proper coordination through government and top-political leadership was ranked as vital in ensuring STI policies are effective. This notion, as indicated by Park and Kim, has been the success factor for South Korea and China's rising power in harnessing STI. These two countries benefit from the top leadership that supports domestic R&D as part of their foreign policy choices.⁵⁰

Within the policy process to advance STI, China embraced a greater policy in R&D driven by the top leadership. Its emergent as a key global player in STI was realized in its policy changes, with

⁴⁹ Madar, M. STI Policy Reform in Developing Countries. 2019.

⁵⁰ Park, D. & Kim, Y. Role of STI Policies in Industrialization of Developing Nations. 2021.

introduction of industrial-led policies in ICT, manufacturing through R&D driven by emerging technologies., such as 5G and AI. Empirical studies by Agarwala and Chaudhary show that China's policies on STI have evolved in phases, and demonstrate the nexus between STI policy and national socio-economic growth. In another study, Moyer and Huett analyzed policy research by utilizing articles and journals relevant to STI policy, with special reference to STI trends in USA. Their theoretical and methodological approach established a growing trend in policy shifts that are targeted towards energy, ICT and cybersecurity. Most importantly, this study identified a clear mismatch in STI governance, recommending the need for multi-stakeholder involvement in policy-processes for STI. In addition, the study identified a growing role of nanotechnology in driving national economic interests.⁵¹

The relevance of STI is now a policy debate, as states make efforts to institutionalize its framework for diplomacy choices. For developed economies, their success in STI diplomacy has also been accompanied by a clear policy framework and channels that support networking and national resource allocation for STI programs. Therefore, an effective operating environment is necessary. For instance, India has a draft policy developed in 2022; "As far as engagement with Indian diaspora is concerned, the policy direction is to create a fine balance between attracting the best talent back home and creating facilitating channels for the diaspora to contribute to national development from wherever they are appropriate institutional mechanisms and suitable opportunities will be created to engage with the Indian diaspora more effectively." Actually, it makes no mention of combining STI with diplomatic activities.⁵²

⁵¹ Park, D. & Kim

⁵² India Department of Science and Technology. 2020.

A case in point has been the relevance of STI policy in diplomacy in Latin America states. Connecting STI and diplomatic systems has become difficult due to these difficult circumstances and strong ideological rifts. In Costa Rica, there have long been tight relationships between the diplomatic and scientific communities. It wasn't until 2014, the year a scientist was named Costa Rica's ambassador to the United States, that all these initiatives started to be referred to and acknowledged as “science diplomacy.”⁵³

EU Framework Programs have provided several European nations with a significant impetus for broadening their international focus. These initiatives initially made it possible to collaborate with other EU member states and affiliated countries, and they now seek to support projects that go beyond Europe and contribute to the development of an international profile. By forming initiatives for China, India, the US, and Brazil, it has grown into a significant group for negotiating a shared strategy (such as common regional priorities). Similarly, a wide spectrum of knowledge pertinent to STI internationalization strategy is offered by German research and financing organizations. Information structures have been developed inside BMBF as a result of initiatives like "Research in Germany" and Kooperation international. Experts based in German overseas embassies, who offer country-specific knowledge to help policy decision-making, is another significant factor that shapes German STI internationalization strategy. German research and intermediary organizations' overseas offices serve as a vital network for the exchange of knowledge and information pertinent to various policy domains.⁵⁴

⁵³ Verges, S. & Navarro, L. Closing the Gap Between Emerging Initiatives and Integrated Strategies to Strengthen Science Diplomacy in Latin America. *Front. Res. Metr. Anal.*, 12 April 2021

⁵⁴ Los Lijte. *Innovation in International Relations Policy and EU Diplomacy*. 2019.

A distinguishing aspect of STI policy formulation in the UK is the STI internationalization policy framework. The UK is distinguished for a robust "science as diplomacy" ahead of other European nations. In 1995 as a result of a government reform to a single government agency, the agency of Trade and Industry, which was later replaced in 2007 to form a business-led innovation and skill-centre division is mandated with strengthening cross-governmental cooperation of scientific policies. Each scientific advisor is supervised by a Government Advisor who provides advice to the Prime Minister. The Chief Scientific Advisors Council serves as a platform for the various Government Advisors to coordinate their efforts.

The UK's new institutions (which include the GSIF, SIN, and CSAs), continues to expand and evolve in order to better coordination among its active actors. The UK also has significant competence, with a range of institutions and STI policy research centres. Both institutions have made STI internationalization a research priority, joining British think tanks like Demos and Nesta in this endeavor. A scientific Policy Center has been established by The Royal Society to address issues related to scientific diplomacy, and it routinely publishes on global science and innovation systems.⁵⁵

1.10.4 Role of STI in Promoting FDI Through Diplomacy

In today's world, STI plays a crucial role in advancing a nation's national interests and tackling global concerns. International scientific collaboration is used to fulfill the role of STI in fostering and securing FDI. Foreign direct investment (FDI) has historically been seen as having the most

⁵⁵ Witjes, N. & Sigl, L. The Internationalization of Science, Technology & Innovation (STI): An Emerging Policy Field at the Intersection of Foreign Policy and Science Policy? 2015.

immediate effect on the productive structure of the recipient nation among the many types of capital input. On how precisely FDI-related policies fit with other STI initiatives to advance diplomacy, there is disagreement, nevertheless. FDI is currently used by governments as an instrument in foreign policy, stimulating the macroeconomic parameters of the host nation. According to Dhiraj, FDI offers the chance to contribute to a nation's economic development and boost growth.⁵⁶ The FDI literature is, however, a little disjointed.

Foreign direct investment has proved to be resilient during financial crises. Since it focuses on attracting FDI to a country's territory, opening up foreign markets to domestic businesses and influencing international legislation to further a country's interests. Ideally, the promotion of businesses frequently takes place in an environment of intense competition through STI. In this Focusing on the connection between STI diplomacy and FDI, it is true that the effectiveness of FDI inflows is correlated with the diplomatic network. The relationship between STI and FDI broadens the definition of diplomacy because it encompasses ideas like financial diplomacy, trade diplomacy, and commercial diplomacy. Firms need compelling reasons for investing in order to have the fortitude to take the risky step of expanding through FDI. Researchers contend that the current focus of STI diplomacy is on conducting global business through economic diplomacy on global trade.⁵⁷

⁵⁶ Dhiraj, A. The impact of FDI on New Economies. 2021.

⁵⁷ Santos, D. FDI and Economic Diplomacy in Investment Agencies. 2021.

Perhaps the most obvious distinction between the two nations is the volume of Chinese FDI in the construction industry. With new infrastructure and development projects being backed by China, Chinese construction businesses are progressively entering the African market. China is a key player in global trade and is increasingly shaping the economies of African countries through its power of technology and innovations. STI is a foundation of economic diplomacy, allowing nations to maximize their gains in terms of trade and investments policies and activities, as well as to enhance their international standing through marketing, branding, and diplomacy. Promoting inward FDI is frequently a crucial component for diplomats. Both diplomacy and FDI promotion are exercises in networking and managing relationships, and diplomats are frequently evaluated on their ability to make contacts. They are required to keep up robust networks of contacts, frequently include important commercial players. Diplomats have excellent communication skills and are prepared to promote their own nation as an investment destination.⁵⁸

The notion of FDI as an economic catalyst is based on the fact that MNCs are better-suited to leverage on technological transfer of innovations in host countries. In this sense, applications in STI are channeled through business and enterprise development, knowledge exchange and scientific discoveries mainly targeted at unlocking development potential for developing countries. Studies demonstrate how FDI is enhancing competition in trade, as companies compete to stimulate investments. Thus, this competition is also an engine for testing science and technology innovations, that also promote diplomacy.

⁵⁸ Debongo, D. China's FDI on African Inclusive Development. 2022.

In the diplomatic arena, FDI is seen as a determinant in facilitating R&D through STI initiatives. Empirical studies by Mohammed and Nie explored technology and emerging innovations and how they influence FDI in Egypt. Their study focused on economic growth as a key indicator, assessing trends in technological progress over a span of 30 years, using models and statistical integration tests. Their study showed a linkage between FDI and growth in economy, driven by technology. In a study by Dash, the nexus between FDI and economic outputs in India were assessed. The study established a nexus between FDI in expanding industrial and manufacturing sector in India. FDI exports contributed to economic growth and cooperation with other countries like China in digital trade.⁵⁹

Other scholars highlight the critical role of FDI inflows and their capability to shape local business suitability. For example, Blomstrom argues that FDI benefits can only be deemed beneficial if such investments allow domestic enterprises to adopt new technologies and capacities to enable them compete globally. In this sense, domestic firms before subsidizing international firms.⁶⁰ In view of the above empirical studies, FDI presents a unique opportunity for advancing foreign relations through economic diplomacy. Every country is now positioning itself through diplomatic strategies to gain competitive edge through STI.

⁵⁹ Mohammed, M. & Nie, G. FDI and technological innovations for economic growth. 2021.

⁶⁰ Blomstrom, M. The effects of FDI on development. 2001.

1.10.5 Role of STI in Promoting Strategic Partnership Linkages in Diplomacy

A conceptual understanding of STI in modern economies is linked to new ways in which diplomacy is provided by the phrase "soft power," which Joseph Nye first used in 1990. In contrast to conventional notions of power in the international system, soft power stresses appeal as a tool for achieving goals rather than force or financial gain. A nation's beliefs, legislation, and culture influence attraction. Thus, a shift from hard power is inherently aligned to "getting others to want the outcomes that you want," as opposed to "getting others to do something they would otherwise not do." Recently, "soft power" entails a tool for states to advance their national interest through knowledge and scientific discoveries, which form part of their grand strategy for solving global challenges. It expands to how an ecosystem of experts and policy think tank can spread its influence beyond their country, seeking to address common challenges through science and technology, while at the same time driving innovative tools applied in diplomatic channels. This form now represents a critical pillar for states and their power to also manage decision-making on foreign policy matters.⁶¹

There is still a lot to understand about how STI and diplomacy interact in Africa, a relationship that goes far beyond developing local or global scientific collaborations and is indicative of broader foreign policy goals. Examples of strategic partnerships that have been studied in the healthcare sector include the management of communicable and noncommunicable diseases (NCDs) through cost-effective transnational policy and governance interventions, the creation of

⁶¹ Witjes, N. & Sigl, L. The Internationalization of Science, Technology & Innovation (STI): An Emerging Policy Field at the Intersection of Foreign Policy and Science Policy? 2015.

regional research centers of excellence, the development of medical products, technologies, and processes, and the creation of a shared information system.⁶²

Research and development must continue in order to generate cutting-edge remedies, such as updated vaccines for diseases like malaria and HIV/AIDS as well as many others that are susceptible to becoming epidemics. The resurgence of the Ebola pandemic on this front highlights the urgent need for a globally coordinated approach that is regionally integrated and knowledge-based to enable rapid diagnosis, isolation, and care of those who are ill. For existing bilateral and multilateral collaborations as well as freshly developing projects, the bilateral and international STI collaboration is essential for leveraging the benefits of rapid technological progress. This is especially important for the least developed nations since they have inadequate ability to detect and handle STI and diplomatic potential.⁶³

1.11 Critique of the Literature

The role of STI and diplomacy, in particular, is this thesis' primary contribution to academic literature. the lens of state bilateral and multilateral relations. However, while STI has been adopted for promoting soft power, empirical studies do not offer the critical discourse on STI and the extent to which it fits the legal and institutional strictures. Moreover, STI is presented in the context of varying institutions and states capabilities, which aim to address global challenges. Yet, STI falls within different phases that consequently affect how it aids in diplomacy in Kenya.

⁶² Qiang, C.Z., P. Kusek, V. Steenbergen, and B. Viney. 2021. "The Road to Recovery in Sub-Saharan Africa: Capitalizing on Transformative Opportunities from Shifting FDI Patterns," World Bank Blog, Africa Can End Poverty, The World Bank, Washington, D.C.

⁶³ Toure, M. Integrating Africa: Prospects and Promise for Science Diplomacy. 2018.

1.11.1 Research Gap

Governments are becoming more interested in utilizing Science, Technology and Innovations (STI) as a key instrument of international relations. Yet, despite the STI trends, there is still a need for a practically useful analytical framework that allows for the assessment of how developing countries like Kenya are utilizing STI to promote diplomacy. While progress in STI is commendable, the paucity of research on interface amongst foreign policy dimensions also limits the role of institutions and the STI legal framework has being aligned to promote Kenya's diplomacy. From the literature, it is evident that Africa's diplomatic history is young, and there is still much to be done. Although much research has been done on technology and digital revolutions, an analysis of effective uptake of STI to advance foreign policy goals is needed in the Kenyan context.

1.12 Methodology

The study combined quantitative and qualitative methods. However, it gravitated towards qualitative because of the key aspects regarding the STI trends and the legal and institutional frameworks that demonstrate the nexus between STI and diplomacy. Given the nature of the study, and various institutions related to STI and diplomacy, the research approach was to identify a design that allowed for exploring the broader views and outcomes, especially through qualitative paradigms. Thus, the concept of STI was granted emphasis from data gathered from various sources, largely drawn from states agencies and foreign affairs covering STI issues.

1.12.1 Research Design

The study relied on a cross-sectional pragmatic design and utilized both qualitative and quantitative approaches. This approach was useful in gaining an in-depth exploration of the problem under investigation. Since the thematic area of STI is a complex area, along with diplomacy, the need for a clear review of existing policies and experts to unmask the context and experiences informed the choice of the design. A cross-sectional design also offers a wealth of material for developing theoretical concepts. The study examined the function of STI in fostering diplomacy in Kenya utilizing both qualitative and quantitative research methods.

1.12.2 Population

Population in research refers to the overall subjects that inform the choice of a sample for investigation. Thus, institutions both public and private, involved in, or supporting the integration of STI and diplomacy at both local and international level.

1.12.3 Target Population

The target population is a group or a set of individuals or group within a given population with some characteristic that can be identified by the researcher. 90 specialists from the National Commission for Science, Technology, and Innovation (NACOSTI), Kenya National Innovation Agency (KeNIA), National Biosafety Authority (NBA), Ministry of Foreign Affairs (MFA), KEMRI, and KALRO made up the target population. In addition, key institutions involved in STI were considered, such as: JKUAT and TUK. The population was 90 institutions engaged in STI as well as diplomacy and foreign policy matters in Kenya, as indicated in Table 1.1.

Table 1.1 Distribution of Target Population

No.	Target group	Total Sample
1.	National Commission for Science, Technology and Innovation	12
2.	Kenya National Innovation Agency	8
3.	National Research Fund	12
4.	The National Biosafety Authority	8
5.	Ministry of Foreign Affairs	15
6.	Kenya Agricultural and Livestock Research Organization	9
7.	Kenya Medical Research Institute	6
8.	Kenyatta University	12
9.	Technical University of Kenya (TUK)	8
	TOTAL	90

1.12.4 Sampling Frame

Obtaining a good probability sample is essential in order to ensure the research represents the population. It thus helps a researcher determine a set of elements from the target population. For an effective generalizability and repeatability of research findings, identification of a good sample size is essential.⁶⁴ The sample size for a study of this kind is decided after taking into account a number of parameters. This was a crucial factor to take into account when conducting a cross-sectional study on STI and diplomacy in Kenya, where, for instance, a maximum of two key informants with trustworthy information were chosen from among the institutions.

The determination of the sample size was based on specific inclusion criteria. Inclusion criteria was thus based on considerations of key personnel involved in Science, Technology and

⁶⁴ Delice, Ali. The Sampling Issues in Quantitative Research. 2018.

Innovations at policy and developmental level, and or charged with coordinating the legal and institutional frameworks on STI and diplomacy at national and bilateral levels in Kenya.

The sample was reached at using a sample statistical formular,⁶⁵ as follows:

$$N = (ZS)^2/E$$

Where;

N= Sample size

Z = Standard value corresponding to a confidence level.

S = Sample standard deviation or an estimate of the population

E = Acceptable magnitude of error (Sampling Error).

Thus,

$$N = (0.05 \times 90)^2 / 0.001 \text{ (at 95\% confidence level).}$$

With these factors in mind, the calculated sample was 30. This sample size was deemed fit and adequate to draw valid and generalized conclusions regarding STI and its role in influencing foreign policy matters pertaining to diplomacy. Studies have documented the determination of sample size parameters, highlighting that adequate sample size requires specific information about the problems under investigation in the population under study.⁶⁶ This study relied on key institutions engaged in STI, diplomacy and foreign policy issues; including information about

⁶⁵ Krejcie, R.V., & Morgan, D.W. Determining Sample Size for Research Activities. *Educational and Psychological Measurement*. 1970.

⁶⁶ Singh, Ajay. sampling techniques & determination of sample size in applied statistics research: an overview. *International Journal of Economics, Commerce and Management*, Vol. II, Issue 11, 2014.

sampling frames and their coverage. Other researchers such as Mugenda and Mugenda⁶⁷ recommend adoption of a thirty-percentage ratio of the total population for smaller population. According to Mugenda and Mugenda, a 10%-30% ratio of the total population is deemed enough for descriptive studies.

Kirsti and Siersma⁶⁸ have also reiterated that choice of a sample size is dictated by the purpose of the study, intended outcome and data quality from the respondents. These key fundamentals of data and their pertinent scopes also guided the sample size determination for this study. In support, Singh and Masuku⁶⁹ posit that mixed methods research employ sample sizes based on proportionality estimates, and in scenarios where a sample is small, then the researcher has to deploy a wide range of data collection instruments to avoid biasness. Therefore, the researcher captured key respondents' views in validating the study's objectives. Given that STI and diplomacy initiatives have been largely driven by public and policy practitioners, the sample size was appropriate in bringing out the balance of key actors from STI and foreign policy experts in different diplomatic governance levels across the various sectors, as displayed below.

⁶⁷ Mugenda, O., & Mugenda, A. (2003). Research methods quantitative and qualitative approaches. Nairobi: Act Press.

⁶⁸ Kirsti, & Siersma, V. Qualitative studies and sample size determination. 2016.

⁶⁹ Singh, A. & Masuku, M. Sampling in statistical research. 2014.

Table 1.2 Sample Population Distribution

No.	Target group	Total Sample
10.	National Commission for Science, Technology and Innovation	6
11.	Kenya National Innovation Agency	3
12.	National Research Fund	3
13.	The National Biosafety Authority	3
14.	Ministry of Foreign Affairs	4
15.	Kenya Agricultural and Livestock Research Organization	4
16.	Kenya Medical Research Institute	3
17.	Kenyatta University	2
18.	Technical University of Kenya (TUK)	2
	TOTAL	30

1.12.5 Sampling Techniques

Sampling is a technique involving the selection of groups in a populace to obtain a representative sample. This process ensures that the features on of the entire cluster are taken into account. The selection and grouping criteria form part of the principles utilized in classifying and obtaining key information from participants of the research.

The study used purposive sampling, because of the nature of the study, where the targeted institutions and groups were based on the prior judgement of their critical role in STI ad diplomacy. Unlike other sampling techniques, purposive sampling was relevant because the aim is to focus on specific aspects that define the study. As a result, the major goal of the study must be matched with the justification for sample selection. A small, purposefully chosen sample was excellent for the study because it was more qualitative in nature. The researcher's objective was to identify important informants who were more likely to provide pertinent and valuable data on current STI trends, the relationship between STI and diplomacy, and the institutional and legislative framework of STI in advancing Kenya's diplomacy.

1.12.6 Data Collection Procedure

The sources of data, including primary and secondary sources, have an impact on the nature of results obtained from a cross-sectional pragmatic approach. In this case, the researcher utilized interviews targeting key policy experts in the STI sector, questionnaires as well as document analysis in this study. Based on document analysis, secondary data from case studies was gathered.

1.12.7 Questionnaires

Data collection was through a structured questionnaire targeting experts with experience in the disciplines of STI and diplomacy. The questionnaires were hand-delivered, and each respondent responded independently to the questions. The questionnaire was occasionally emailed to important informants who operate outside of Kenya. To gauge the degree of agreement or pleasure among respondents, a rating scale (Likert scale) was also employed. Key informant interviews were utilized, drawing critical information from policymakers, top STI experts, representatives of important STI state institutions and Foreign Affairs.

1.12.8 Secondary Data

Specifically, qualitative case studies, policy papers, and current STI and diplomatic governance framework publications, books, journals, articles, and magazines were used as the primary sources for secondary data collection in this study. To give the course breadth and depth, all of these case studies centered on current issues at the nexus of STI and diplomacy. International organizations collaborating with Kenyan institutions on STI concerns were also consulted to strengthen the study's data.

1.12.9 Pilot Study

Piloting in research represents an important preparatory step to ensure quality of the actual research. A pilot test ensures that a researcher puts in place quality data and evaluates the instruments before the actual study is undertaken. The authors add that such a preparation ensures that an investigator obtains methodological findings in a systematic manner. Piloting thus has the potential to improve research quality when organized and handled carefully since results from the pilot test may provide information for other stages during the stages of the study.

Piloting phase for this study was conducted at the Ministry of Agriculture and Health. These two institutions were selected because of the ease of access and target key informants. While this study sought to rely more on qualitative methods, the pilot test was essential in assessing the efficacy of research instruments. This trial process helped the researcher to be aware and ready for any difficulties that might arise in the actual study, which increased trust in the data gathering tools.

1.12.10 Validity of Research Instruments

The validity of the tools used in research technique, which is an essential element for the research to yield usable results, describes the accuracy of a measure. If a measurement tool accurately captures the behavior or attribute it is designed to measure, it is said to be valid. This indicates how effectively the measurement device serves its purpose.

In this study, validity was measured using content analysis through critical review of all aspects related to STI and diplomacy tools. Key indicators as demonstrated in the conceptual framework were used to map the test, while comparing against the variables to limit any biases. The Ministry of Foreign Affairs and NACOSTI's key objectives for diplomacy were therefore compared with

Kenya's current STI policy using content analysis. With the help of specialists and a supervisor, the questionnaire and interview schedule were both assessed and reviewed for each set of items. Before the field research itself, contentious questions were altered.

1.12.12 Reliability of Research Instruments

The consistency of a research tool's results across trials by several researchers is referred to as the tool's reliability. In this case, the questionnaires and interview guides should reflect a tendency toward consistency based on repeated measurements to ensure they are reliable. To assure the instruments are reliable, two pilot tests were conducted. The results of the first and second pilots were then compared, and any changes in the feedback were confirmed using the instruments (questionnaire and interviews). The dependability of the instruments was then determined through computation of the relationship.

1.12.13 Data Analysis

The study relied more on STI and diplomacy practice, increasingly informed by qualitative data and document analysis, as well as quantitative research. In this regard, qualitative data formed a major part of the research, based on descriptions of STI setting within the diplomacy discourse. A qualitative inductive approach was used, whereby the narratives from respondents formed part of the main data, while themes were included in the discussion to reach conclusion. These themes arose from interview responses, case studies and document analysis to identify the relationship between new knowledge generated from the experts and previous case studies.

Qualitative analysis for data obtained from interviews was evaluated and selection of key quotes obtained that represent the research. These excerpts were used to illustrate the findings using direct quotes from the participants. Both content analysis and narrative analysis was used to categorize key themes arising from the study, based on research objectives. These narratives were then integrated within the research, taking into account each case and related empirical studies for interpretation.

Descriptive analysis for quantitative data was undertaken, using SPSS. Data were first imported into the computer, coded, then descriptively analyzed using frequency, percentages, while utilizing descriptive statistics. Tables and charts were used to present the analysis' findings.

CHAPTER TWO

CURRENT TRENDS OF SCIENCE, TECHNOLOGY AND INNOVATION IN PROMOTING DIPLOMACY IN KENYA

2.1 Introduction

It is evident that the 21st century has witnessed an emergent of new forms of technologies, discoveries and innovations that now shape the global sphere. For the developed economies, advances in new STI trends have been driven by technology, with AI, quantum computing, 5g mobile, blockchain, IoT now shaping not only the business and economic sectors, but also political discourse. In addition, advances in ICT, biotechnology and nanotechnology are also necessitating bilateral linkages and collaborations to meet the competency gaps. As the trends continue to evolve, new actors are also emerging on the international stage, with a shift from the state as the main actor, to a sphere where non-state actors are also at the centre of diplomacy. This new dimension is a key growth-indicator for developing countries, particularly for the African continent. These new trends are now placing innovation further on diplomacy, as the international relations stage keeps changing to seek a balance.⁷⁰

This chapter provides an analysis of the trends in Science, Technology and Innovations (STI). It identifies major themes of STI trends, their current setting and mainstream application in relation to diplomacy.

⁷⁰ Kufeoglu, S. Emerging Technologies in Sustainable Development. 2022.

2.2 Emerging Technologies Influencing Diplomacy

In exploring the emerging technologies, the study first sought to establish new technologies at centre stage in Kenya. Results are presented in Figure 2.1.

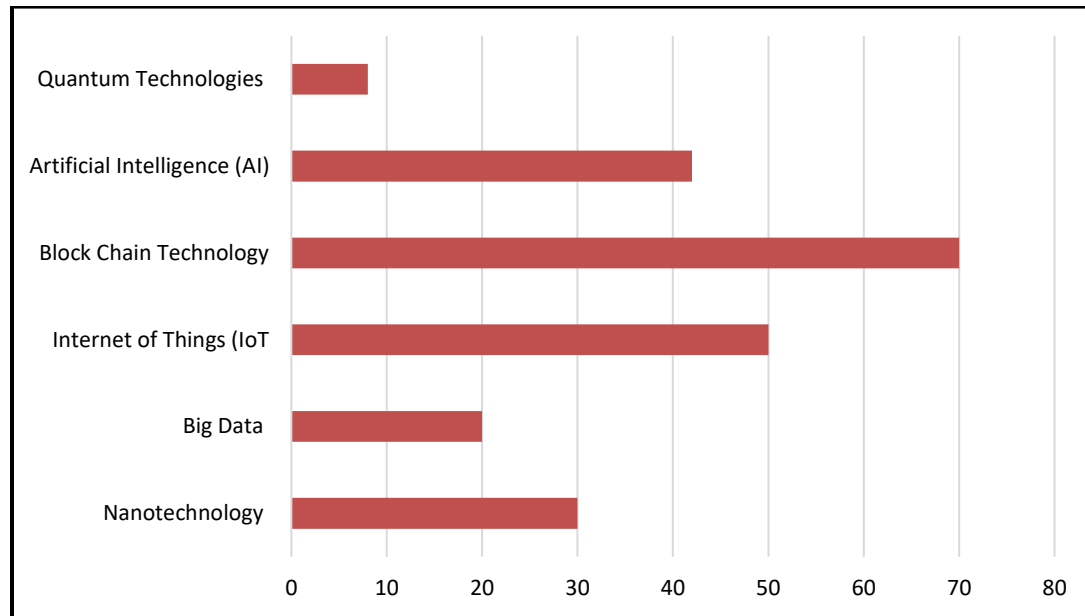


Figure 2.1 Key Emerging Technologies

Figure 2.1 shows various forms of emerging technologies, from Block-chain technology (70%), Internet of Things (50%), Artificial Intelligence (42%), Nanotechnology (30%), Big Data (20%) and Quantum technologies. Within the STI discourse, these emerging technologies are now shaping the interaction between international organizations, private companies and national governments. The results suggest that Kenya is embarking on an innovative journey through a number of institutional transformations, one of which involves emerging technology. Within the STI perspective, emerging technologies present opportunities and value in Africa, largely contributing to a transformation of the export and import market for products and services.

In Kenya, blockchain technology is still in development. People and companies are starting to accept the new phenomenon, which has gained popularity due to the rise of Bitcoin. The adoption of BitPese, a platform for money transfers that converts digital currencies like Bitcoin to the regional African currency without the help of intermediaries, is on the rise in the nation. The National Transport Safety Authority (NTSA) in Kenya has connected numerous state institutions to its service in order to warn security about car insurance and other crucial information like ownership.

The majority of public hospitals in Kenya share a central hub where data like the usage of public resources and hospital management can be monitored. The Kenyan health sector has also implemented a smart platform that uses Blockchain technology. The creation of a cloud-based database is being used to carry out the task., with Kenya-UK pact in creating a special purpose vehicle as a platform to harness all trade logistics (TLIP) thus doing away with paper-based processes and replace them with digital ones that improve visibility throughout supply chains. The system links everyone in the supply chain using blockchain technology in an effort to facilitate quick logistical clearance and simpler trading. This was accomplished by MoU between TradeMark East Africa and the Institute of Export and International Trade in July 2021 at the Kenya High Commission in London. The Memorandum of Understanding (MoU) offers a structure for cooperation to establish a digital trade corridor between the UK and Kenya.⁷¹

⁷¹ Mathenge Oliver. UK-Kenya Partnerships in Block-Chain Technology Trade Logistics. 2021.

Internet of Things utilizes a rather combination of all the other technologies and has become a common solution being adopted in various sectors. In Kenya, IoT has been documented in various firms, particularly the case of telecommunication sector and water supply sectors.

There is a partnership case where Esri Eastern Africa offering real-time mapping platform clear monitoring in water utility (EWASCO), and is helping ensure effective service delivery for water consumption patterns and needs in the city.

Notably, the new Internet of Things (IoT) network targets utilities that employ smart meters for energy, water, and power, and it has completely changed how transportation businesses manage their fleets of vehicles. For example, some greenhouse farms in the agriculture sector utilize IoT devices to track temperature and humidity levels. Another illustration is the collaboration between France-based network operator Sigfox and Kenya's Internet Service Operator Liquid Telecom to build an IoT network.⁷²

Artificial Intelligence (AI) is another emerging technology, driven by the Fourth Industrial Revolution. AI is aligned with computer science that incorporates machines with artificial intelligence that can accomplish activities that ordinarily need human intelligence. Kenyan government has made steps towards AI in agriculture. Key informants noted the following:

AI is gaining ground in Kenya, in agriculture sector, where tractors, sprayers, or combines automatically navigate through the field and only sprinkle fertilizer where it is needed. Today's combine harvesters are capable of measuring harvest yield in real time, assisting farmers in identifying fields with high and low yields. Examples include AI applications in agricultural practices, such as monitoring crops and yields through technology, these applications provide real-time data and are able to forecast crop yields through satellite images and drone technology.

The views provide case examples of how AI is shaping agricultural production. Such automated systems, such as robotic drones are now seeing enormous benefits in improving efficiency in agro-

irrigation and agri-business, through monitoring techniques that relay data on moisture content, pesticides and expected crop yields. Given that food security is now a national and global crisis, STI is now seen as a key driver through which states can advance diplomacy, through diplomatic and bilateral cooperation. Technologies are now utilizing intelligent sensors, supported by visual data relayed by drones that have the capability to infections in farms crops.

With regards to nanotechnology, Kenya launched of a nanotechnology and semiconductor manufacturing factory in Nyeri County, making a statement about its goal of utilizing public-private partnerships to further the government's manufacturing strategy for the nation's development. The business manufactures nanotechnology-related integrated circuits, sensors, and other goods for the global market. Big Data is also an emerging technology supporting business, as affirmed by one expert:

The emergence of big data and its analytics is gaining ground in Kenya. Companies are now tapping into big data technology for decision-making in business, industrial and even political interest. To an extent to which such are being tapped for diplomacy remains unclear.

These views above point to slow adoption of certain emerging technologies in Kenya, and Africa at large. The slow pace in utilization of emerging technologies in Africa has been attributed to limiting regulation on the continent.

R&D and innovation in new and developing technological fields. In a knowledge-based society, technologies like nanotechnology and biotechnology are crucial for fostering national economic progress. Many of our complex technological, environmental, and economic issues can be resolved in a sustainable manner by harnessing emerging technology areas. These technologies have the enormous potential to offer creative and affordable solutions in crucial areas of sustainable

development, such as reducing climate change through storage technologies, providing clean water and wastewater treatment, ensuring the safety of food, boosting agricultural production, preventing disease, and ensuring access to healthcare.

Nanotechnology has a wide range of uses, including improving crops' capacity to absorb nutrients, improving agricultural soils' ability to bind water and retain moisture, purifying water and wastewater, detecting toxins and bacteria in food and boosting the effectiveness of solar cells. Nanomaterials are being developed to create nanoporous membranes for oil spill cleanup, and other environmentally friendly technologies that will lower CO₂ emissions and energy use in buildings and transportation. Similar to this, it is commonly agreed that other industries have great promise, such as biotechnology, ICT, and new and renewable energy.

The study posed the following questions to better explore this aspect: To what extent has Kenya embraced technological endeavours such as emerging technologies in promoting diplomacy?

Results are presented in Figure 2.2.

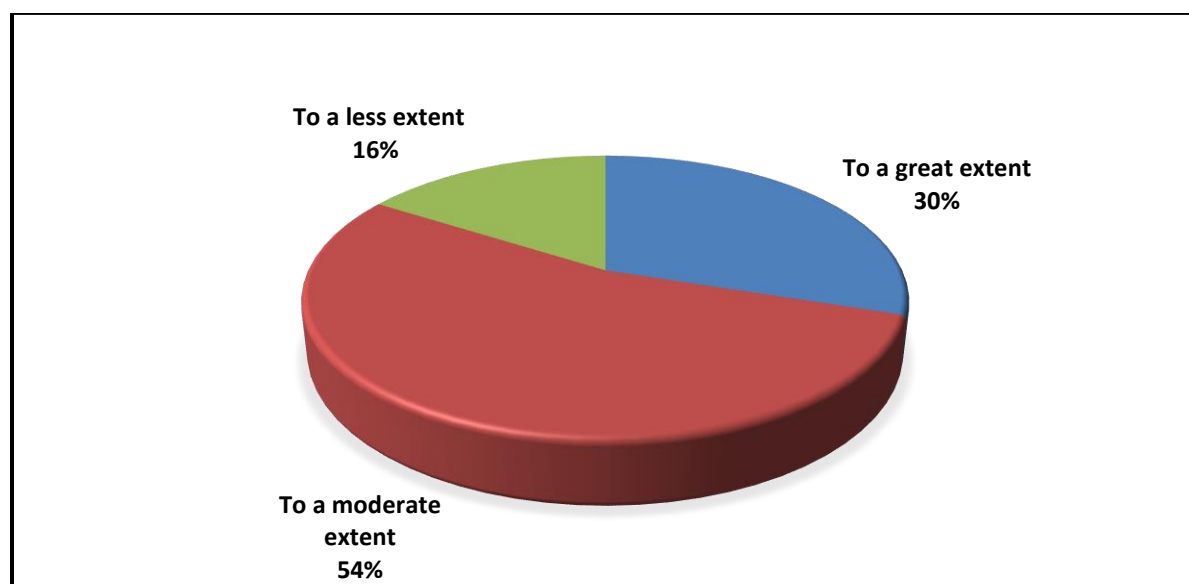


Figure 2.2 Emerging Technologies Influencing Diplomacy

Results in Table 2.1 reveals majority said to a great (54%), 30% said great extent while 16% said to a less extent. What this means is that emerging technologies are indeed powerful forces altering existing patterns in global activity in STI, and their influence on diplomacy. So much is happening at the frontiers of technological advancements, with firms pursuing on creative technologies that influence governments in significant ways. However, looking at the results, 16% suggest slow pace among developing countries such as Kenya that face certain barriers that limit their prompt and capability to global networks in STI and diplomacy.

A significant reason behind developing countries' weak uptake of STI in diplomacy could be the slow rate of innovation, often linked to budgetary constraint by governments. This place private firms in the forefront in advancing emerging technologies, but are usually challenged by an unsupportive environment that lacks a coordinated national innovation framework.

Results from the interview resonate with quantitative data, as quoted by one key informant as follows:

The country's technological and innovation ecosystem has grown significantly with impressive performance in several global rankings such as the global innovation index. There are still many opportunities to exploit to bridge the technological divide, ensure inclusivity and gender equality in STI.

From the foregoing, it is evident that Kenya has positioned itself as a regional innovation powerhouse in East and Central Africa because to ICT. Kenya's global innovation index increased to 27.5 in 2021 from 26.1 the year before, a change of 5.36%. Kenya was placed 77th globally in the Global Innovation Index (GII, 2019), ahead of Mauritius (93), but behind South Africa (63).

This put Kenya in second place among Sub-Saharan African nations, up from third in 2018 behind South Africa and Mauritius. Kenya is recognized at the GII 2019 as one of the nations that has emerged as a regional innovation leader because to its sustained investment in innovation.

Governments, corporations, and citizens are all being transformed by this cutting-edge technology into a fully digital society. The internet is becoming more decentralized as vital infrastructure, financial systems, and communication channels migrate to it. Technology advancements like blockchain, AI and IoT, nanotechnology, and big data have the potential to significantly reduce the digital gap while bolstering diplomacy and global economic security.

The study's findings make it evident that Kenya prioritizes the use of emerging technologies, which are currently influencing international relations, and that this priority is reflected in the country's adoption of STI trends. This new and dynamic period, driven by globalizations, has presented enormous opportunities an international space for movement of people, goods and services, including knowledge exchange.

Additional interview responses emphasized Kenya's strategic posture and footprint with regard to using emerging technologies as part of Vision 2030 targets, to become a major player on the international stage in STI-driven diplomacy. According to a key informant who was quoted:

There has been a rise in leveraging emerging digital technologies, particularly in the private sector and multinational technology companies making Kenya and Nairobi their sub-Sahara Africa offices examples include IBM Africa Research Hub at Catholic University and Microsoft Africa Development Centre in Nairobi. However, Notably the Public sector is slowly lagging.

Automated clearing methods for issuing declarations, efficient risk management, and non-intrusive inspection tools have all significantly improved Customs' ability to function during the COVID-19 epidemic. Instant information regarding the physical state of a cargo, or even just one item in route, is available thanks to the Internet of Things. It provides us with genuine supply chain visibility. With that comes the capacity to identify and resolve losses, damage, and delays in real-time.

The aforementioned statement highlights Kenya's efforts to shift from being solely an importer of technology to harnessing new technologies for both domestic growth and global placement. The IBM case serves as an example of how developing technologies are essential. For instance, utilizing a blockchain-based finance system, the Kenyan Agri-tech start-up Twiga Foods collaborated with IBM Research to provide 220 food stall retailers across Kenya with access to microloans. The program connects food growers, packers, and vehicles with cell phone technology to provide and convey products straight from farmers to urban stores. All parties involved, including the lending bank, the bank of the borrower, and the loan applicants themselves, may see the lending process in real time thanks to blockchain technology. In fact, new business models, research advancements, knowledge sharing, and even diplomacy are being made possible by developing technologies like the Internet of Things.

In tapping into the emerging technologies, focus has been in utilizing nanotechnology, blockchain, big data and AI and IoT. A case in point is the IT firm, Pawa IT, which is leveraging Google Cloud infrastructure, technologies and services, thereby harnessing business operations and enabling them counter complex problems of scale and operations. For instance, in 2021, Pawa IT worked with the Angolan Government to deploy Google Workspace at ANPG. This project has a large scope in that it supports the operations of the 700 workers in the agency.

Apart from block-chain data, emerging technologies in Kenya have also targeted mobile financial transaction apps, such as M-Pesa, Nairobi's iHub is a coworking space with a technology focus that helps entrepreneurs, researchers, and tech companies. Foreign VCs and multinational corporations like Google and Microsoft have been drawn to Nairobi's other digital incubators and innovation hubs, including iHub. iHub and the national Internet communications technology board collaborated on a number of initiatives. The government also implemented Vision 2030, a plan to build the foundational infrastructure required for further IT advancement. Despite the progress, results from the interview also demonstrated certain gaps, as evidenced by one key informant:

Promotion of diplomacy in Kenya still focuses on old methods of trade and tourism. Kenya does not seem to leverage on technology to analyze big data for trends and new areas of focus on diplomacy.

In view of the above, it could be that Kenya's uptake of big data is still work in progress, and has not been operationalized within the diplomatic functions. Big data is based on the idea that there is currently more information available than ever before and that this information is being used in astonishing new ways. Big data is unique from the Internet, and because of its expanding importance, many businesses, including international trade, are now able to harness industrial value chains. However, big data technology is also being used in the fields of charity, security, and peace. For operational planning, logistics, and project monitoring, humanitarian and development aid depend on trustworthy data. A number of platforms have been created to enable this and offer open access to information to those working in humanitarian aid. Small businesses and individuals can also increasingly use big data. Important problems about global Internet governance have also become more pressing as a result of its ascent in all spheres of social and political life.

Developed countries like the G20 nations, such as South Korea, Netherlands and France, have pioneered creative industrial revolutions through emerging technologies, such as robotic engineering that are now revolutionizing the manufacturing and distribution value-chain and easing industrial processes. The fourth industrial revolution has opened up the space for emerging technologies, with Germany's industrial tech-programmes, Chinese digital telecommunications and smart manufacturing programs that are pioneering partnerships with countries such as India's cyber-physical systems innovation hub.

Overall, the findings support a Jilani⁷³ research that found that STI are now providing enormous opportunities, particularly for the commercial and diplomatic communities. Studies like this by Khursid⁷⁴ demonstrate the influence of new developing technologies from a diplomatic perspective by highlighting how states have used them to address regional and global concerns in the past and to enhance peace, security, and prosperity. Scientists from the Soviet Union and the West exchanged ideas in order to better understand each other's positions on nuclear weapons control and other relevant topics.

The study findings thus point to the role emerging technologies play in diplomacy, from negotiations and representation in trade, to communication and business transactions and operations, as well as agribusiness and agricultural practices. The role of emerging technologies in expanding and supporting intra-regional and global trade and investment represent their key role in spurring industrial growth and innovation, thereby influencing diplomacy through global

⁷³ Jilani Zaid. Emerging Technologies: A Role for Science Diplomacy. 2022.

⁷⁴ Khursid, Syed. Impact of New Emerging Technologies-Science Diplomacy perspective. 2022. Al-Muqet Laboratories (pvt) Ltd & Region.

competition for new markets. Therefore, provision of frontier technologies such as AI, IoT, big data, nanotechnology and robotics offer tremendous potential for diplomacy. While results show progress being made in Kenya, there is need to steer emerging technological change towards diplomacy and national development.

2.3 New Vaccine Research and Diagnostic Solutions Influencing Diplomacy

The study sought to establish whether the governments' uptake of new trends such as Vaccine research through diagnostics/treatments has been utilized within the national health needs and promotion of diplomacy. Results were summarized as presented in Figure 2.3.

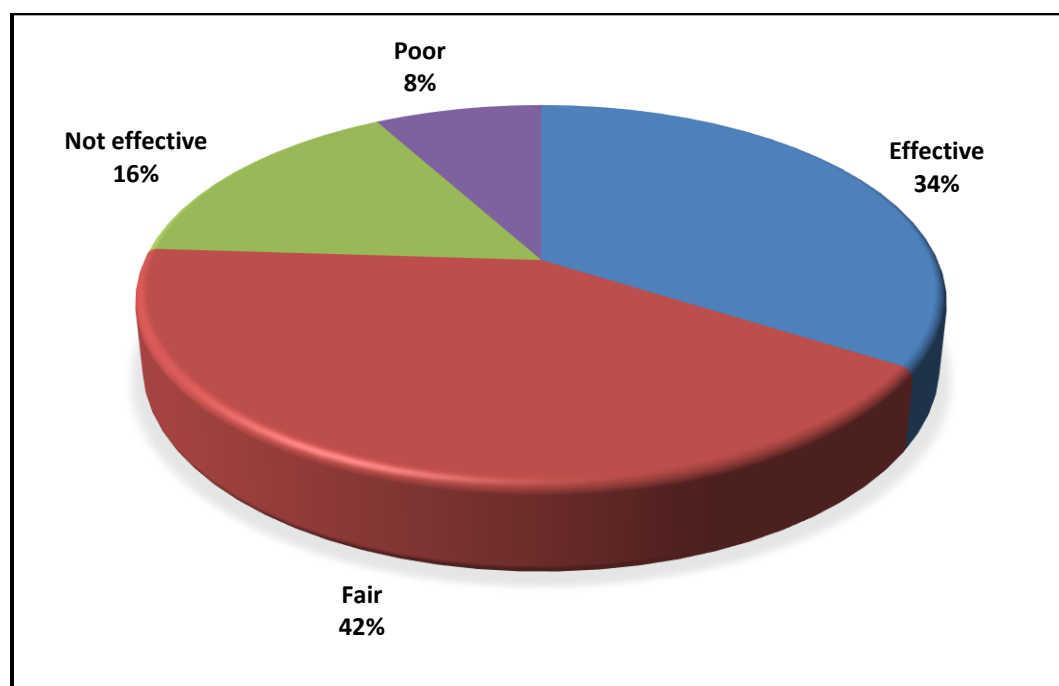


Figure 2.3 Vaccine Research/Diagnostics and Diplomacy

Figure 2.3 shows 42% said fair, 34% said effective, 16% said not effective while 8% said poor. The results paint a picture of vaccines research progress, that has been made possible by scientific and technological breakthroughs. The 34% who mentioned effective as well as 42% who said fair

could be attributed to a steady progress in the surge of genomic sequencing by scientists on the African continent. Nevertheless, figure 2.3 indicates, 16% said not effective while 8% said poor, a clear indication of the fact that progress in vaccine research and the translational applications on the could still be limited by internal and external factors.

The figure also depicts a trend towards the ongoing bilateral and multilateral approached to facilitate vaccine acquisition, distribution and uptake. Notably, Kenya's progress has been witnessed through its unveiling of the new malaria vaccine *Mosquirix*, evidencing the success in health promotion in children and control of malaria.⁷⁵

From interview results, one key informant noted this:

The research on the AstraZeneca Vaccine by KEMRI, Welcome Trust and University of Oxford is an indication of bilateral ties of Kenya with UK. The ongoing Successful rollout of the Malaria Vaccine by KEMRI involves multilateral agreements that includes Africa CDC. Ongoing establishment of a vaccine center by Modana in the country shows an increasing global interest by the growing pharmaceutical companies to setup shop in the country and the facilitative roll been played by the government

The knowledge that is fundamental to the aforementioned viewpoints is Kenya's position in advancing vaccine research is linked to R&D. with the recent COVID-19 pandemic, harnessing STI through bilateral and therefore, a top priority should be given to multilateral R&D with an emphasis on medicines, vaccines, and diagnostics for infectious and noncommunicable diseases. In fact, efforts to capitalize on Africa's strong genomic centres, as well as the wealth and diversity of the African diaspora, are beginning to show results. Another key informant was quoted saying:

⁷⁵ Okwembah, David. New vaccine paves the way for new thinking in malaria research. 2021.

There are now plans to have Kenya join the International Vaccine Institute, as well as progress towards institutionalization of the Kenya Biovax Institute, with partnerships between Kenya and South Korea to produce packaging and commercialization of specialized health products and technologies including vaccines and therapeutics. Kenyan health researchers have been working well in strong collaborations globally. The health professionals in the Ministry are also well recognized in multilateral bodies like WHO.

The above statement reiterates the role of STI through vaccines, and their potential to unlock human changes related to health. At a global stage, Additionally, the foundation of the selective primary care strategy espoused in developing nations like India has been vaccinations. Kenya's ability to develop international relations through health. Sending medical experts to nations like the Seychelles Government to address COVID-19 is another example of a case. The two nations' efforts to forge regional partnerships and collaboration in the fields of trade and technical cooperation benefited from this initiative.

New manufacturing processes and medical advancements are being discovered thanks to biotechnology. Kenya is making progress in the use artificial intelligence (AI) technology solutions. Chatbots that monitor sexual and reproductive health are among the AI technologies used in Kenya. COVID-19 brought to light revolution and opportunities have made vaccinations and diagnostic procedures one of the best approaches to improve STI diplomacy.

In light of COVID-19 pandemic, developing countries such have been adversely affected, increasing demand on healthcare systems and access to scientific and technology (S&T) resources inequality. The pandemic has highlighted the gaps in Kenya's national STI capability for research and development, in particular, one respondent reiterated that:

Kenyan government has been at the forefront of advancing uptake of vaccines, but the efforts are hampered; coordination among key agencies is still weak, including public education, limited health funding among others.

From the foregoing, the progress towards effective vaccine diplomacy requires new measures that deal with limiting factors, both at the local and international level. Since vaccine research and diagnostic technologies require a wide range of stakeholders (scientists, policy makers, universities and international cooperation) for global access, research and development is vital. Through such advancements, a country can harness its soft power and influence in the multilateral system at the global stage. However, the response from interviews above shows that gaps still exist: limited financial resources targeted towards supporting long-term development in R&D from African philanthropists, the commercial sector, regional funders, and governments. Additionally, the lack of local investment in the growth and emergence of the biotechnology sector as well as a shortage of highly qualified and talented human resources may be contributing factors to the grade.

In Kenya, KEMRI and universities have taken up roles in National Emergency response committees to inform surveillance efforts. The data generated through such efforts has helped monitor the spread of the virus while identifying various transmission routes as well as contact tracing.⁷⁶ With such trends in STI, proper diagnosis for the diseases is now proving a success endeavour. For example, COVID-19 cases have prompted the development of testing kits, drugs, medical supplies highlight the trends of STI and cooperation between industry, governments and international organizations. Indeed, we have seen applications of innovations and scientific

⁷⁶ Ndege, N., Atela, J. & Mbeva, K. Harnessing the Applications of Science Technology and Innovation in the Fight Against Covid-19 And Future Pandemics: Lessons for Science Policy. 2020.

technological solutions in the development of testing kits that are able to test and results achieved within the shortest time possible. Data applications have also supported these efforts.

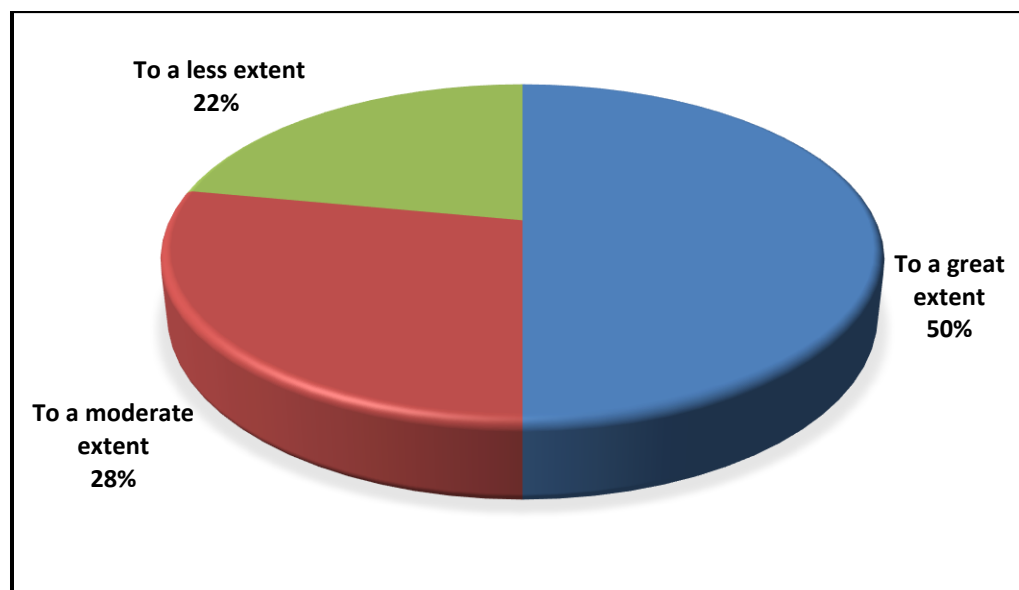
Western nations generated excellent and unique vaccinations during the most recent pandemic and saw themselves as industry leaders. But their attempts to change vaccine policy politically fell short. COVID-19 strengthened state power on the international scene. Only state monopolies could deliver the swift, all-encompassing, and highly centralized solutions that the pandemic required. The creation and use of vaccines were directly impacted by this. But vaccine diplomacy also gave nations with the means to participate a global stage. These countries may openly debate their divergent viewpoints on wider topics, such as models of statecraft and the governance of global health. A primary focus should be bilateral discussions on a global health strategy amongst competitors in the vaccination market.

Enhanced adoption of STI in vaccine research lays ground for R&D, as well as innovative solutions through science diplomacy. Thus, it is clear that STI has potential to contribute to fighting current and future pandemics, based on scientific predictions, surveillance efforts and foresight analysis that can influence diplomacy. Therefore, the study concludes that better coordination to support collective efforts in advancing scientific and technological innovations is key to ensure vaccine research is undertaken as a strategic foreign policy and diplomacy tool.

The findings of this study support a previous analysis by Bhattachanya, Gokdemir and Mehta⁷⁷ that emphasizes the importance of vaccine diplomacy and its rising role in leveraging diplomatic ties and influence over other countries. In fact, the widespread use of vaccinations remains one of the key strategies for developing nations like Kenya to achieve the SDGs and other objectives. Therefore, STI and vaccine science is connected to national efforts of advancing economic influence over other states. The pressing need for vaccine diplomacy thus necessitates nations to build capacities in STI to deal with the re-emerging threats of diseases.

2.4 Uptake of GMOs in promoting Diplomacy

Further analysis was based on identifying GMO issues. The question was: Do you think Kenya has prioritized the uptake of GMOs as part of the meeting global needs and promoting Kenya's diplomacy? The results were presented as shown in Figure 2.4.



⁷⁷ Bhattachanya, S. Vaccine Science Diplomacy in low-income countries. 2021.

Figure 2.4 Uptake of GMOs in prompting Diplomacy

Figure 2.4 shows 50% said to a great extent while 28% said to a moderate extent while 22% said to less extent. The varying responses denote the mixed reactions on how the Kenyan government has made key pronouncements on looking at GMO as part of the key areas to deal with the food security crisis. The 50% who said great extent could be linked to the growing advances in Kenya, as a response to the ongoing drought, to see GMOs in a positive light, as contributing to the food security and economic development. However, 22% showing less extent clearly depicts If certain GMO advancements come under the categories of dual use research or genetically modified organisms (GMOs), for instance, they may cause unease, misunderstanding, and even mistrust in diplomatic and community settings. Generally speaking, the worries are of a biosecurity or biosafety nature, frequently linked to the worries that GMOs might unleash pathogens or that GMOs might occur and harm humans or the environment.

In the African context, GMOs have always been viewed practically as a taboo, strongly avoided by the vast majority due to perceived health risks. Despite the concerns of biosafety regulations, Kenya's decision to lift the ban on openly cultivation and importation of GMO is seen as a response to the drought crisis in the country that has affected the national food basket.

Figure 2.4 also reveals that the GMO debate has also been linked to diplomatic circles, with a progress towards embracing new advances as they emerge. This role played by the enormous increase of global scientific partnerships, represents a clear scenario that GMO is indeed a key diplomacy agenda. Results from one key informant was quoted as follow:

My opinion on this question is highly subjective, however, I believe the government priority to alleviate extreme hunger as part SDG 2, Zero hunger: this it is meeting the global needs for this goal. The questions on the sourcing of GMOs from what is to be imported, and from whom, and

how much will need to be intricately balanced considering the majority if not all of the exporters of the GMO's have banned their use in their countries of origin.

These findings demonstrate that the motivation towards GMOs is linked to utilizing the potential of biotechnology to alleviate hunger and poverty is required due to the rise in global population, fast industrialization, along with food security debate. A consensus must be reached because the majority of African countries are divided on the issue of agricultural biotechnology. This can only be done if African governments are willing to recognize the importance of biotechnology in developing improved crops that support sustainability as well as food and health security in the face of climate change. The next quote comes from another important informant:

Kenya will require scientific collaborations to foster learning among scientists and researchers as well as policy makers in order acquire new knowledge to ensure research and uptake of GMO is smooth and is based on evidence. These GMO emerging technologies are impacting on production as well as on markets.

In view of the above, GM technology thus requires a robust infrastructure, given that the issue It's still debatable whether contemporary biotechnology can handle these particular difficulties as it is right now. Africa has remained mostly indifferent regarding GMO crops due to factors including biosafety and concern over losing export markets, and the legislative frameworks governing biosafety in numerous nations largely hinder their development. Notably, Kenya outlawed genetically modified (GM) foods in 2012 after a contentious study connected them to cancer. However, subsequent reports have shifted toward easing the ban in an effort to use biotechnology research to combat food shortages in Kenya.

Some of the biggest seed firms in the world, including Monsanto (now Bayer), have a history of promoting GM technologies on important crops like maize and potatoes around the globe. However, some contend that East African neighbors like Tanzania and Uganda, which export their excess supply to Kenya, will also be impacted by Kenya's imports of GM foods and food crops. When a market is lost, people lose interest in farming and abandon their land, which opens the door for multinational corporations to purchase abandoned land and cultivate export-oriented commercial crops. This could result in population shifts from rural to urban areas in search of alternative sources of income. It was affirmed that:

GMO crops have potential to increase agricultural sustainability at the farm level by lowering greenhouse gas emissions and the usage of fertilizers, pesticides, and herbicides. The National Biosafety Authority must, however, conduct thorough, independent study on the safety of these foods and crops in terms of their effects on human and animal health.

The above response resonates well to the ongoing debate over GMOs in agricultural and food production systems, evidence by mixed reactions, both at local and international level. Although there is solid evidence that farmers in both developing and developed countries benefit from GM crops, some nations have experienced stakeholder conflicts, with concerns raised over the safety standards and health implications related to GMO crops and products. In Kenya, recent debate on GMO crops remains controversial, even after the ban was lifted ever since it was banned in 2012. Nevertheless, health-related risks and public perceptions on the use of GMO foods is still a major issue. For African nations, the prospect of losing access to markets for agricultural exports has been a major worry.

These findings are in tandem with empirical studies that have shown the African continent's dilemma, confronted with significant obstacles in the deployment of GMO crops. A study by

Akinbo⁷⁸ indicates that due to inconsistencies in the procedures for effective and efficient commercial release while simultaneously maintaining food and environmental safety, African countries confront significant obstacles in the deployment of GMO crops. In light of the aforementioned situation, it is essential that GMOs and diplomacy work closely together to provide a thorough examination of environmental, human health, and safety data. This will allow for the successful and efficient commercial introduction of GM crops.

In light of the aforementioned situation, it is essential that GMOs and diplomacy work closely together to provide a thorough examination of environmental, human health, and safety data.

What comes out from these findings is that the GMO will also subject farmers to onerous intellectual property regulations pertaining to patents held by international GMO corporations. While promoting GMO as a solution to food insecurity amounts to the Kenyan government acknowledging that Kenya has a seed shortage, food sovereignty and security actually rest with farmers who have control over and access to their own seed breeding programs, area-specific infrastructure, and storage facilities. Given the foregoing, Kenya's GMO problem offers a prime opportunity to examine how STI elements and science might enhance diplomacy through institutional reforms.

⁷⁸ Akinbo, O. & Sinebo, W. GMO Crop Commercialization in Africa. Sec. Plant Biotechnology 2021.

Genetically modified (GM) food is the subject of a heated controversy around the world between two opposing viewpoints. The advantages are emphasized by proponents, who include biotechnology firms, trade groups, and some non-governmental organizations (NGOs). Opponents, who are mainly environmental NGOs, contrast this by emphasizing the dangers of related to consumer skepticism and tense public emotions, which have been exacerbated by these divided stances, conflicting messaging, and skewed reasoning. GM foods have been consumed for more than ten years in the US. As a result, the intricacy of the GM food issue is a result of various socially significant forces, such as those associated with the economy, the government, regulations, the media, politics, and religion.

From the results, it can be argued that leveraging agricultural biotechnology calls for a developing STI and society conversation, particularly in view of technological improvements. This indicates that expanding and thorough partnerships between scientists, decision-makers, and society on basic resources like food and health are necessary for development in STI and diplomacy. To ensure that technologies are able to meet global concerns, regulatory viewpoints surrounding those technologies also need to be altered.

2.5 STI Trends and FDI Inflows

The study further assessed how the various STI trends influence foreign direct investments: New trends in STI (such as Vaccine science & GMOs) have created the potential for FDI inflows in Kenya. Figure 2.5 presents the results.

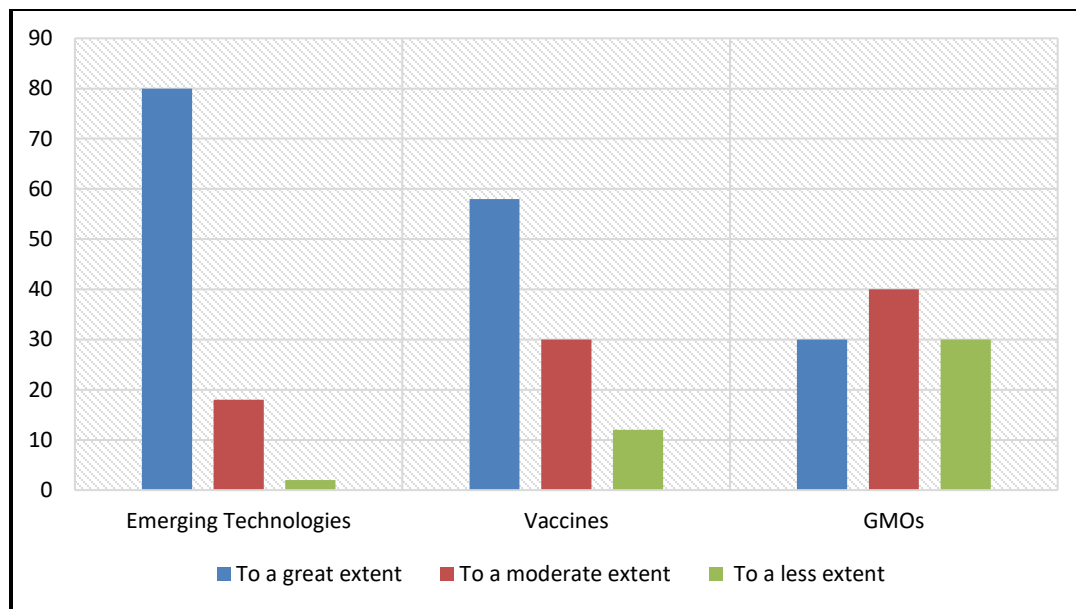


Figure 2.5 STI Trends and FDI Inflows

Figure 2.5 shows how different STI trends have different results in with regards to their effect on FDI. 80% of respondents indicated that they use developing technologies to a great level, 18% indicated a moderate extent, and 2% indicated a lessening of use. In regards to vaccinations, 58% said to a large extent, 30% said to a moderate extent, and 12% stated to a less extent. GMOs were mentioned in relation to a degree by 30%, a degree by 40%, a degree by 30%, and a degree by 30%.

With regards to emerging technologies, 80% said great extent, meaning the emerging technologies are harnessing FDI and diplomacy. The spill-over effect for technologies such as IoT, Big data and AI that multinational corporations introduce spreads to local businesses, promoting FDI. Additionally, trade collaborations facilitated by cutting-edge technology are allowing for knowledge spillovers from foreign direct investment, which is currently having a favorable effect on Kenyan enterprises' productivity. One key informant was quoted as follows:

Through ease of communication, availability of data and information, new technologies and provision of e-services including e-learning particularly during the COVID-19 Pandemic. The contribution to the national innovation system is thus impacting positively on FDI which is extremely beneficial to Kenyan firms.

From the foregoing, it is evident that for host countries, FDI is seen as a gateway to cutting-edge technology. This is done in order to make technology that would otherwise be prohibitively expensive, inaccessible, and based on foreign knowledge. In terms of diplomacy, foreign businesses in Kenya have considerably boosted the economy of the agricultural sector, particularly in floriculture and horticulture. It has been found over a considerable amount of time that foreign direct investment (FDI) has various advantageous externalities in the Kenyan economy. These benefits come in the form of general knowledge transfer, specific production and distribution technologies, industrial upgrading, labor force experience, the creation of trading and financial networks, and the enhancement of telecommunications services.

French companies are now harnessing merging technologies for investment opportunities in Africa. For companies and countries, the ability to support high-level scientific inquiry through FDI is key to unlocking economic growth. Kenya's fruits and vegetable delivery company, Twiga Foods, represents the role of technology and FDI, harnessed to promote diplomacy.

The findings on emerging technologies and FDI are consistent with recent Economic Group statistics, which show that FDI is flowing to a variety of sectors in the region and in Kenya, but ICT is a leading target, both directly, as in the case of data centers, in 4G and 5G mobile-phone networks, and indirectly, as in investment in financial technology (fintech) and e commerce (often

channeled through start-ups), which are disrupting traditional banking and retailing operations. Investment in ICT-related fields such as health, education, and agriculture is also expanding.

Multiple groups are interested in Kenya's under-construction Konza Technopolis. Another important investment objective is renewable energy, both grid-based and off-grid, which is supported by climate change imperatives. Due to foreign investments like the Carrefour franchise, Kenya's retail industry is in transition. There are several instances of foreign direct investment (FDI) in start-ups, such as digital payment and e-commerce operators, in addition to significant investments in fiber networks and data centers. After obtaining US\$180 million in private equity funding from the US company D1 Capital Partners, Bolt Kenya revealed intentions to expand its food delivery and ride-hailing service, including a rollout of electric scooters. The Phatisa Food Fund would receive US\$74.5 million to support agricultural programs, according to an announcement made in the same month by the CDC and development financing organizations from Norway, Finland, and Canada. According to the UN Conference on Trade and Development's (UNCTAD) Technology and Innovation Report 2021, Kenya was the top African market for start-up investment in 2018 with US\$348 million, followed by Nigeria (US\$306 million) and South Africa (US\$250 million), accounting for 90% of the regional total. Fintech was the leading sector with US\$379 million.

With regards to vaccines, Figure 2.5 shows linkages to FDI where with 58% who said great extent, 30% said moderate extent. Notably, FDI can make recovery contributions that go beyond financial. This is because, compared to exclusively local businesses, MNC enjoy a greater resource pool in R&D-intensive investments and are in a good position to assist governments in addressing the pandemic's effects.

FDI inflows should be positively impacted by the creation of PPPs. Despite this, there are still several barriers to investment, including the country's subpar infrastructure, a lack of skilled workers, instability brought on by terrorism risk and political, social, and ethnic divisions, a weak legal system, and corruption. Kenya implemented local participation requirements in 2020 as a result of the epidemic in a number of industries, including insurance, telecommunications, and ICT services. It may be deduced that going future, the requirement to promote developing technologies and vaccines in order to draw FDI necessitates utilizing long-term solutions that connect FDI and diplomacy.

2.6 STI Trends Through Technological Transfer and diplomacy

Further analysis was based on identifying STI Trends and how they promote technological transfer. The question was: To what extent does emerging technologies, advances in vaccine science and GMOs been utilized as a key asset of technological transfer in promoting Kenya's diplomacy.

Table 2.1 Emerging technologies and application in in vaccine science and GMOs

Rating	Emerging Technologies	Vaccines	GMOs
To a great extent	92	50	36
To a moderate extent	8	40	40
To a less extent	0	10	14

Table 2.1 shows varying responses across the STI trends. Regarding emerging technologies, 92% said great extent while 8% said moderate extent, indicating the case of emerging technologies and

disruptive innovations, particularly directed towards businesses and industrial production, military and security surveillance, agribusiness and energy sectors. As discussed earlier, technology transfer is being mediated through: Artificial Intelligence (AI) and associated group of digital technologies like Internet of Things (IoT) and Big Data, blockchain, quantum computing, advanced robotics, additive manufacturing (3D-printing), social networks, the new generation of biotech and genetic engineering and many others. From Table 2.1, there is strong indication national and international measures that transfer of technology.

It is worth noting that global attempts to address development challenges have undergone a shift in recent years. Thus, STI is now taken as a new engine for technological transfer. In 2018, the UK Government announced its ambitious Innovation Partnerships with Africa to help transform societies by increasing economic participation and creating sustainable jobs and growth through science and innovation. Global Alliance Africa is a pioneer project within this new aid agenda, looking to build on already-strong relationships with Kenya, Nigeria and South Africa. As cited by one key respondent:

Global Alliance Africa is a refreshing new approach harnessing the collective power of innovators in Kenya, Nigeria, South Africa and the UK, to drive positive change and create value. It is focused on building long-term partnerships connecting the innovation ecosystems of these four countries, so that innovation stakeholders can come together to share knowledge, learn from each other and work together.

A good example emanates from collaboration between the Kenyan government and UNIDO, with assistance from the government of Japan, to improve Kenya's capabilities to transfer technologies to lessen the effects of COVID-19 and other infectious diseases. The Ministry and NMS worked together with three Japanese businesses as part of a USD 4 million effort by the Government of Japan to transfer technologies and offer technical training to three hospitals in Kenya. Through the

application of the three technologies, the project permitted the introduction of new applications in Kenya and promoted close collaboration with Kenyan partners to give training to technical and medical workers.⁷⁹

Regarding vaccines, Table 2.1 shows that 50% said great extent and 40% moderate extent. This could be linked to new advances such as the UK-Kenya technological transfer, through new health technologies including diagnostics, drugs, and vaccines or satellite technologies to assist rural areas gain access to healthcare and veterinary innovations to protect livestock and combat antimicrobial resistance in Kenya. UK's Science and innovation footprint in Kenya is considerable and growing. An array of partnerships between academics and researchers, both at individual and institutional level. The main bilateral S&I program is the UK/Kenya Newton Fund, launched in July 2016. Activities will focus on food security, sustainable and renewable energy, health, manufacturing for SMEs, environment and climate change and cross cutting issues to include: capacity building, big data, innovation and entrepreneurship.

From the results it can be argued that Governments, corporations, and citizens are all being transformed by developing technologies into a fully digital society. The internet is becoming more decentralized as vital infrastructure, financial systems, and communication channels migrate to it. Web3, blockchain, and AI are recent technological advancements with enormous promise to improve democracy and economic stability globally while bridging the digital gap. These improvements do, however, carry a lot of danger.

⁷⁹ GoK. Japanese Three Technologies to Assist Fighting Against COVID-19 Were Transferred to Kenya. Ministry of Industrialization, Trade and Enterprise Development (MoITED) .2022.

In light of these findings, technology policy will be a crucial and distinctive aspect of Kenya's standing both locally and internationally. Heads of state and diplomats won't, however, be the only ones influencing tech diplomacy. The main force driving an open, safe, and dependable digitalized world for everybody requires maximizing the potential of STI to spur scientific advancement, while ensuring emerging technologies and diplomacy are strategically matched.

CHAPTER THREE

THE ROLE OF SCIENCE, TECHNOLOGY AND INNOVATION IN PROMOTING KENYA'S DIPLOMACY

3.1 Introduction

The role of STI continues to grow, with a rising competition in the international system with an intense pressure on states to define their place in development. While nations differ in their capabilities with regards to harnessing the power of STI, it is clear that strategic role of STI is also being driven by collaborative alignments, seen through North-South relations. For Kenya, its strategic position means that tapping into the role of STI welcome a new era in foreign policy and diplomatic choices. As new products and services continue to crop into the market every day, institutional changes are also being re-designed to match these changes. At a global level, the STI umbrella is now a vital element in national socio-economic, security, environmental and political survival. Scholars and policy makers now contend that STI is now an essential component when discussing matters to do with nurturing international relations. However, the STI pipeline is also an expensive affair, and developing countries are challenged with the rising global competitive space to ensure full benefits for their national development.⁸⁰

This chapter provides findings regarding the critical role of STI and promotion of Kenya's diplomacy. Key indicators covered under this objective include: bilateral scientific cooperations, research and development initiatives (Bilateral & multilateral cooperations) and collaborations in green energy technology. The findings from both questionnaires and interviews are presented.

⁸⁰ UNIDO. The role of science, technology, and innovation policies in the industrialization of developing countries. 2021.

3.2 STI and Bilateral Scientific Cooperation

The question posed was: What role has STI initiatives related to bilateral scientific cooperation played in the promotion of diplomacy in Kenya? Results are presented in Figure 3.1.

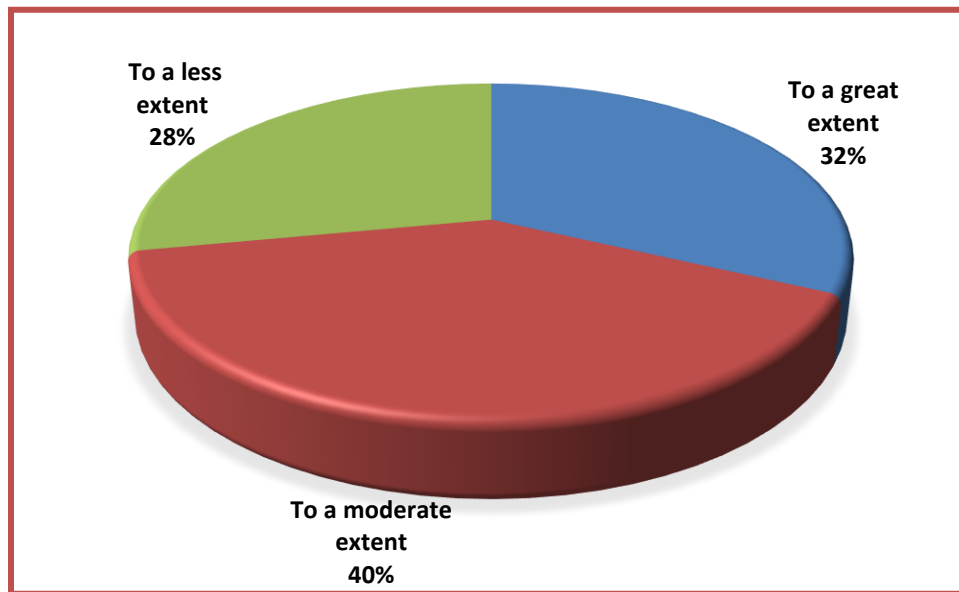


Figure 3.1: STI and Bilateral Scientific Cooperations

Figure 3.1 shows 40% said moderate extent, 32% said great extent while 28% said less extent. What this means is that there is a growing linkage between STI and bilateral cooperation activities that are now influencing diplomacy. However, the 278% less extent means that Kenya has not fully operationalized bilateral STI cooperation agreements through a sound framework for supporting bilateral scientific cooperation.

These bilateral scientific cooperations are now at the centre stage within various Ministries that act as the special vehicles to steer partnerships with other countries. Such programs are also aimed at harnessing key funding mechanisms to promote diplomatic engagements for economic development. Amongst the key areas include health, agriculture and energy, where states have pushed for bilateral linkages in improving access to medication, reproductive health as well as

pandemic research such as the recent COVID-19 pandemic, which has seen various countries collaborate on testing and treatment services.

From the results, the progress for bilateral scientific cooperation can be identified through agencies such as USAID and UKAID, which demonstrate the strong capabilities that USA and UK hold with regards to STI surveillance. For Kenya, the recent COVID pandemic and the growing urgency of the climate crisis are just some cases that bring to light the STI diplomacy, where scientific cooperation is now a growing foreign policy agenda.

Academic exchanges and joint research projects, focused mainly on neurosciences; information and communication technologies; renewable energies and social and human sciences; and academic and industrial research have been idealized through bilateral cooperation between Kenya and its partners such as UK, USA, Japan, China, France and Canada. For example, France, through its French Development Agency (AFD), France is supporting research in universities. A long - term partnership between Kenya and France has existed through advances in scientific linkages, including frontiers in education.⁸¹ Championed through Ministry of Europe and Foreign Affairs. This is also highlighted in key policy documents as follows:

Partnerships seen to strengthen science diplomacy can be informed by the Kenya- France deal in supporting STI in education, targeted in universities as part of a strategics measures to boost Kenya's development, through "PAMOJA PHC" that was launched in 2015. It was renewed on the 6th of October 2021 to cover the 2021-2026 period.

Kenya-France bilateral scientific cooperation is envisioned to steer partnerships as well as excellent innovation ideas, and capacity building among junior researchers as well as strengthen

⁸¹ NRF. France-Kenya Joint Program Cooperation -PAMOHA PHC. 2022.

linkages between research and industry (public and private) entities. Kenya-USA bilateral cooperation in health has been established in to identify, prevent, and treat COVID-19, researchers are working together to develop diagnostics, vaccines, and treatments.

In the recent COVID-19 crisis, Kenya has made great strides to strengthen with USA, particularly with regards to the vaccine diplomacy: this has been achieved through the agreements to have COVAX vaccine doses in Kenya. The US also made commitment; since the start of the epidemic, it has offered medical supplies, personal protective equipment, testing (including genome sequencing), training, surveillance, and research. The HIV/AIDS response in Kenya has also received help from the US government. In addition to treating more than 1.2 million HIV-positive Kenyans, the cooperation has avoided millions more HIV infections.⁸²

The above statement underscores how STI though scientific cooperation are linked to diplomacy. In practice, Kenya's plan for achieving universal health for all Kenyans bring into focus how Kenya's positioning in the region is being advanced through medical research. To promote Kenya's regulation of foods, pharmaceuticals, medical devices, and chemicals, for instance, collaboration on cancer research, evidence dissemination, and training initiatives to strengthen cancer control is intended. These coordinated initiatives, in cooperation with the commercial sector form a basis through which Kenya can launch its own manufacturing of medical supplies, equipment and vaccines. Kenya-South Korea scientific bilateral cooperation has also been on the rise.

The partnership between Kenya and South Korea reflects diplomatic engagements to deepen their relationship in order to aid in the socioeconomic development of both nations. South Korea promised to help Kenya's development strategy to a number of projects in the areas of agriculture, ICT, health, energy, infrastructure, education, affordable housing, and urban transportation. To build industrial facilities in the Konza Technopolis, an export promotion area devoted to the production of pharmaceuticals, vaccines, and value-added agricultural products, Kenya will collaborate with South Korea.

⁸² US Department of State. Joint Statement on the Second Kenya-U.S. Bilateral Strategic Dialogue. 2021.

In view of the above cases, it is evident that strengthening the capacity of scientific research and is key to advancing Kenya's socio-economic development. With such bilateral and multi-lateral cooperation, there are opportunities for knowledge exchange with the states and their private sector programs. In the words of one key informant:

In many cases science diplomacy initiatives exist independent of other diplomatic activities and sometimes are not well publicized, coordinated and documented.

Another respondent was quoted as follows:

Kenya has limited STI initiatives related to bilateral scientific cooperation with a few countries (Established and appointment of STI attaches to High Commission, Embassies and Consulates) as compared to the number of Cultural and Commerce attaches). There is need to enhance and appoint the role of STI attaches to foreign countries to strengthen, develop, and aligned the country's foreign policy and promote STI diplomacy. There is a lot Kenya can learn and benchmark from developed nation, particularly EU and the BRICS frameworks on building STI capacities for diplomacy. Such models have also led to establishment of STI agencies in embassies attached to each of their member states and countries of interest such as Israel, South Korea etc.

The results from the interview show that Kenya has not fully integrated the scientific prowess into the foreign policy pipeline.⁸³ From the point of view of these key informants, it could be that while bilateral scientific cooperations are in progress, the STI diplomacy initiatives are still fragmented, and are not well anchored institutionally. Overall, the way states frame their foreign policy goals and the financing they provide for scientific research and development for national growth present one of the main obstacles to diplomatic engagement. This might also be linked to a change in the internal political landscape or priorities, which would then have an effect on the STI diplomacy agenda. As observed by one of the key informants above, sometimes these STI programmes are not well publicized, coordinated and documented, thus making it hard for them to be prioritized within bilateral foreign policy.

⁸³ Ministry of Foreign and Diaspora Affairs. Kenya, South Korea Pledge to Work Together.2022.

In comparison, studies have shown that countries such as Switzerland, France, Germany, and Japan primarily use bilateral scientific cooperation in order to produce and market their high-tech products, as well as advances in research and higher education. In Kenya, as evidences in the results, often is mediated by actors outside of the state-centric circle, which raises the main challenge on the effectiveness of this action. The results agree with studies by King and Andrade⁸⁴ indicating that in most cases, STI diplomacy has not been successful in Colombia despite the multilateral settings with global partners, often challenged by the traditional cooperation diplomatic activities and weak capacity building. Indeed, the researcher is of the view that promoting bilateral scientific abilities in the scientific community requires a robust framework that anchors policy and the intersection of science diplomacy. While initiatives to promote and strengthen STI activities are demonstrated through institutions such as NACOSTI, NRF, the findings underscore the need to enhance STI governance within the diplomatic framework.

3.3 Research and Development Initiatives and Diplomacy

Further analysis was done to identify research/development initiatives (Bilateral & multilateral cooperations) as part of building STI infrastructure to promote diplomacy in Kenya. Figure 4.2 gives a summary of the analysis.

⁸⁴ King, F., Gnzalez, A. & Andrade-Sastoque, E. Science Diplomacy in Emerging Economies: A Phenomenological Analysis of the Colombian Case. *Front. Res. Metr. Anal.*, 2021

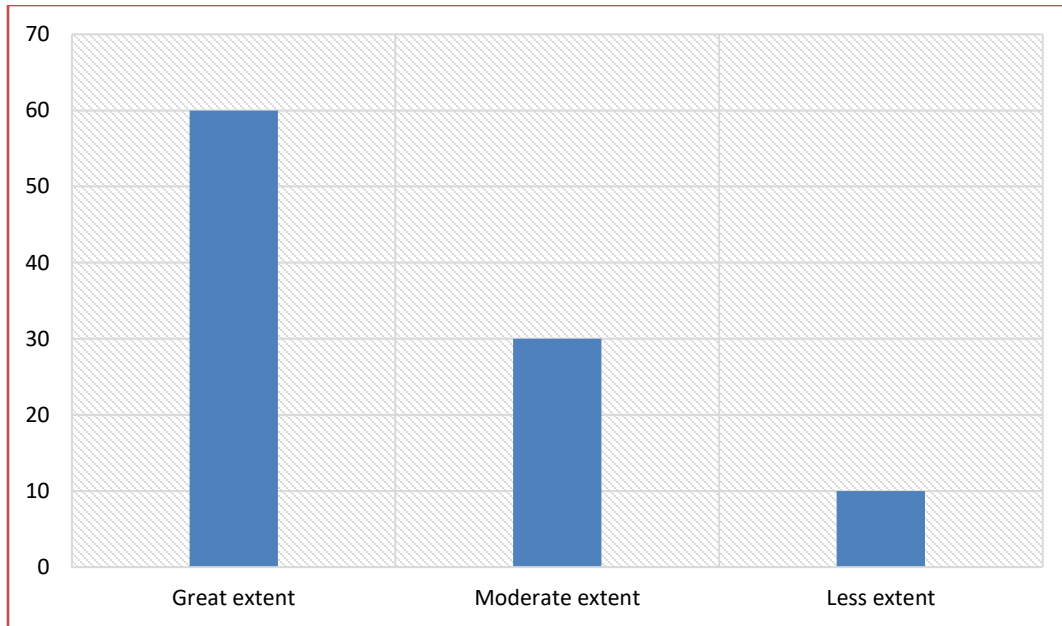


Figure 3.2: Research and Development Initiatives and Diplomacy

Figure 3.2 shows 60% said to a great extent, 30% said moderate extent while 10% said less extent. The results demonstrate a positive trend towards harnessing R&D to foster STI diplomacy in Kenya. This could be attributed to the increased globalization wave shaping the R&D, with countries now opening up research and innovations firms in foreign countries, aiming at promoting socio-economic, environmental and security. In this regard, key developments at the national level have been accompanied by the enhanced funding by a range of public and private as well as MNCs network of actors. From the interview response, one key informant said the following:

NACOSTI has established partnerships with various regional and international institutions to develop and promote STI. As a focal point to various international obligations related to STI, the Commission works with other actors to coordinate implementation and reporting on the progress the country has made towards implementing these obligations in the country.

In view of the above findings, utilizing research and development initiatives is key in shaping a platform for cooperation and diplomatic action that provides global public goods, currently being applied in other emergency development responses to crises. For example, the Kenya-Japan

cooperation, through JICA has continued to provide support for KEMRI as a core research institute. Through R&D, Japan continues to partner and collaborate with KEMRI to support Kenya's health sector in various capacities including the attainment of universal healthcare as well supporting COVID-19 measures, by providing of supplies and equipment including testing kits and testing consumables.

KEMRI has strengthened partnerships with various Japanese Universities such as Nagasaki University to enhance research capacity which has played a prominent role, as it has not only sent research personnel to work at the Institute, but it also provided scholarships for Kenyan research scientists to study in Japan.⁸⁵

With regard to multilateral cooperation, a number of initiatives have been made in Kenya, as evidence by one key informant:

NACOSTI is the Focal point for BTWC, IAEA, CBTO, ICGEB, EASTICO and has represented the country in a number other engagement such as UNESO, AU, CBD, SKA, IDRC etc. By virtual of the Commission has negotiated support on research programmes and set up development initiatives (Bilateral & multilateral cooperations) and help to build STI infrastructure to promote diplomacy in Kenya. Is also rightfully to note there are still opportunities and engagement not optimized or explored.

Recognizing the immense potential for R&D, the above results indicate that these institutions and programs are now playing a key role in international issues. At a diplomacy-focused point of view, the engagement in bilateral relations and dialogue between countries is bringing experts at these organizations together, aimed at boosting research and dissemination of information important to international relations and policy-making. One of the most important of them is Kenya's Vision

⁸⁵ JICA: Promoting Development in Kenya: The Growth Path of Japanese ODA. 2021.

2030, is its emphasis on R&D, innovation meant to establish Kenya as the unchallenged leader in R&D, multinational firms are also establishing offices in Kenya.

A flagship of UK-Kenya partnership is the Newton-Utafiti Fund, which enables joint priority setting, matched and in-country direct research funding. Kenya's Big Four Agenda and National Research Fund present opportunities for UK-funded research to expand across Kenyan national development priorities for further alignment, coherence and equitable partnerships. USAID's Partnerships for Enhanced Engagement in Research (PEER) program, managed by US National Academy of Sciences, promotes bilateral and regional cooperation between U.S. federally funded scientists and developing country investigators. CDC and KEMRI's long standing research collaborations and well-established platforms are able to support complex vaccine research. In collaboration with key partners, such as USA, UK, China, Kenya is harnessing its own advanced R&D. These initiatives represent a key platform for STI diplomacy, as a key channel that is steering innovations in areas such as agriculture, health and education. It also highlights how STI is a key driver under the globalization wave, with rising exchange in information meant to address global challenges.

Through German development cooperation, western Kenya is strengthening food security through improved productivity focusing on higher and more sustainable production and better access to market for farmers. The other focus lies on drought resilience and adaptation to climate change in Northern Kenya. In the water and sanitation sector Kenyan-German development cooperation focuses on three areas: policy and regulation, improvement of urban water and sanitation services, and water resources Management. US-Cuba diplomatic relations have also been undertaken within

the R&D, with scientists of the two countries engaged in marine sciences and health threats from infectious diseases.

From the study findings, the importance of R&D in promoting diplomacy indicators has been proved in dealing with challenges such as HIV/AIDS in Africa, and the fight against new infectious diseases of Ebola, coronavirus-19 pandemic and food security threats. Through coordinated global response and international programs based on R&D, combined with international cooperation, Kenya can thus build extensive network of international partners to share scientific expertise and resources.

Despite the growing progress in R&D, the findings also indicate foreign ministries view R&D narrowly, looking for economic and technological advantage or simply sector-specific promotion. Responses from key informants were evident suggesting the following:

There has been progress in advancing R&D to advance diplomatic goals, and Kenya has been very active in championing for climate change and environmental/ marine research.

From the foregoing, foreign policy agendas in R&D are geared towards to addressing water scarcity, food insecurity and droughts. However, as the results suggest, financial resources present challenges to harnessing the power of R&D to promote diplomacy. One interviewee was quoted as follows:

Research and development are fundamental to the progress of innovation and foreign policy competitiveness. Unfortunately, the current national and bilateral/multilateral system is not functioning well. Yet, so many issues require the use of R&D to promote diplomacy more effectively.

In view of the above, it could be that existing institutional and information breach among advanced and emerging countries can be a reason limiting the full utilization of R&D within the diplomacy discourse. Moreover, systematic assignation might occasionally solitarily happen amid specific scholars within specialized scientific or specified institutions via intercontinental cooperation. Studies have highlighted the rising uptake of research and development within the foreign policy paradigm (Naitore⁸⁶), underscoring the benefits of creating measures that prioritize STI as a tool of diplomacy to deal with the complex challenges of the 21st century. Research and development initiatives (Bilateral & multilateral cooperations) are likely to be shaped by national policies and foreign policy goals, with a renewed age where grand strategy for states rests on their continuous search for survival and global power. The negotiations between diplomats have opened new ways in advancing possibilities that R&D create though accords, “between national commercial interests and ambitions for between nations.”

Empirical studies such as that of Doku and Essah⁸⁷ are in agreement with these findings, indicating the role of R&D in enhancing food security, and the compounding influence that diplomacy plays in advancing STI, particularly for the developing economies. In light of the above, the researcher opines that building more effective relations with bilateral and multilateral organizations, as well as building capacities for institutions to spur R&D is key to promoting diplomacy. In many ways,

⁸⁶ Naitore, D. Twenty First Century Diplomacy Engagement in Africa, Kenya. 2017.

⁸⁷ Doku, Isaa & Essah, Kwame. 2022.

the potential benefits of R&D are enormous, from health, to environment, climate change and technological developments.

Drawing on experience from research intuitions, universities and other state institutions can thus provide the pathway to engage and establish R&D collaborative programs across borders. This is because modern diplomacy is seeing the rise of the ‘technocrat’ at multilateral meetings where specialist knowledge is required. Subsequently, the complexities of operating in a multilateral arena also rely on established rules and regulations, and these platforms can form basis that allows R&D to operate and inform the actors of multilateral. While some authors believe that states will remain the most important players in international relations, states increasingly have to adapt to their concept of sharing the R&D ‘stage’ with many other governmental and non-governmental actors. One respondent had this to say:

In the current setting, the focus is shifting from the traditional practice of state-based diplomacy in R&D to an inclusion of relations between states and other entities, such as private sector, multinationals and entities.

From the interview responses, it is clear that while it is ideal for R&D outputs to become marketable technologies, in most developing countries this is not the case. Innovations are crucial because they can increase the efficiency of currently used technologies and uncover new, useful applications for them. The contribution of technology innovation to achieving national development agendas has, however, remained elusive in many nations because advances are frequently connected to already-existing technologies. This is frequently connected to due to weak STI infrastructure, including a fragmented ecosystem for technology innovation and finance of technological advancements.

On the basis of these results, it can thus be argued that R&D flourish but a bilateral system is required, and hence the need for engaging multinationals and private entities who can exploit the existing framework of international systems for STI interests at local, regional or global scales.

3.4 Green Technology and Diplomacy

Further analysis was done to establish whether Kenya has utilized green technology as part of the STI role in promoting diplomacy. The question posed was: How would you rate the governments' uptake of green energy technologies as part of the current international development activity to promote diplomacy?

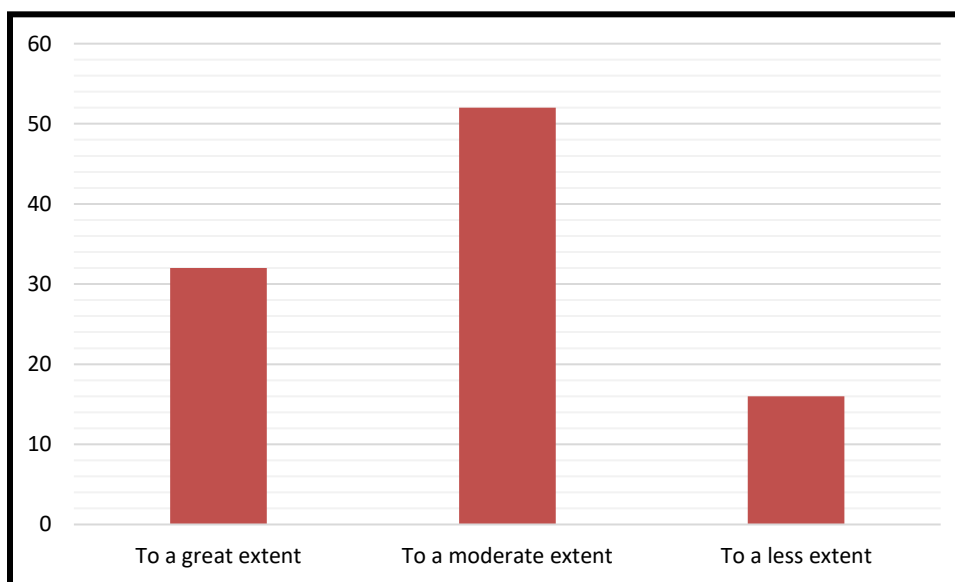


Figure 3.3: Green energy initiatives and diplomacy

Results show 32% said great extent, 52% said moderate extent while 16% said less extent. The results demonstrate a slow but sure uptake of green energy in Kenya. Renewable energy is thus at the centre of the global energy landscape, with rising technological advances, combined with innovative policies and financing mechanisms, have built a strong business case for renewables, making it competitive with conventional sources of energy. These remarkable advances have taken place in

Kenya as well, with additional investments in solar, wind and geo-thermal energy, which could be attributed to the response in the findings above.

The current energy needs place green energy at the centre stage of diplomacy, as it remains a propriety agenda for conferences like the G7 and G20, as well as the United Nations.⁸⁸ Therefore, it is not surprising that foreign ministries around the world are becoming more involved in directing international energy cooperation and forming strategic thinking on energy-related issues. Findings from key informants in interviews revealed the following:

The governments' uptake of green energy technologies as part of the current international development activity to promote diplomacy ranks extremely high. Kenya is among the few countries in the globe that have more than 75% of its electricity from renewable sources primarily geothermal power and hydropower. Kenya has an ambitious plan to transit 100% green energy by 2030.

Kenya is currently leading the way in Africa in terms of renewable energy development as it continues to invest in diverse energy technologies such as wind, geothermal and small-scale hydro-electrics. The Kenyan government as well as numerous renewable energy firms operating in the country, have all contributed significantly to making access to renewable energy in Kenya a reality. Renewable energy sources account for 70% of Kenya's installed electrical capacity. Hydropower, geothermal, bioenergy, wind and solar energy are the primary renewable. For example, Lake Turkana Wind Power Project represents one renewable energy opportunities available in Kenya. Kenya's energy mix is dominated by bioenergy (64.6% of total primary energy supply), oil products (16.9 %), renewable energy sources such as wind and solar (15.2%), and to a lesser extent, coal and hydropower (1.9 %). Kenya relies on imported fossil fuels to meet its baseline energy

⁸⁸ Raghav, P., Sibaram B. Renewable Energy and Science Diplomacy. 2021.

requirements and the country spends close to half of its yearly foreign exchange on petroleum and oil imports. As noted by one key informant:

Uptake of green energy is slow, but there are ongoing efforts to accelerate the uptake. Since the geopolitics of energy are impacted by a worldwide low-carbon energy transition, the need for a clear policy framework is key to ensure it supports Kenya's diplomacy.

In light of this shift, the ongoing debates on combating fossil fuel and a transition to green energy calls for Kenya to streamline its STI policy. Consequently, given the increasing scientific development and the increasing global issues, STI are pushing scientific endeavours to new frontiers with regards to alternative energy sources. This is particularly seen at the forefront in the field of STI diplomacy, with diplomatic channels to bring like-minded countries into discussion. A variety of innovative business ventures have also emerged from this energy ecosystem. M-KOPA, which helps low-income communities get access to energy, provides affordable solutions where people can gradually increase their ownership through flexible micro-payments, enabled by smartphone technology. It represents one key green energy technologies a vibrant and dynamic energy market, where all stakeholders are pushing clean energy generation throughout Kenya.

On a global perspective, the ongoing call for multilateral cooperation from Asia, Africa and Latin America to frame an International Solar Alliance intended to promote renewable energy by capacity building, increasing the role of non-state actors and funding new projects among member countries.⁸⁹ This initiative illustrates the diplomatic stand in climate change governance, anchored on new discoveries on STI that are now shaping regional and international diplomatic discourse. It further elaborates a move-away from realism-base approach of military to soft-power (STI)

diplomacy and the rising competition for nations to seek for solutions for a changing planet through diplomacy. Another respondent was quoted as follows:

Green energy technologies as part of the renewable energy diplomacy have the potential of consolidating the firm bonds STI collaborations between states; but for Kenya, it needs to be institutionalized and urgently explored. Renewable rollouts have substantially improved energy access.

Indeed, energy sources are essential for meeting fundamental human requirements including food, water, and lighting. The modern world depends on resources for everything from agriculture to transportation. Protecting energy security, which is strongly linked to overall security and prosperity, is the goal of energy diplomacy. To help the participating nations collectively identify sustainable energy solutions, numerous bilateral and multinational STI diplomacy activities have been undertaken. The Africa -EU Green Energy Initiative seeks to support investments in renewable energy generation and supporting reforms of the energy sector and carbon pricing policies. Japan-U.S. Clean Energy Partnership (JUCEP) launched in 2021 represents just how bilateral arrangements are at the epicenter of STI diplomacy. For Kenya, partnership include the recent Kenya-UK agreement to support green investments in Kenya, this initiative, signed during the 2022 UNCC (COP27) conference, is geared towards strengthening UK-Kenya partnership in sectors such as solar power generation, with potential exploration in geothermal energy.⁹⁰ This was cited by one key informant as follows:

Kenya is making tremendous progress in tapping geothermal energy; the move towards opening up new plants in Olkaria demonstrate clean energy. There have been new partnerships with institutions such as World Bank Group to harness energy potential for power supply.

⁹⁰ World Bank. Kenya's Geothermal Investments Contribute to Green Energy Growth, Competitiveness and Shared Prosperity. 2015.

Kenya's ascendancy as a leader in clean energy on the African continent has been achieved through a comprehensive mix of policy, market-based incentives, and an ability to leverage its energy abundance, namely geothermal energy. The momentum behind renewables in Kenya shows no sign of slowing. And, although issues remain around connectivity and cost, the energy landscape in Kenya is providing a blueprint for other African states to scale up clean generation to achieve sustainable development.

In light of the above, the growing energy diplomacy is currently on the international stage as a pillar for economic power. Interests by MNCs and private sector entities are now shaping how states are deploying their economic diplomacy choices. This means that national that have to align their STI to effectively manage and influence policy for economic development. This issue was raised by one key informant:

Despite the importance of green energy, its linkage to diplomacy remains limited, particularly because of the limited engagement of key national stakeholders beyond the MFA in fostering special bilateral linkages to promote diplomacy is disjointed.

Significant social, political, and economic ramifications would result from moving toward an energy system in the world that relies primarily on renewables. The eventual scope of this transformation as well as its effects on groups of nations and organizations with shared interests will be heavily influenced by multilateral diplomacy. On the other hand, through the promotion of international ties regarding energy supply and demand, bilateral energy diplomacy can help the long-term energy security and economic well-being of individual nations. Based on these factors and the answers given above, bilateral energy diplomacy is critical, and it is crucial to forge special strategic partnerships with a number of nations that are crucial allies for both energy and economic reasons. Another respondent said the following:

The Kenyan government has introduced a range of policies that have bolstered renewable generation at both the utility scale and at a micro-grid level. Having an energy policy that encourages scale at both ends of this spectrum has led to impressive penetration rates for an array of renewable technologies, across urban and rural populations.

Kenya introduced a feed-in tariff (FiT) on electricity generated from wind, biomass, and small hydropower in 2008 before extending the tariffs in 2010 to include geothermal, biogas, and solar energy. Due to the contextualities of each nation's energy system, the design of feed-in tariffs is crucial for determining their success and depends on factors such as time periods for support, graduated tariff decreases over time, minimum or maximum capacity limits, amongst other elements. There are other supporting policies that have enabled Kenya's impressive growth in renewable generation.

In 2021, Kenya introduced the Finance Act 2021, which reinstated VAT exemptions on renewable energy products ranging from small-scale solar modules and mini-grids, to larger wind power equipment, as well as clean cooking technologies. While the VAT exemption has helped speed up the deployment of clean energy generation, and made them far more accessible, there are concerns that it has made Kenya's energy markets dependent on imported technologies, from the likes of China.

Leveraging soft power bilateral energy collaborations to advance national STI capabilities is thus vital. Moreover, engaging multilateral diplomacy can help Kenya position itself as a strong economy in the region while advancing its national interests at the foreign policy sphere. This is true because renewables might alter how states interact with one another. Such connections can serve as effective platforms for international cooperation. If handled correctly, these connections can make electricity more affordable, our systems more efficient, and potentially promote

international interdependence. However, to do this, diplomats and other government representatives will need to create an efficient STI operating environment. In view of the above results, scholars such as Griffiths⁹¹ contend to the fact that STI diplomacy requires tactics and strong institutions that can advance a just transition. The EU-Kenya agreement (2023) to address the climate issues and harness renewables presents a great step towards promotion of diplomacy.

3.5 STI and its Role in Enhancing FDI inflows in Kenya

Further analysis was done to establish the extent to which STI has been utilized as an instrument of diplomacy to enhance FDI inflows in Kenya.

Table 3.1 STI role in Enhancing FDI inflows in Kenya

Rating	FDI Inflows
To a great extent	30
To a moderate extent	45
To a less extent	25

Table 1.1 shows varying responses across the STI and FDI flows, with 30% who reported to a great extent, 45% said moderate extent while 25% mentioned less extent. The results could be attributed to the understanding that FDI inflows are linked to economic diplomacy in promoting foreign direct investment. In essence, varying diplomatic strategies for promoting FDI as well as prospects for promoting FDI as a key component of economic development depends on how nation states cooperate with one another thereby creating room for investment flow from one region to the other.

⁹¹ Griffiths, Steven. Energy diplomacy in a time of energy transition. *Energy Strategy Reviews*. Volume 26, 2019.

With a 30% citing great extent and 45% moderate extent, signals the nexus of STI and FDI. The 25% who mentioned less extent also point to the notion of the nexus between diplomatic relations and FDI activities, often challenged by the dilemma of diplomats, in such a way that promoting inward FDI may at first seem a complex activity, coupled with the limited budgets for investment promotion.

These findings demonstrate how STI can advance diplomacy in various forms. In Kenya, both technological advancement and foreign direct investment have attracted a lot of interest. Effective methods for job creation, technology transfer and skill development should be given top priority. FDI plays a key role in bridging the productivity gap and can be utilized to expand high value activities for developing countries. Additionally, FDI investments from developing nations continue to have an impact on emerging technology, particularly now that global corporations are supporting regional industrial and manufacturing operations. Due to the increased need for countries to become more competitive in order to increase their export share, FDI acts as a bridge to support diplomatic efforts that can help align development and transfers of new technologies and push multilateral actors channel funds for targeted investments through trade agreements with host country. This was pointed by one key informant:

We have seen the growing role of STI through the opening up global trade opportunities and the increasing FDI is being driven by technological development, which is also encouraging bilateral cooperation in export and import sectors. For example, FDI has opened the door for many multinationals operating in Kenya currently.

In view of the above, some sensitive and significant investments are effectively supported by bilateral diplomatic operations, and multilateral and bilateral collaborations are crucial in host nations with weak or nonexistent institutions. Practical ramifications include the ICT industry, which has drawn

the biggest FDI since fiber optics arrived. Harnessing FDI can thus facilitate transfer of technological capabilities, access to new global industrial knowledge and know-how that can spur economic growth. Equally important is the role of FDI in orienting the national policy measures and standards that have also led to re-engineering the local infrastructure projects to attract foreign investors, as in the case of recently discovered hydrocarbon resources.⁹²

From these findings, the nexus between STI and FDIs can be seen through various lens. First, FDI opens up the export window opportunity, thereby unlocking the production potential through access to new technological transfer. Second, FDI is a catalyst that triggers the STI spillover-effect and foster bilateral and multilateral cooperation. Lastly, the economic phase aligned to FDI attracts policy review, which can assist companies in expanding internationally and reduce FDI risks. In this way, governments can encourage investor inquiries and disseminate material online, through advertising, trade exhibitions, seminars, and exhibits.

The crucial role of STI lies in the opportuneness for innovation that attract FDI imports into the country, thereby promoting sustainable economic growth. Moreover, FDI creates employment and provides the opportunity to impact a firm's growth in diverse sectors, which is crucial for growth and development. MNCs create production value chains in the host country that can be utilized to increase its product distribution capacity. From the point of view of one respondent:

By encouraging MNCs to invest within, Kenya generates the indirect consequences of transferring the associated technology, as how much FDI-related technology contributes to local businesses' ability to generate profits depends on how much of it does so. In terms of research and development, their local impact also serves as a diplomatic and foreign policy tool.

⁹² Griffiths, Steven. Energy diplomacy in a time of energy transition. *Energy Strategy Reviews*. Volume 26, 2019.

From the above views, the ability of these corporations to be such strong players in shaping diplomacy is due to their vast wealth and resources. For example, MNCs were behind USA support of the imposition of Structural Adjustment Programs (SAPs) in Kenya in the early 1980s. Other firms including Del Monte, Exxon Mobil and Firestone played a crucial role in lobbying the US Congress to support the expansion of democratic space and respect of human rights in the early 1990s.

Other MNCs such as Coca Cola, Ford Motor Company, Bechtel Corporation, Overseas Private Investments Corporation (OPIC), Microsoft, IBM, Exim Bank operate under the STI platforms, leveraging technology for quality product and service delivery in all their processes. As a result, FDI can profoundly influence the labor market and hence a broader development approach at a national and global level. The firm growth process can undergo a significant alteration in a deep environment where the spillover effect is seen by businesses unrelated to MNEs (OECD, 2002). In most cases, it creates significant efficiency in the host market and business opportunity.

In Africa, Kenya sits as one of the top beneficiaries in FDI. However, one respondent, one concern was as follows:

For developing countries like Kenya, the main problem often comes back to budgets and funding. Leveraging STI within the FDI framework and mobilizing investor engagements requires funding.

From the foregoing, FDI presents both enormous opportunities and difficulties for the practice of economic diplomacy. The findings hold particularly given the rising number of private foreign investor firms, that look for a good environment and strong institution that can champion STI governance to do business, based on local governance and institutions. With a global system of

rule-based agreements already strained, raising funds for FDI productivity growth against weak STI institutional framework becomes a challenge.

There has been notable extent to which the nexus between STI and diplomacy been utilized in Technology use and adoption, Infrastructure development such as roads and dams, Design and development of innovative solutions to common challenges affecting citizenry, however, there have been a few failures like the Galana Kulalu project between Israel and Kenya on food security. There is need to review the STI and diplomacy policy as an instrument of economic development in Kenya. There is need to seek ways to alleviate changes noted and strengthen relations where value and benefits are being realized and opportunities exists.

From the above statement, the challenge for governments in poor nations is how to encourage FDI and STI in a world that is changing so quickly. The findings also indicate that improving STI capabilities and strong links can contribute to the advancement of FDI as a diplomatic tool. Studies have shown the conditions under which STI diplomacy can influence FDI, particularly with regard to investment interests for developing states. Local scholars⁹³ have demonstrated similar findings, on how STI can be utilized as an instrument of diplomacy to enhance FDI inflows, and concluded that FDI may support economic growth by boosting exports and productivity. Another key informant stated that:

FDI has now become a global phenomenon, and the international market competition is stiff; therefore, FDI is a key solution to narrow the STI gap between developed and developing nations. Kenya is benefiting more on FDI particularly in tech-based business investments. However, there is need for better policies that ensure overseas investments are aligned with local STI plans to promote our diplomacy power.

⁹³ Osano, Hezron M.; Koine, Pauline W. Role of foreign direct investment on technology transfer and economic growth in Kenya: A case of the energy sector, Journal of Innovation and Entrepreneurship, ISSN 2192-5372, Springer, Heidelberg, Vol. 5, Iss.31, pp. 1-25, 2016.

FDI can stimulate growth, and the competition at the international stage offers a clear indicator that STI and FDI play a central role in diplomacy. In the same context, FDI has also evolved to entail not just cash transfers, but also innovations and modern technologies that are now shaping foreign investment and political debates between MNCs and host government within the diplomatic arena.⁹⁴ These results are in accordance with Bi et al.,⁹⁵ who concludes that FDI is more effective in regions that are geographically and culturally close but economically distant from the home country, confirming the gravity effect. Overall, the findings suggest STI as a critical pillar having a positive influence on the attraction of FDI in diplomacy.⁹⁶

3.6 STI and its Role in Enhancing Technological Transfer in Kenya

The study sought to determine the role of STI in promoting diplomacy through facilitating technological transfer in Kenya.

Table 3.2 STI in enhancing technological transfer in Kenya

Rating	Emerging Technologies	Vaccines	GMOs
To a great extent	26	50	36
To a moderate extent	62	40	40
To a less extent	12	10	14

⁹⁴ UNCTAD. World Investment Report. 2021.

⁹⁵ Bi, Y., Ren, Z. & Bao, K. (2020), Does distance matter in foreign direct investment subnational location choice? Evidence from China, *Frontiers of Business Research in China*, 14, 1-19.

⁹⁶ Bi, Y., Ren, Z. & Bao, K. (2020), Does distance matter in foreign direct investment subnational location choice? Evidence from China, *Frontiers of Business Research in China*

Table 3.2 shows 26% said great extent, majority (62%) said moderate extent while 12% said less extent. What the results indicate is a steady progress in utilizing STI as a tool for technology transfer. STI has an objective of creating opportunities to promote social progress and have a favorable influence on a nation's economic development and social development. Given this importance of technology, foreign policy choices can also be undertaken drawing reference from key experts in scientific fields while seeking to address geopolitical challenges or in applying breakthroughs in science and technology for economic development. Such measures include the recent partnership between Kenya and South Korea to improve its education in science and technology, in efforts to produce high-skilled engineers and scientists to propel its Vision 2030. In 2019, the two countries signed a partnership to establish a graduate only university at Kenya's Konza Technopolis.

Kenya-Japan cooperation in sectors such as energy, through Olkaria's use of geothermal energy has increased thanks to financial and technical advancements, which have also enhanced transmission. In addition, Kenya-China collaboration has demonstrated its commitment to combating the effects of climate change through its renewable energy initiatives. One of the biggest photovoltaic electricity facilities in Africa is the 50-megawatt solar power station project in the Garissa County in northern Kenya. The project, which started in 2016, was finished by China Jiangxi Corp for International Economic and Technical Cooperation. The China-Africa Environmental Cooperation Center was established in Kenya in 2018, institutionalizing the battle against climate change in Kenya and throughout Africa.⁹⁷

⁹⁷ Munene Dennis. China and Kenya Foster Cooperation on Climate and Energy. 2022.

Regarding partnerships between private businesses, Chinese technology giant Huawei promised to help Kenya advance the use of green energy and speed low-carbon growth. Huawei is also dedicated to supporting student training in green energy technology.⁹⁸ However, according to one key informant:

The nexus between STI and diplomacy has been applied as a strategy to facilitate national technological transfer and innovation system but not adequate. There exist gaps in strategies and also in policy. There in need to explore approaches for optimizations such as STI attaches among others.

What this means is that the need for ongoing improvements in bilateral and multilateral coordination requires a systematic technology transfer in the geopolitical arena. This kind of engagement creates invaluable opportunities. It creates chances to build and to share awareness of evolving threats, to share perspectives and compare notes on “best practices” with which to respond to technology-transfer challenges, to develop and improve cooperative synergies, to explore mutually supportive capacity building enterprises, and to form closer partnerships in mitigating the threats presented by STI influence. Taking advantage of the potential that such diplomacy can improve coordination on common technology-transfer challenges.

Results agree with a study by Adesina⁹⁹ indicating the technology and diplomacy as a diplomatic instrument, and how nations use these tools to further their foreign agendas. While knowledge exchange and technological transfer is crucial, its weaknesses lie in its potential to lead to the development of new dependencies in recipient nations, epically developing or poor states. In order

⁹⁸ Munene Dennis. China and Kenya Foster Cooperation on Climate and Energy. 2022.

⁹⁹ Adesina, Olubukola. Foreign policy in an era of digital diplomacy. *Cogent Social Sciences* 19(5):169-189, 2017.

to make communities and economies sustainable over the long term, it is imperative that innovation capacity development be given top priority. In order to facilitate intellectual property regimes for strengthening STI partnerships, it also emphasizes developing technological and financial capacities.

Conversely, scholars like Rashica¹⁰⁰ argue that diplomatic relations is hence the basis for the significance of STI diplomacy and technology transfer. Therefore, understanding the function and significance of digital diplomacy is essential. Meeting the STI technology transfer goals to advance diplomacy can be significantly aided by digitalization and incorporation into the digital economy. In fields like agriculture, they can have a big impact. Many developing nations are putting money into their digital infrastructure and improving their capacity to manage information and communication technologies as well as digital technologies to promote inclusivity and greater access. There should be a synergy between STI and innovation policy to promote technical transfer on a diplomatic level. The importance of STI and innovation policy frameworks in this is evident.

In view of the results above, the research opines that technological transfer can be achieved through elaborate efforts that link institutions of higher learning to tech-hubs, while harnessing diaspora linkages to spur development. Within the foreign policy sphere, Kenya has made tremendous steps in leveraging international cooperation, and hence diasporas can be the bridge to foster diplomacy through foreign scientists, bringing along special programs that can aid students in Kenya. Such STI programs can strengthen investment as a tool for harnessing STI diplomacy.

¹⁰⁰ Rashica, Viona. The Benefits and Risks of Digital Diplomacy. *SEEU Review* 13(1):75-89, 2018.

3.7 STI and its Role in Strengthening Strategic Partnerships Through Diplomacy

Further analysis was made to establish whether STI has played a critical role in enhancing strategic partnership linkages to advance Kenya's diplomatic priorities.

Table 3.3 STI and its Role in Strengthening Strategic Partnerships

Rating	Emerging Technologies	Vaccines	GMOs
To a great extent	50	50	36
To a moderate extent	36	40	40
To a less extent	14	10	14

Table 3.3 shows 50% said great extent, 36% said moderate extent while 14% said less extent. An indication of 50% great extent shows the relevance of the STI in advancing strategic alliances. STI thus provides a stable environment that brings actors to play an active role in development. It is clear that the driver for any scientific and technological power rests in a nation's capacity to develop institutional systems that act as building blocks for innovation. Such an ecosystem attracts alliances that can then inform diplomatic agenda. Indeed, the developments to achieve diplomatic goals necessitates more involvement and integration of scientists and scientifically inclined diplomats within diplomatic missions to promote shared STI policy objectives.

In risky times when bilateral and multilateral relations are being disrupted around the globe, scientists are now engaged in research, technological projects and innovations in which their respective national interests meet. For instance, even when their governments didn't get along, scientists have developed relationships with peers around the world for a long time. More and more nations are realizing the diplomatic importance of such international scientific networks and projects. In fact, for their greatest potential, many scientific advancements require political

cooperation. In the COVID-19 situation, scientists have provided essential advice by educating governments, foreseeing risks, and ensuring that research findings inform policy. In support, one informant stated:

During the COVID-19 pandemic, Kenya closely partnered with its international partners in reducing the pandemic burden. Beyond the vaccines, strategic partnerships have now been developed in other areas beyond health, including energy, education, research and development.

The above response points to the growing role of STI diplomacy in influencing strategic partnerships in various sectors. COVID-19 has also provided a chance for cooperation that can help to strengthen international unity. The Kenya-UK strategic relationship (2020–2025) is built upon five major pillars: prosperity for both parties, relationships between people, a climate action, development as well as peace and security. The year 2020 saw the signing of the UK-Kenya Strategic Partnership between former leaders Boris Johnson and Uhuru Kenyatta. The UK government commitment to fund the establishment of guarantee firm to boost its capacity for climate financing represents a key role that STI plays in enhancing partnerships. This, the importance of promoting cooperation and striving for global excellence in STI is a key pillar through which developing countries increase their strategic partnerships and diplomacy.

Strategic partnerships in Kenya have also been made possible through a number of international organizations. UNESCO promotes world peace through effective intergovernmental cooperation. For example, NACOSTI and ACTS, spearheaded by UNESCO Office for Eastern Africa acknowledge that achieving the SDGs requires bringing their unique capabilities and talents to bear on the attainment of the SDGs.

On a multilateral front, STI thus lays a platform through to strengthen bilateral and international ties, scholars, institutions, and states can work together. This frequently entails creating networks and working together in places where relationships are solid. According to the British Council, where the UK's science and research are highly regarded, science and research diplomacy is a potent instrument for fostering trust and understanding with Iran. In fact, the International Biology Olympiad, a student biology competition that included teams from the UK, recently took place in Iran. Overall, the researcher believes that STI is an effective tool for pursuing knowledge as well as for forming strategic alliances, addressing global issues, and improving the lives of all individuals.

Building strategic partnerships in STI as a diplomacy tool also require strategic interventions in evidence-based STI policy making. This is because strategic partnerships are seen in the global call for implementation of the SDGs that requires unparalleled collaboration in key areas such as enabling policy environments, developing human skills and capacities, trade, driving transformative change through science, research, technology and innovation, mobilization of the private sector and capital. For the international aspects of the SDGs, STI can provide the grounds for a new global partnership that will eventually bring a new transformative spirit of solidarity and cooperation. Moreover, to build capabilities of exploiting opportunities offered by STI for achieving sustainable development partnership is very important. Therefore, STI can be tapped as a key transformational force of future policies that promote diplomacy.

CHAPTER FOUR

LEGAL/POLICY FRAMEWORK OF SCIENCE, TECHNOLOGY AND INNOVATION IN PROMOTING KENYA'S DIPLOMACY

4.1 Introduction

Globally, the STI policies are now a critical pillar in and are a component of a broad range of policy actions required to start the transformation of socio-economic, environmental, and political systems to address global concerns. However, this necessitates a change in government policymaking that adopts a more systemic and inclusive approach. In view of these, this chapter presents key findings on the policy and legal perspectives of STI policy and its role in advancing diplomacy.

4.2 STI Policy and Institutional Mandates for diplomacy in Kenya

The critical role of STI policy in building institutional mandate, seen through the policy mandate in the establishment of institutions to provide a roadmap and channel required STI priorities is key. The results key institutions and assigned them mandates and functions which if well implemented would contribute immensely to promotion of STI diplomacy. Ideally, these institutions, including universalities and research institutions, ensure that policies not only advance national interest, but also serve as centers engaged in the innovative research activity with global STI centres. However, results show research is highly fragmented as a result of siloed research and knowledge institutions. Additionally, there are little connections between industry, research, and innovations. This highlights the crucial role that PPP play in harnessing the potential role of STI in foreign policy discourse. Yet, this knowledge exchange and dissemination is threatened by widespread fear of losing intellectual property among researchers and research institutions.

The above views show that priority-focused approach, as granted through the distinctive roles of each institution, presents new challenges that may hinder how these institutions function increasingly in networks and partnerships, to promote diplomacy. One key informant was also quoted as follows:

Kenya lags behind rich nations in STI because of generational gaps in policy that have hindered it from pursuing very basic technical goals and opportunities.

These views underscore the need for a process for developing policies that is practical, context-based, and based on an effective strategic approach, that ensures institutions do not work in silos, and advance a sustainability dimension towards building strong foreign relations. As such, Kenya could also be struggling with the dynamics of STI. The STI policy frameworks coined to ensure institutions offer a significant resource central to promoting diplomacy.

There is a growing appreciation that STI can promote diplomacy by fostering inclusive growth and sustainable development. The planned national STI ecosystem and sufficient funding for institutions are crucial for creating an ideal setting for STI to play its role in diplomacy. A successful STI policy is the result of cooperation between important parties, including public, corporate, and academic organizations as well as other industries. In order to create an institutional environment, STI policy incorporates potential national development sectors. Such partnerships are necessary not just to create policies but also to guarantee their transnational implementation. In order to improve the absorptive abilities of both governmental institutions and the academic community, including the commercial sectors, STI policy must be altered continuously and

gradually.¹⁰¹ Studies have also indicated that the relevance of STI is rising and crucial for the implementation of STI diplomacy strategies. Similar to this, Aktar¹⁰² contends that building the ability of local businesses necessitates enough funding, training, and development in addition to sensible regulations that remove impediments to both business and innovation.¹⁰³

4.3 STI-Related Institutions and their role in diplomacy

This analyses' second dimension concentrated on the diplomacy and foreign relations/international outlook of STI institutions in Kenya. This perspective was key since, in advancing STI policy and institutional strength needed for international STI collaboration as a tool to address global concerns.

¹⁰¹ Anand, Kedia. Innovation Policy and Sustainable Development. Brief for GSDR. The Energy and Resources Institute (TERI), New Delhi. 2015.

¹⁰² Aktar, A., Harun, M. & Alam, M. Science, Technology, and Innovation (STI) Policy for Sustainable Development. 2021.

¹⁰³ Jarquin-soliz, M. Science, diplomacy and the institutional capacities in C. America. Vol.6, 14, 2021.

Table 4.1 STI-Related Institutions in Kenya

Public Research Institutions in Kenya		Private Research Institutions in Kenya	
1.	Kenya Agricultural and Livestock Research Organization		Africa Institute for Capacity Development
2.	Kenya Industrial Research Institute		International Cancer Institute
3.	Kenya Marine and Fisheries Research Institute		The World Agroforestry Centre (ICRAF)
4.	Kenya Medical Research Institute		International Livestock Research Institution (ILRI)
5.	Kenya Veterinary Vaccines Production Institute		HJF Medical Research International Inc
6.	Tegemeo Institute of Agricultural Policy and Development		The International Centre of Insect Physiology and Ecology (ICIPE)
7.	Tourism Research Institute		Regional Centre for Mapping of Resources for Development

As shown in Tale 4.1, various institutions, both public and private exist. While the study targeted public institutions, their role in STI policy is key. In the case of KALRO, formed in accordance with the 2013 Act, its mandate includes to promote, streamline, coordinate, and oversee agricultural, zoological, genetic research.

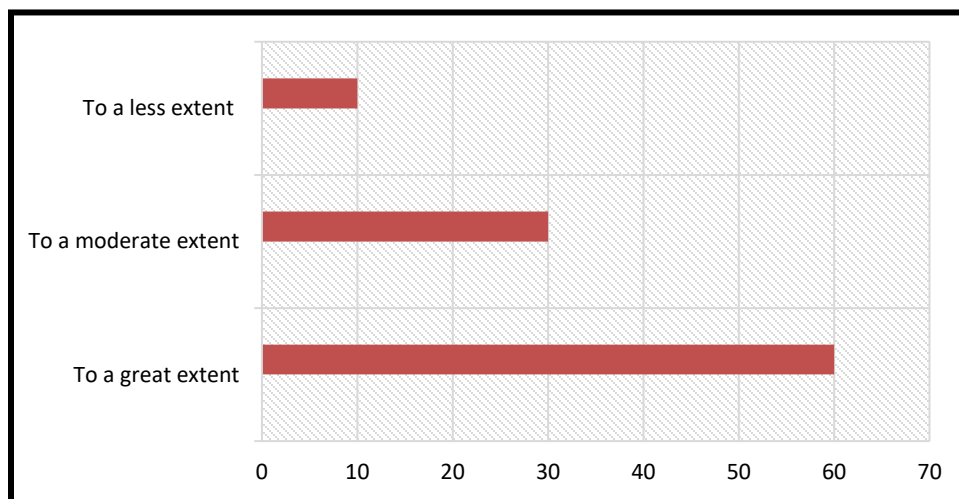
Research centers are crucial at the national level as well as internationally, for example through the informal connections of their members or formal connections to overseas networks, and they may play a role in influencing their nation's STI diplomacy agenda. Research centers play a critical role in the STI ecosystems, which typically finance all or parts of their operations through public funding. Existing national institutions highlight the difference in their mandate and represent a key avenue under which the legal and institutional framework is implemented.

Since diplomatic concerns are always headed by ministries, (which constitute the highest hierarchical level of the public administration), STI issues do not lie within the mandate of a single coordinating ministry, but rather within secretariats, scientific councils and national authority

bodies. These national agencies, while in charge of overarching STI issues, do not necessarily hold the same political and institutional weight as ministries. When establishing a STI and diplomacy agenda in partnership with other government ministries, this could lead to an institutional “imbalance.” This could be the cause of STI’s continued restricted significance in promoting diplomacy in Kenya. However, it is worth noting that STI policy is still work in progress. Kenya and other developing nations share characteristics of political and socioeconomic instability that invariably have a negative effect. According to numerous respondents, from their diverse points of view, many socio-political variables continue to impede the creation and execution of well-structured STI policy. However, after the 2010 Constitution, abrupt changes in policy trajectories continued to be a noticeable trend.¹⁰⁴

4.4 The Constitution in STI diplomacy nexus

The study sought to establish the supporting role that Kenya’s Constitution 2010 has offered in strengthening national STI strategies and key actors to promote diplomacy. Results of the analysis are given in Figure 4.3.



¹⁰⁴ Jarquin-soliz, M. & Mauduit, J. Institutional Capacity for Science Diplomacy in Central America. *Front. Res. Metr. Anal.*, Vol.6, 14, 2021.

Figure 4.3: Role of Kenya's Constitution in STI diplomacy

According to Figure 4.3, 60% said to a great extent regarding the role that Kenya's Constitution 2010 has offered in strengthening national STI strategies and key actors to promote diplomacy., 30% said moderate extent while 10% said less extent. The Kenyan constitution recognizes the role of science, indigenous technologies in the development and there is a commitment of 2% GDP to scientific research in raising the quality of Science, Technology and Mathematics (STEM). Vision 2030 where STI is imbedded quite explains why the STI policy has taken quite some treads in Kenya and thus the advancement of the STI sub-sector towards realization of a knowledge-based economy. Responses from key informants showed the significance of the constitution in STI diplomacy. Some key informants were quoted as follows:

Vision 2030 Agenda and the Kenya's Constitution 2010 provide STI as a foundational base for the three pillars and national production systems respectively. They both provide a platform in leveraging STI's role in social-economic development. There is still need to factor diplomacy in both of the documents to tap in the benefits id STI diplomacy.

The contribution of STI to socioeconomic development is well recognized in the Vision 2030 and Constitution. With requisite support to allow implementation in a coherent manner through the established institutions, Kenya can fully realize the benefits of STI diplomacy.

Innovation, technological transfer, and intellectual property are all explicitly protected by the Constitution. The principles of intellectual property have been enshrined in the constitution for the first time in Kenyan history. According to Article 11(1) of the Constitution, culture is acknowledged as the basis of the country and as the people of Kenya's collective civilization. Additionally, it requires the state to support all forms of national and cultural expression through literature, the arts, traditional festivals, science, communication, information, publications,

libraries, and other forms of cultural heritage; to acknowledge the contribution of indigenous technologies and science to the development of the country; and to support Kenyans' right to intellectual property. Therefore, the Constitution represents an opportunity for Kenya to refine the institutional strength and inter-institutional connections necessary for the implementation of an effective STI diplomacy strategy. This is especially important in light of new STI trends, which necessitate additional efforts in institutional policy guidance and STI foreign policy objectives.

Constitutional diplomacy anchors a policy framework for STI to flourish. Since the objectives of diplomacy cannot be successfully pursued by discarding constitutional interests, underpinning these foreign goals is the Kenya Constitution which outlines key values that guide institutions, and provide a framework for their operations as provided for in law and ensure policy and practice match the desires of the Kenya's diplomacy interests.

A number of interviewees discussed the significance of adopting contemporary responsive legislation to make it easier for important stakeholders to participate in the STI policy framework on a national and worldwide level. These changes must go beyond the executive branch of government in terms of the constitution. The legislative branch must take immediate action to develop an appropriate legal framework for science diplomacy. This is due to the constitutional requirement that the legislative branch allocate public financing, such as any STI-related legislation and budgetary support for public institutions and oversight. As a result, the Kenya Constitution of 2010 marked a change in Kenya's legal system with regard to STI.

Similar findings have been observed by Bonilla¹⁰⁵ in Ecuador, stressing the principles of foreign policy to encourage developed countries' shared responsibility through constitutional diplomacy. Within the policy framework, political discourse has been explored to understand implementation processes related to policies and political discourse. There is evidence to support on how the Constitution provides an avenue for institutions to undertake their mandate, in which concrete STI policies can be championed through institutional strengthening, international support and foreign policy practices.

4.5 STI policy and FDI in the context of diplomacy

The study sought information regarding the role of STI legal and policy framework (STI Policy/Act) in outlining policy objectives that enhance FDI inflows and promoting diplomacy in Kenya.

Table 4.2: STI Policy in shaping FDI diplomacy

Rating	%
To a great extent	30
To a moderate extent	62
To a less extent	8

Table 4.2 shows varying responses, where 62% said moderate extent, 30% said great extent while 8% said less extent. Results point to the role STI policy plays.

Within the legal an institutional policy framework, STI policy brings to focus institutions that champion for FDI. Excerpts from interviews show STI policy is a key tool for advancing FDI, and

¹⁰⁵ Bonilla, K. & Serafim, M. Science Diplomacy in Ecuador: Political Discourse and Practices Between 2007-2017. *Front. Res Metr Anal Journal.*, 6. 2021.

the role of an operating institutional policy guidance on which the Kenyan government can effectively harness the opportunities of the diplomatic actors. However, a myriad of challenges stands on the way. This was cited as follows:

The STI policy and legal framework have critically well drafted and needs minor reviews. The challenge as a country we do not conduct effective monitoring, review and reporting of the documents to learn from the progress achieved, deviations noted, and challenges encountered. Thus, this makes it difficult to provide objective and informed view on how they steer FDI, facilitate transformation of economy in influencing cooperation and diplomacy.

In the excerpt above, it is possible to verify that Kenya's STI policy framework has the potential to offer effective institutional tools to attract FDI and facilitate FDI flows. STI policy framework advances in sectors such as the National Biotechnology Development Policy 2006 marked the green light for using biotechnology in the nation. Thus, biotechnology has a role to play in reducing poverty, improving food security, and protecting the environment and biodiversity. The policy commits to ensure that information on biotechnology development is accurately and effectively presented to the public and highlights industry and trade as key areas for exploiting it. For the quick and safe development and implementation of biotechnology in agriculture, environment, health, industry, and research, it is ideal to prioritize the provision of pertinent infrastructure, framework facilities, and other resources.

The study findings thus demonstrate how STI policy is a roadmap and compass, that nations have to focus, as it provides direction on how states can initiative diplomacy interventions in the context of FDI. According to one interviewee:

The primary objective for the growing and developing economies at the moment is attracting FDI. The advancement of national businesses and multinational corporations in driving innovation and facilitating FDI in Kenya should also be a goal of STI policy.

In view of the above, a policy on STI can ensure its cross-cutting nature reaps benefits that come along with MNCs. This is vital, given that STI has the potential to open up business diplomacy, as MNCs seek to strengthen partnership with governments across the globe. For Kenya, managing such linkages within the foreign policy choices will require a concerted efforts from both public and private sector, while reviewing the STI policy to ensure it adapts to the changing business diplomacy environment. Indeed, borrowing from countries like S. Korea that are advancing in STI policy and FDI, these findings demonstrate the relevance of policy framework in shaping FDI as a diplomatic tool for national development. In Kenya, policies aimed at promoting STI have made room for floriculture/ horticulture FDI, generating a variety of economic benefits in the Kenyan economy.

The study findings point to similar cases, such as Singapore, as pointed by Pereira¹⁰⁶ indicating a linkage between technology and FDI that is driving the country's economic strength and diplomacy interests. Similarly, China multinational endeavors (MNEs) have benefited from STI policy and sectoral support to steer Chinese outward foreign direct investment.¹⁰⁷ However, recent comparative analyses of the effects of STI policies lead to the conclusion that not all policy instruments are equally effective at generating FDI. Policymaking for science, technology, and

¹⁰⁶ Pereira, A. Biotechnology foreign direct investment in Singapore. *Transnational Corporations* 15(2). 2016.

¹⁰⁷ Abdulsalam, A. & Xia, J. Exploration of the Impact of China's Outward Foreign Direct Investment (FDI) on Economic Growth in Asia and North Africa along the Belt and Road (B&R) Initiative. 2021.

innovation (STI) might be greatly improved through national STI-specific policies and policy instruments for biotechnology, nanotechnology and ICT.

The government's efforts are acknowledged, as seen in the extracts below:

FDI is considered an important channel for the transmission of STI trend by the government of Kenya, seen through the STI policy framework. However, the STI policy needs to address the role of FDI on productivity growth and how it can be its potential for fostering diplomacy.

The transformative potential of FDI can help enhance bilateral cooperations. The trade agreement between Kenya and USA within the AfCFTA represents how policy can deepen FDI across the continent.

From the findings of this study, it can be argued that STI as any other public policy, The systematic approach to adapting and implementing policy-making procedures has not been used. Therefore, it is crucial to discuss how local and global environment affect STI policy implementation. It would not be practical for policies to be developed and carried out by independent government agencies without consultation with other local, regional, and international parties. In this broader sense, the STI policy creates a ground where scientists, experts and actors in the global environment offer alternative pathways of development, which occasionally collaborates with STI organizations and development organizations in search of money, institutional backing, or other forms of support; but also including supportive regulatory structures that can advance FDI. Interview responses reiterated the need for interactions between professional bodies and formal institutions to ensure FDI is effectively utilized as a diplomacy tool.

4.6 STI policy framework and bilateral/multilateral technology transfer

The study further sought to advance the STI policy discourse, to establish how existing legal and policy framework on STI facilitate coordination to promote technology transfer at bilateral and multilateral levels within the context of diplomacy?

Table 4.3: STI Policy in bilateral/multilateral technology transfer diplomacy

Rating	Technology transfer
To a great extent	50
To a moderate extent	28
To a less extent	0

Table 4.3 shows 50% said great extent while 28% said moderate extent, indicating a growing role of STI policy in supporting bilateral and multilateral technology transfer as a tool of diplomacy. Just like trade, STI policy offers a critical pathway for technological partnership. However, achieving this development mean that STI policy, anchored by an Act, has to be coherent in supporting institutional partnerships that leverage technology in all sectors. Accelerating technology in a global village, along with the fast-pace technological trends will thus require a well-established regulatory environment.

This ensures such a policy offers ground rules that spur innovativeness in technology transfer and funding that can drive both entrepreneurial and private investment. Ideally, STI policy has to be grounded on interventions that are practical to enhance the technological transfer and reasonable outcomes that work for the benefits of the country. Thus, in bilateral settings, diplomacy comes

into play with regards to how a nation effectively aligns the policy with practice, along with national aspirations development goals. Although setting a comprehensive and decentralized STI strategy is the government's responsibility, this does not mean that the government is solely responsible for carrying it out. The interview results painted a picture of a disjoint in the Kenyan STI policy with regards to harnessing technology transfer and diplomacy.

There quite a number of coordinated initiatives, however, in many cases institutions work in silos. The low level of development of STI diplomacy has particularly contributed to the situation. There is an average value addition on the legal and policy framework on STI in facilitating coordinating and promoting national innovational systems. This is informed by non-coherence engagement of the MDA's involved in the STI subsector. There is need for all parties involved within the context of diplomacy to cooperate and collaborate effectively within the context of diplomacy.

In essence, the above Kenya's STI capabilities have been on the rise, socially in technological fronts. Yet, the question remains whether there effective STI policy guideline, such as institutions and processes involved have been positioned as tools of diplomacy.

It might be argued that a financial plan that is adapted to particular objectives and criteria within the national framework plays a growing central role in STI policy. Indeed, a number of scientific bodies that operate in a semi-autonomous capacity, such as financing councils or advisory boards that widen the technology-transfer gap, have been involved in the governance of science policy. One significant policy barrier relates to multi-stakeholder conflicts that has often derailed consensus- building among STI policy makers leading to institutional and organizational fragmentation in STI. Another respondent was quoted as follows:

Quite often, national-specific STI strategies have been championed outside the sphere of technology-driven actors, which makes it hard to integrate all these components in a well-established ecosystem. This often creates the dilemma for ensuring coherence and streamlining processes at national level agencies in a way that it promotes diplomacy.

To make this happen, bilateral and multilateral cooperations can work more effectively with STI actors for structuring STI capacities through technology transfer. For Kenya, examples have been seen in the renewable energy sector, agriculture, SMEs and health. An example is Kenya-South Korea development programs that are being utilized to promote growth in key sectors including educational programs, energy and infrastructure development, information technology in agriculture and in housing schemes.¹⁰⁸ This represents a critical step in technology transfer.

From the study findings, the STI policy firmly establishes a national institution's right to steer the policy agenda with the cooperation of all stakeholders. STI policy should, in this sense, communicate with the demands of the trajectory levels within the framework of the ecosystem and serve the interests of the larger community. Global STI policy should incorporate best implementation strategies and draw lessons from current constraints. The STI landscape is shifting globally, and new STI hotspots are emerging. In order to respond to and integrate STI ecosystems into the global context, developing nations like Kenya must advance research and innovation initiatives in technology transfer and diplomacy.

¹⁰⁸ Osano, H. & Koine. Role of foreign direct investment on technology transfer and economic growth in Kenya: a case of the energy sector.2016.

4.7 STI Legal/policy framework and strategic partnerships in diplomacy

Further analysis was done on analyzing the effective role that STI legal and policy framework provides in strategic partnership linkages as part of a national strategy to promote diplomacy in Kenya.

Table 4.4: STI Policy in strategic partnerships that promote diplomacy

Rating	Emerging Technologies
To a great extent	40
To a moderate extent	40
To a less extent	20

Table 4.4 shows 40% said great extent, 40% said moderate extent while 20% said less extent. The results indicate the critical role of STI policy framework and how it lay ground for multi-level interaction of the various ecosystems both local and international. While it is seen that the STI policy has made some progress, the 20% less extent indicates the need to address the difficulties facing STI policy as it strives for inclusive implementation. Effective STI policy implementation requires a local level approach. Additionally, overall institutional ecosystem linkages at the national level should be more inclusive to ensure successful strategic alliances amongst all stakeholders within a policy framework. It's possible that current regulations and other mechanisms are needed to guarantee investments in STI financing and strategic partnerships are weak. From the interview, key informants had the following suggestions:

It has fairly provided strategic partnership partly because the operationalization of STI legal and policy framework has been fully achieved. Institutions established are characterized by sub-optimal operations and remain under-resourced in terms of human resource and funding.

There is above average effectiveness on the current STI legal and policy framework on partnerships and linkages. This has been contributed by several factors the major one been a weak and infective quadruple helix STI model. There is also limited financial and budgetary allocation to achieve the envisaged targets.

The above views emphasize how national STI policy actions are being made more difficult by funding through tight budgets. This is demonstrated by the fact that the national direction of STI policy has not been replaced by comprehensive strategic alliances that result in the production of new value and strong diplomatic standing. This necessitates the coordination of policy, which presents considerable implementation-related difficulties. Synthesizing various scientific, social, and economic knowledge and communication in multidirectional ways are crucial for improving the interface between science, policy, and society. It is necessary to reevaluate the current unidirectional flow of knowledge and recommendations from scientists to policy makers and citizens, and to restructure the science-policy-society interface as a co-creative ecosystem.

From a conceptual perspective, STI policy across levels of ecosystem depends mainly on the ability to communicate effectively the institutional frameworks established by top-level government policy-making have a significant impact on how well its implementations work across system boundaries. Emphasizing strategic partnerships means that interaction between actors, institutions at all levels; national, regional, global and sectorial systems, stand for supporting the implementation of the STI. It also calls for anchoring a policy that adapts to the constantly shifting local, regional, and international environment. Here, it is recommended that national institutions take part in coordinating and set up a system that encourages expert input.

Similar studies connecting STI policy and strategic partnerships provide important intuition into more interdependence and collaborative approaches. Kenya and the United States signed the Strategic Trade and Investment Partnership (STIP) on July 14, 2022. The agreement outlines the two countries' increased involvement and high level of commitment, and it strongly emphasizes increased investment as well as sustainable and inclusive growth that will benefit both countries' citizens and enterprises. The agreement also includes goals to strengthen regional economic cooperation in East Africa. The pact emphasizes the need for all actions implemented under the agreement to benefit local communities, consumers, and enterprises in both nations. It also places a stronger emphasis on sustainability, innovation, and good governance.

The Kenya-US agreement on agriculture states that a supportive environment for agricultural innovation will be promoted to raise food security and farm production. The importance of consumer protection online, durable and secure digital infrastructure, and the significance of digital inclusion and accessibility are all discussed in order to build trust, combat discrimination, and advance the growth of the digital economy. We'll keep an eye on and take into account any new concerns in digital trade. On the agenda are also the protection of the environment, adaptation to climate change, reduction of its effects, and conservation. Both countries have highlighted the importance of sustainability when using natural resources as they strengthen their mutual commitments and trade relationship.

A commitment to sound regulatory practices, such as adequate time for public consultations on proposed regulations, basing decisions on as they fortify their shared commitments and trade ties, both nations have emphasized the significance of sustainable resource use. A dedication to strong

regulatory processes is also mentioned as a critical area of concentration. These practices include conducting regular risk and regulatory impact assessments, giving the public enough opportunity to comment on new regulations, and basing decisions on science and evidence. science and evidence and regularly undertaking risk and regulatory impact assessments is also noted as a key focus area.

Kenya-UK strategic partnership focuses on a collective expertise, resources and leadership on the priorities; bilateral, regional and global, that will help deliver more prosperous, secure and sustainable societies. This is evidence by key informant responses as follows:

Kenya-UK strategic partnership (2020 to 2025,) targets 5 pillars; mutual prosperity, security and stability, sustainable development, climate change, and people to people, reflecting the key challenges and opportunities of our time. A focus on quality investments and improving environmental, social and corporate standards will ensure sustainable growth. This, combined with the delivery of ongoing business reforms, will put us in a strong position to build on over £1.35 billion of private British investment into Kenya confirmed at the UK-Africa Investment Summit on 20 January 2020.

The UK and Kenya already benefit from close economic ties and under the first pillar; mutual prosperity, increase their breadth and strength, boosting growth and improving living standards. Capitalizing on initiatives launched by the UK in January 2020, backed by £400 million of UK aid and with the potential to generate billions of pounds of investment into Africa from the City of London, new investment and trade opportunities are meant to support businesses, including those in the Blue Economy.¹⁰⁹

In view of the above two examples, the author argues that STI policy framework could be revised to strengthen key institutions as well as networking with private sector. By facilitating connections

¹⁰⁹ GoK. UK announces £132m of new investments in Kenya. Gov. UK.

with policy and diplomatic institutions and networks beyond borders, STI policy needs to reflect the national and global cooperation agreements, in a variety of fields, on the future of collaboration, and in encouraging STI partnerships. These findings point to the need for reinforcing STI governance and policies that can fully be incorporated in key sector plans of government agencies and institutions. This can contribute to an enabling environment for promoting both the economic arm and strategic partnerships that promote diplomacy.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The previous chapters have explored the STI concept and its role in diplomacy. This section presents a summary, highlighting important findings emanating from the study. It also draws conclusions that form a basis for recommendations. The study sought to examine the role of STI and how it promotes diplomacy in Kenya. Objectives were to: establish the current trends of STI in promoting diplomacy, examine how STI plays a role in promoting Kenya's diplomacy and determine the compounding role of STI policy frameworks in promotion of diplomacy in Kenya.

5.2 Summary of Key Findings

The summary of key findings of the study are discussed under each study objective as follows:

5.2.1 STI trends promoting diplomacy in Kenya:

With regards to the first objective, the study established that various forms of emerging technologies, from Block-chain technology, Internet of Things, Artificial Intelligence nanotechnology, big data and quantum technologies are driving technology and innovation, utilized under various missions and actors. The study established key areas of application including Block-chain technology in the transport, supply-chain and health sector, driven by partnerships such as UK-Kenya Trade Logistics Information Pipeline (TLIP) project. In addition, the study shows rising uptake of IoT solutions applied in real-time mapping platforms and adopted in the water supplies for Kenyan water utility EWASCO. The study showed that AI is gaining ground in Kenya, in agriculture sector, where tractors, sprayers,

or combines to steer automatically through Kenya are a constantly moving target, especially in the manufacturing sector, harnessing nanotechnology through manufacturing factories. Beyond reporting the latest STI developments, the study established that STI trends are now key pillar for national developing, extending beyond local cooperation in supporting development. The study showed that Big Data is also an emerging technology supporting enterprise growth and development. Key informants cited the country's technological and innovation ecosystem has grown significantly with impressive performance in several global rankings such as the global innovation index. These have been idealized through some targeted mobile financial transaction apps, such as M-Pesa, iHub, a technology-focused co-working facility in Nairobi, supporting tech companies, researchers and entrepreneurs. However, the results showed current trends in STI have not been adequately harnessed to foster diplomacy. The study showed that STI trends have an effect on FDI inflows, and the spill-over effect for technologies such as IoT, Big data and AI are encouraging FDI. However, STI internationalization as an arena in which STI and FDI connect is still work in progress.

The study established that scientific discoveries in vaccine research have been adopted in to drive progress on societal issues. As part of a social innovation-meets-science diplomacy strategy, new vaccine research and diagnostic solutions influencing diplomacy serves to highlight pressing social and sustainability issues of importance to Kenya. Cases areas of research on the AstraZeneca Vaccine by KEMRI, Welcome Trust and University of Oxford is an indication of bilateral ties of Kenya with UK, indicating Kenya's position in advancing vaccine research is linked to R&D. Although this trend has not been fully

institutionalized at the consulates to better suit their purpose, the study also showed that embedding STI trends in vaccines has boosted collaborations between industry, governments and international organizations.

The study further established that STI trends in harnessing GMOs and its appreciation as a key pillar to guide science diplomacy is still work in progress. The results also showed a slow uptake of GMOs, coupled with an unclear framework on embracing new advances in GMOs in Kenya. Evidence from interviews showed that agricultural biotechnology is a contentious issue and GMO emerging technologies are impacting on production as well as on markets. The study established that STI policy framework reform is key to harnessing new trends for sustainable economic growth and promoting diplomacy. While FDI may provide additional mechanism of STI development, the study showed the need for Kenya to take caution on the risks associated with technological capabilities driven by MNCs and their impact on unlocking GMO to boost local food security and economy.

Overall, these findings show that STI trends in emerging technologies, vaccine research and GMOs are drivers that can contribute to diplomacy. Kenya has made great strides in tapping into emerging technologies and vaccine research through science diplomacy. However, GMO trends as part of STI pipeline to promote diplomacy is still largely underappreciated and not institutionalized as a foreign policy tool. Although STI trends promote technological transfer, the study showed that strengthening bilateral cooperation to promote diplomacy is key. Kenya's uptake of new trends in STI is mixed in different

layers and actors, and harnessing this power is key to channeling diplomacy-based choices for national development.

5.2.2 Role of STI in promoting Kenya's diplomacy

The study established that STI plays a key role in grounding bilateral scientific cooperation. There is a growing linkage between STI and bilateral cooperation activities that are now influencing diplomacy in Kenya. Interview results demonstrated advance in bilateral scientific cooperation such as USAID and UKAID in recent COVID pandemic crisis and the role that scientific cooperation is now a growing foreign policy agenda. In addition, the study showed that STI is being driven through academic exchanges and joint research projects, between Kenya and its partners such as UK, USA, Japan, China, France and Canada. The Kenya and France co-operation through the Ministry of Education, National Research Fund (NRF), and in France by the Ministry of Europe and Foreign Affairs (MEAE) and the Ministry of Higher Education, Research and Innovation (MESRI). Presents the role of STI and diplomacy. Furthermore, the study established that STI has played a critical role in enhancing strategic partnership linkages, evidence by the Kenya-UK strategic partnership (2020 to 2025) grounded on five key pillars: mutual prosperity, security and stability, sustainable development, climate change, and people to people.

With regards to research and development initiatives and diplomacy, the study established that Kenya's positioning to harness R&D to foster STI diplomacy has been through NACOSTI's partnerships with various regional and international institutions to develop and promote STI. Kenya-Japan cooperation, through JICA is a proof of how R&D is

driving Kenya's health and science diplomacy through partnerships with various Japanese Universities such as Nagasaki University. The study showed that STI in Kenya is also being championed through R&D by the German development cooperation promoting food security. Research and development initiatives are also being undertaken in a mix of bilateral and multilateral cooperations to steer technological transfer in Kenya, cited by recent partnership between Kenya and South Korea to improve its education in science and technology, in efforts to produce high-skilled engineers and scientists to propel its Vision 2030.

On the aspect of green energy technology, the study established that STI are greatly being utilized in Kenya in the green energy technologies, and unlocking strategic partnerships such as EU-Kenya agreement (2023) to address the climate change issue and tap into renewable energy potential. Interview results showed that Kenya's uptake of green energy technologies is part of the current international development activity to promote diplomacy ranks, particularly in renewables such as solar and geothermal power. The study established that STI has been utilized as an instrument of diplomacy to enhance FDI in sectors such as banking, tourism, infrastructure and extractive industries. The study indicated the role of MNCs and their potential technologies associated with FDI on stimulating economic growth in Kenya. The recognition for collaborations in green energy technology represents a potential sector that can drive FDI and implementation of energy diplomacy to be re-defined within Kenya's foreign policy perspectives.

Overall, the results demonstrate that although they have not been defined in the foreign and diplomatic chain, the three key dimensions namely bilateral scientific cooperation, research and development initiatives and collaborations in green energy technology represent some key areas that define Kenya's STI diplomacy.

5.2.3 Role legal and policy framework of STI in promoting Kenya's Diplomacy

The study found out that STI Act in Kenya has not been overly effective in promoting Kenya's diplomacy. While a number of policy framework for STI through a number of progressive changes have seen the creation of key institutions such as NACOSTI, KENIA and NRF, interview results showed that there are gaps in the STI Act on how it fosters effective planning and coordination of various local and foreign process. The study showed that the STI Act and its role in shaping the institutional mandates for diplomacy in Kenya is still challenges in the sense that the STI policy still exist in draft format and suffers from weak collaborations across the various bodies that work in silos. The study also showed that the linkages between researchers, innovations and industry are also weak.

On the role of Kenya's Constitution 2010 in strengthening national STI strategies, the study established that indicators that recognizes STI, as well as native discoveries are present, including the Vision 2030. However, limited political support and the limited funding explains why it has taken so long to implement the STI policy and to institutionalize it. The study established STI legal and policy framework (STI Policy/Act) and its role in outlining policy objectives that enhance FDI inflows. However, interview results from key

informants revealed that sustaining FDI at levels that allow domestic investment to take advantage of benefits associated with capital inflows from local STI sectors.

In addition, the study showed that STI policy discourse has not fully facilitated coordination to promote technology transfer at bilateral and multilateral levels. This was informed by non-coherence engagement of the public and private agencies involved in the STI subsector at the local level. With regards to the role of STI policy framework in harnessing strategic partnership linkages, the analysis found connections between every institutional ecosystem at the national level are still not embedded within the diplomacy chain, thereby slowing down the effective strategic partnerships of all stakeholders within a policy framework.

Overall, the findings demonstrate that the policy and institutional framework on STI in Kenya is still weak. Effectively, an STI Act, STI policy and constitution are key centre points that can drive STI initiatives to promote diplomacy.

5.3. Conclusion

The study has brought forth the theoretical, conceptual and analysis that highlight the importance of STI in promoting diplomacy. Relying on institutional and positioning theories, the study sheds light on the spectrum shaped by the nexus between various STI components and their equivalent role in promotion of diplomacy in Kenya.

First, the study raises critical role of harnessing STI in foreign policy dimensions, given that scientific, technological and innovative advances emerging across the globe play centre stage in diplomacy. These emerging trends re not only influencing national policies, but also re-orienting diplomatic discourses in communications and actions to solve global challenges. Emerging technologies (Blockchain, IoT, AI, Big data, nanotechnology) and advances in vaccine research are also strengthening technology transfer as an avenue to promoting diplomacy. New trends in harnessing GMOs is still weak, and pioneering cooperation mechanisms that create an enabling environment for GMO as a key driver for food security and diplomacy is needed.

Secondly, the interplay of STI and diplomacy rests on how well foreign policy is framed. For a country like Kenya, the study sheds light on the importance of strengthening its relations with international players through science-driven diplomacy, R&D and seizing the opportunities revolving around green energy. These have the potential to draw FDI inflows through technological transfer needs to be aligned to diplomacy. This is because these key areas are opening up spaces for participation of diplomats and advancements in technological transfer and channeling FDI in Kenya, thus bringing out the linkages of STI, FDI and diplomacy.

Third, STI policy implications can be drawn from these study findings, and demonstrates the critical role of aligning STI Act, policy and the constitution under the foreign policy umbrella to promote diplomacy. Kenya's STI policy is still weak. It is clear that STI policy and institutional framework forms a crucial background that can necessitate tapping STI initiatives to enhance strategic partnerships that promote Kenya's diplomacy. The STI policy and institutional order shapes the central role that STI plays in diplomacy. Reflecting these results, it can be concluded

that existing STI Act and policy framework require new ways of thinking beyond bilateral cooperation. This may also call for reviewing national institutional reforms accompanied by funding so that STI can be effectively harnessed to play a crucial role in advancing diplomacy.

5.4. Recommendations

The concept of STI as a diplomacy tool is an important pillar for Kenya's development. The study recommends the following:

Regarding STI trends:

First, the Kenyan government needs to harness the power of emerging technologies, particularly AI and block-chain in its diplomatic efforts as part of its foreign policy tool. The government should utilize the potential of technology and innovation hubs, by launching capacity-building centers as an eye-opener for relevant government agencies to utilize the expertise and knowledge resources of the current technologies such as IoT, Big data and AI and their potential to enhancing technological transfer as a diplomacy tool. STI advisors to foreign agencies, ministers and other mechanisms for integrating STI advice into foreign ministries will be pivotal in developing evidence-informed foreign policies and in proactively identifying emerging STI trends that intersect with foreign policy.

In addition, Kenya needs to move with speed in utilizing vaccine research by expanding its research centres beyond KEMRI. This could be achieved through linking STI institutions, both public and private, to support universities undertake research programs through

financing mechanisms that attract sharing vaccines development technologies with developed and emerging players such as China, Russia and India.

Notwithstanding the rising public concerns regarding GMOs, the government should review its strategy through public awareness and come up with rules that guide greater use of GMO technologies in agriculture. This can boost its efforts aligned with climate-smart agriculture to enhance Kenya's food diplomacy via increased agricultural production.

With regards to the role of STI in promotion of diplomacy:

The government should broaden its bilateral scientific networks, while ensuring that science diplomacy is well anchored and developed at the MFA. Establishing a directorate for scientific collaborations at the MFA can go a long way in enhancing the coordination of diplomatic practice for scientific programs and strategic partnerships in multilateral settings. This will ensure that research and development through bilateral and multilateral development initiatives aim to directly and indirectly foster the development, dissemination and diffusion of STI to promote diplomacy.

There is need to deepen regional and international partnerships between academia, private sector and scientific community to promote R&D. This can be strengthened by ensuring an enabling STI infrastructure. Tools and facilities, such as laboratories, ICT incubation hubs, must be made available to drive successful innovation initiatives that promote R&D. Innovation infrastructure can also play an important role in convening communities, enabling networking to create partnerships, share advice on navigating the R&D systems and developing skills, with important spill-over benefits for businesses in the local

economy. With appropriate support, these centres could play a stronger role in the Kenya's STI system, de-risking the early stages of innovation, providing key scientific and technical resources and engaging business to promote innovation and economic growth.

The government should enhance its efforts to turn green energy into a diplomacy tool, as it serves as a strategic tool to influence its foreign agenda. This will ensure Kenya positions itself in the region with regards to green energy security particularly in the renewables such as wind, solar and geothermal. This will also require establishing new partnerships that attract FDI that can propel more investments in green energy technologies. More importantly, an elaborate plan and strategy of widening the STI ecosystem can be a key enabler and facilitator to harnessing international STI collaboration especially in new projects such as renewable energy technologies. Targeted engagement with the investment community about Government STI initiatives can help attract more investors into strategically important and related sectors, such as agriculture and health, thereby unlocking FDI.

With regards to policy and institutional framework:

The government should review the current STI Act and the institutional framework on STI. Kenya's STI requires a broad-based framework in order to effectively harness experience, knowledge and networks.

The draft policy on STI should be reviewed to match the current trends and aspirations of the country. This will ensure that the policy lays ground for streamlining diplomacy

practices with a more-practical and coordinated path that taps strategic partnership linkages. In light of this, the mindsets of both the public and policy makers need to be changed through promoting awareness, linking NACOSTI, universities with various stakeholders, including private sector collaborations both in and outside the country. Key institutions mandated to drive STI, such as NACOSTI, KENIA and NRF should keep fostering, upholding and disseminating the STI message.

Finally, the government should ensure that the constitutional aspirations, which also guides the conduct of foreign affairs, protects STI policies that advance national interests. The constitutional role of the executive and legislative arm of government has a key role in shaping the development of STI policies. Thus, these two organs should work closely to ensure that all state agencies and institutions established through the STI Act have adequate long-term finance needed, particularly in funding R&D programs at the local level.

5.5. Areas for Further Research

The results of this study have shown that STI is now an emerging special purpose vehicle that states are utilizing to promote diplomacy. For Kenya, harnessing STI thus represents a critical strategy for not only to gain economic benefits and help the country thrive through FDI inflows/trade and technological transfer, but also advancing diplomatic activities that maximize foreign policy goals. Thus, if well harnessed, STI can advance national policy priorities through diplomacy. This study has elicited key areas for further research into the topic of STI and foreign policy and how it can promote national and global interests through diplomacy.

First, the current trends of STI represent a critical area where institution, both public and private, could strengthen partnerships in key sectors such as food security, energy, vaccines and education.. The study revealed inconclusive evidence on how emerging technologies (nanotechnology) and advances in GMOs can be harnessed to enhance national food security, while also promoting human security with regards to health, given the growing controversies surrounding healthy issues associated with the GMOs, thus creating an unhealthy imbalance. In this regard, a comprehensive analysis of Kenya's science diplomacy is needed to explore how emerging trends in GMOs, through agricultural biotechnology trends shape its national and foreign policy.

Pertaining the nexus between STI and diplomacy, the study findings demonstrate new perspectives on effectively harnessing STI to unlock its potential within the foreign policy pipeline. While there are notable strides on how Kenya is leveraging bilateral scientific cooperation and R&D initiatives. Within the Kenyan context, the practice of diplomacy can be seen in the lens of foreign policy objectives that set pace priorities for harnessing STI, though still weak in implementation. This disclosure emanates from the ground that STI diplomacy is still in its infancy, and thus the institutionalization of STI diplomacy is still disjointed. As such, the extent to which these gaps impact on the effectiveness of STI to steer national and foreign policy goals remains a priority are for further investigation. This can also be linked to the lack of adequate research infrastructure that prevents exploitation in sectors such as green energy. Therefore, there is need for a study to examine the energy diplomacy as it relates to foreign relations that aim to promote energy security while also influencing diplomacy in Africa. Such a study could also explore the global energy transition, and how foreign policy on clean energy diplomacy influences FDI in African countries in times of geopolitical crisis.

In view of the third objective, the legal and policy framework on STI represents one of the key mechanisms through which states design their methods, procedures, and measures to achieve its goals in foreign policy. Achieving an effective legal and institutional framework that commits to promoting best practices for STI in national development and foreign policy is critical. Indeed, while the study established gaps in the STI Act, it also underscores the need to further areas of research given the fact that the foreign policy field has caught the attention of interaction and exchange that shape STI diplomacy as a practice aimed at bridging science and policy in the international arena. Therefore, it is clear that a legal and policy framework aimed at enabling STI-diplomatic processes to thrive is necessary. Yet, difficulties for STI and diplomatic institutions could emanate from the structural complexity of institutional bureaucracies that could potentially inhibit STI diplomacy endeavors. Therefore, a study is needed to analyze how STI policy plays a role in fostering strategic partnership linkages in promoting foreign policy in Africa. Such studies could help internalize the role of STI policymakers and development stakeholders on future lines of action, and how such policies shape diplomacy through a broad range of actors.

References

- Adesina, O. S. Foreign policy in an era of digital diplomacy. *Congent Social Sciences*, 19(5), 169-189. 2017.
- Agarwala, N. & Chaudhary, R. China's Policy on Science and Technology: Implications for the Next Industrial Transition. 2019.
- Akinbo, O., Obukosia, S. & Sinebo, W. Commercial Release of Genetically Modified Crops in Africa: Interface Between Biosafety Regulatory Systems and Varietal Release Systems. *Front. Plant Sci., Sec. Plant Biotechnology* 2021
- Aktar, A., Harun, M. & Alam, M. Science, Technology, and Innovation (STI) Policy for Sustainable Development. 2021.
- Aktar, M.A., Harun, M.B., Alam, M.M.Science, Technology and Innovation (STI) Policy for Sustainable Development. In: Leal Filho W., Azul A., Brandli L., Lange Salvia A., Wall T. (eds) *Affordable and Clean Energy. Encyclopedia of the UN Sustainable Development Goals*. Springer,2020.
- Arero, Jaro. STI Policy Gap: A Barrier to Economic Progress in Africa. 2018.
- Benson, D. & Kjelgren, R. Tacit Diplomacy in Life Sciences. 2014.
- Bettine, Marco, Picoli, Lia & Bin, Adriana. Gaining soft power by fostering science, technology, and innovation: dilemmas in international relations. Volume 6 Issue 2, 2022.
- BRICS: BRICS STI Framework Programme5th coordinated call for BRICS multilateral projects. 2021.
- Campbell, Steve, Greenwood, Melanie and Young, Sarah. Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing*, 25(8): 652–661, 2020.
- Colglazier, William "Science Diplomacy and Future Worlds," *Science & Diplomacy*, Vol. 7, No. 3, 2018.
- Dash, R. FDI, services trade and economic growth in India: Empirical evidence on causal links. 2012.
- Da-silva, R., Ferreira, G. & de Oliveira, A. The Institutional Building of Science and Innovation Diplomacy in Latin America: Toward a Comprehensive Analytical Typology. *Frontiers in Research Metrics and Analytics*, 27 Apr 2021.

- Echeverria-King, Luisa, & Gonzalez, Diana. Science Diplomacy in Emerging Economies: A Phenomenological Analysis of the Colombian Case. *Frontiers in Research Metrics and Analytics*, 2021.
- Ezekiel, I.P. Engaging science diplomacy for nanotechnology development in Africa. *IOP Conference Series Materials Science and Engineering*, 805(1), 2020.
- Faahnrich, Birte. Science diplomacy: Investigating the perspective of scholars on politics–science collaboration in international affairs. *PMID*, 26(6):688-703, 2017.
- Gallo, M. The European Social Innovation Diplomacy, a post-2020 strategy to put the EU at the global scene: The role of Sweden as an innovative leader. 2021.
- GoK. UK announces £132m of new investments in Kenya. Gov. UK.
- Greenwood, B. The contribution of vaccination to global health: past, present and future. 2014.
- Griffiths, Steven. Energy diplomacy in a time of energy transition. *Energy Strategy Reviews*. Volume 26, 2019.
- Griset, P. Innovation Diplomacy: A New Concept for Ancient Practices? *The Hague 020. Journal of Diplomacy*, 15(3), 383-397.2-
- Griset, Pascal. Innovation Diplomacy: A New Concept for Ancient Practices? *The Hague Journal of Diplomacy*. 2020.
- Hawkins, Richard. *Looking at Innovation from a Uniquely Canadian Perspective*. Ottawa: Institute for Science, Society and Policy, 2012.
- Helding, Elsa & Bremberg, Niklas. Practice Approaches to the Digital Transformations of Diplomacy: Toward a New Research Agenda, 2021.
- Ibragimova K.A. EU Science Diplomacy and Framework Programs As Instruments Of Sti Cooperation. *MGIMO Review of International Relations*. 2017;(5(56)):151-168, 2017
- Ieamvijarn, S. Technological Innovation: Concepts for Economy Driving in an Era of Platform Economy. *Journal of Research and Development Institute Rajabhat Maha Sarakham University*, Vol. 9(1)., 2022.
- Jacobsen, L. & Olsakova, D. Diplomats in Science Diplomacy: Promoting Scientific and Technological Collaboration in International Relations. *Science and Humanities*, Volume 43, Issue4, 465-472, 2020.
- James, Melanie & Langenhove, Luk. The practice of Science Diplomacy studied from the Positioning Theory angle. Conference: 3rd International Conference on Public Policy,

- SINGAPORE 28th June to Friday 30th June 2017. United Nations University (UNU). 2017.
- Jilani Zaid. Emerging Technologies: A Role for Science Diplomacy. 2022.
- Kaltofen, Caroli & Acuto, Michele. Rebalancing the Encounter between Science Diplomacy and International Relations Theory. 2018.
- Kaltofen, Caroline & Acuto, Michele. Science Diplomacy: Introduction to a Boundary Problem. *Global Policy* 9(2):8-14, 2018.
- Karacan, D. Science diplomacy as a foreign policy tool for Turkey and the ramifications of collaboration with the EU. *Humanities and Social Sciences Communications*. Vol 8(49), 2021.
- Khursid, Syed. Impact of New Emerging Technologies-Science Diplomacy perspective. 2022. Al-Muqet Laboratories (pvt) Ltd & Region. 2022.
- Kim, J. & Yoo, J. Science and Technology Policy Research in the EU: From Framework Programme to HORIZON 2020. 2019.
- King, F., Gnzalez, A. & Andrade-Sastoque, E. Science Diplomacy in Emerging Economies: A Phenomenological Analysis of the Colombbian Case. *Front. Res. Metr. Anal.*, 2021.
- Kishi, T. & Turekian, V. Science and Technology Advising in Today's Foreign Policy. 2017.
- Kose, Ilker. Science And Technology Policies in Turkey. 2017.
- Kourti, Andrew: 2020. The Long March to Peace: The Evolution from "Old Diplomacy" to "New Diplomacy."
- Krasnyak, Olga. National Styles in Science, Diplomacy, and Science Diplomacy: A Case Study of the United Nations Security Council P5 Countries. In book: National Styles in Science, Diplomacy, and Science Diplomacy (pp.1-100), 2018.
- Krasnyak, Olga. National Styles in Science, Diplomacy, and Science Diplomacy: a Case Study of the United Nations Security Council P5 Countries. In book: National Styles in Science, Diplomacy, and Science Diplomacy (pp.1-100), 2018.
- Krejcie, R.V., & Morgan, D.W. Determining Sample Size for Research Activities. *Educational and Psychological Measurement*. 1970.
- Kufeoglu, S. Emerging Technologies. In book: Emerging Technologies, Value Creation for Sustainable Development (pp.41-190). 2022.

- Linkov, Igor & Basu, Sankar. Diplomacy for science: strategies to promote international collaboration. *Environment Systems and Decisions* 36(4):1-4, 2016.
- Los Lijten Innovation policy and international relations: directions for EU diplomacy. *European Journal of Futures Research*, 7(4). 1-21, 2019.
- Madar, Mohammed. Science, Technology & Innovation (STI) Policy Reform for Developing Countries at the Grassroots Levels. 2019.
- Mohammed, M. & Nie, G. Are Technological Innovation and Foreign Direct Investment a Way to Boost Economic Growth? An Egyptian Case Study Using the Autoregressive Distributed Lag (ARDL) Model. 2021.
- Mohammed, M. & Nie, G. Are Technological Innovation and Foreign Direct Investment a Way to Boost Economic Growth? An Egyptian Case Study Using the Autoregressive Distributed Lag (ARDL) Model. 2021.
- Montgomery, K. & Colglazier, W. Emerging Technologies and Science Diplomacy. 2022.
- Moons, S. J. V. Heterogeneous effects of economic diplomacy: instruments, determinants and developments (Doctoral Thesis, Erasmus University of Rotterdam, Rotterdam, Netherlands. 2017.
- Moyer, R. & Huett, B. A Review of Contemporary Science and Technology Policy Research: Recent Trends and Future Directions. 2017.
- Moyer, R. & Song, G. a review of contemporary science and technology policy research: recent trends and future directions. 2017.
- Nina, Klimburg-Witjes. The Internationalization of Science, Technology & Innovation (STI): An Emerging Policy Field at the Intersection of Foreign Policy and Science Policy?2014.
- Osano, H. & Koine. Role of foreign direct investment on technology transfer and economic growth in Kenya: a case of the energy sector.2016.
- Osano, Hezron M.; Koine, Pauline W. Role of foreign direct investment on technology transfer and economic growth in Kenya: A case of the energy sector, *Journal of Innovation and Entrepreneurship*, ISSN 2192-5372, Springer, Heidelberg, Vol. 5, Iss.31, pp. 1-25, 2016.
- Pandey, N. & Deepthi, T. Emerging Technologies, STI Diaspora and Science Diplomacy in India: Towards a New Approach. *Sec. Research Policy and Strategic Management*, Volume 7 – 2022.

- Pandey, N., Srinivas, K. & Deepthi, E. (2022). Emerging Technologies, STI Diaspora and Science Diplomacy in India: Towards a New Approach. *Policy and Practice Reviews Article*, Front. Res. Metr. Anal., 22 June 2022.
- Pantoja, M. Business Diplomacy Strategies and Instruments: Biotechnology Companies Promoting GMOs in Mexico. 2018.
- Park, D. & Kim, Y. The Role of Science, Technology, and Innovation Policies in the Industrialization of Developing Countries. Lessons from East Asian countries. 2021.
- Raghav, P., Sibaram Badatya, & Rai, T. Science diplomacy for renewable energy: The making of International solar alliance. SPAST Abstracts, 1, 2021.
- Sahin, K. & Mert, K. Institutional theory in international business studies: the period of 1990–2018. *International Journal of Organizational Analysis*. 2022.
- Shok, N. Vaccine Diplomacy in the Wake of COVID-19. 2022.
- Solis, M. & Mauduit, J. Institutional Capacity for Science Diplomacy in Central America. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8317690/>. 2021.
- Suddaby, R. Institutional Theory. 2021.
- Toure Moctar. Integrating Africa: Prospects and Promise for Science Diplomacy.
- Toure, M. Integrating Africa: Prospects and Promise for Science Diplomacy. 2018.
- UN. Technology and Innovation Report. 2021.
- UNESCO. Overview of the Science, Technology and Innovation Landscape of Eastern Africa. 2022.
- UNESCO: Strengthening national STI policies and governance in accordance with *the* UNESCO. 2021.
- UNIDO. The role of science, technology, and innovation policies in the industrialization of developing countries. 2021.
- US Department of State. Joint Statement on the Second Kenya-U.S. Bilateral Strategic Dialogue. 2021.
- NRF. Kenya-France PAMOJA PHC 4th Call for Applications (2022/2023). National Research Fund. 2022.
- Washbourne, Carla. Science Diplomacy and Cities. 2016. Conference: Science Diplomacy in Africa: Concepts, praxis, prospects.
- Weiss, C. How Do Science and Technology Affect International Affairs? 2015.
- Williams Robyn. ‘New-new’ diplomacy: A new technological dawn. *Digital Policy Studies*. 2022.
- Witjes, N. & Sigl, L. The Internationalization of Science, Technology & Innovation (STI): An Emerging Policy Field at the Intersection of Foreign Policy and Science Policy? 2015.

APPENDICES

APPENDIX I: QUESTIONNAIRE

My name is Christopher Chumba, pursuing a Master of Arts in National Security Strategy at the National Defence University-Kenya. I am undertaking a research study on “Science, Technology and Innovation in Promoting Kenya’s Diplomacy.” Kindly assist in contribution of information towards this study by filling in the questionnaire below.

*NOTE: **STI** is used to mean Science, Technology & Innovations*

BIODATA

Expert Area _____

Industry/Institution _____

SECTION I: STI TRENDS PROMOTING KENYA’S DIPLOMACY

1. To what extent has Kenya utilized technological endeavours such as emerging technologies in promoting diplomacy in Kenya?
 - a. To a great extent []
 - b. To a moderate extent []
 - c. To a less extent []
 - d. Not at all []

Give a reason for your answer above:

2. How would you rate the governments’ uptake of new trends in Vaccines (Vaccine research through diagnostics/treatments) to advance Kenya’s national health needs and promoting diplomacy?
 - a) Effective []
 - b) Fair []
 - c) Not effective []
 - d) Poor []

Give a reason for your answer above

3. In your opinion, do you think Kenya has prioritized the uptake of GMOs as part of the meeting global needs and promoting Kenya's diplomacy?

e. To a great extent []

f. To a moderate extent []

g. To a less extent []

h. Not at all []

Give a reason for your answer above:

4. In your opinion, to what extent would you say the new trends in STI (such as Vaccine science & GMOs) have created the potential for FDI inflows in Kenya?

a. To a great extent []

b. To a moderate extent []

c. To a less extent []

d. Not at all []

Give a reason for your answer above:

5. In your opinion, to what extent has emerging trends in STI (such as Artificial Intelligence/Vaccine science & GMOs) been utilized as a key asset of technological transfer in promoting Kenya's diplomacy?

a. To a great extent []

b. To a moderate extent []

c. To a less extent []

d. Not at all []

Give a reason for your answer above:

6. In your opinion, has the Kenyan government effectively utilized of new trends in STI to enhance strategic partnership linkages and building capacities for international cooperation and promoting diplomacy in Kenya?

a) Effective []

b) Fair []

c) Not effective []

d) Poor []

Give a reason for your answer above

SECTION II: THE ROLE OF STI IN PROMOTING DIPLOMACY

1. In your view, what role has STI initiatives related to bilateral scientific cooperation played in the promotion of diplomacy in Kenya?

- a. To a great extent []
- b. To a moderate extent []
- c. To a less extent []
- d. Not at all []

Give a reason for your answer above:

2. In your opinion, to what extent has Kenya adopted research and development initiatives (Bilateral & multilateral cooperations) as part of building STI infrastructure to promote diplomacy in Kenya?

- To a great extent []
- To a moderate extent []
- To a less extent []
- Not at all []

Give a reason for your answer above:

3. How would you rate the governments' uptake of green energy technologies as part of the current international development activity to promote diplomacy?

- a) Effective []
- b) Fair []
- c) Not effective []
- d) Poor []

Give a reason for your answer above

4. To what extent has STI been utilized as an instrument of diplomacy to enhance FDI inflows in Kenya?

- To a great extent []
- To a moderate extent []
- To a less extent []
- Not at all []

Give a reason for your answer above:

5. In your opinion, would you say the role of STI in promoting diplomacy has been adequately applied as a strategy to facilitate technological transfer?
- a) To a great extent []
 - b) To a moderate extent []
 - c) To a less extent []
 - d) Not at all []

Give a reason for your answer above:

6. To what extent has STI played a critical role in enhancing strategic partnership linkages to advance Kenya's diplomatic priorities?
- a) To a great extent []
 - b) To a moderate extent []
 - c) To a less extent []
 - d) Not at all []

Give a reason for your answer above:

SECTION III: LEGAL/POLICY FRAMEWORK ON STI IN PROMOTING DIPLOMACY

1. In your opinion, would you say the STI Act is effective in promoting Kenya's diplomacy?
- a. To a great extent []
 - b. To a moderate extent []
 - c. To a less extent []
 - d. Not at all []

Give a reason for your answer above:

2. In your opinion, how effective is the STI Policy in providing a clear roadmap for facilitating institutions to promote diplomacy in Kenya?
- a) Effective []
 - b) Fair []
 - c) Not effective []
 - d) Poor []

Give a reason for your answer above:

3. In your opinion, how would you rate the role of Kenya's Constitution 2010 in offering coherence of national STI strategies and key actors to promote diplomacy?

- a) Satisfactory []
- b) Fair []
- c) Not satisfactory []
- d) Poor []

Give a reason for your answer above:

4. In your view, how can you rate the STI legal and policy framework (STI Policy/Act) in outlining policy objectives that enhance FDI inflows and promoting diplomacy in Kenya?

- a) Satisfactory []
- b) Fair []
- c) Not satisfactory []
- d) Poor []

Give a reason for your answer above:

5. To what extent has the existing legal and policy framework on STI facilitated coordination to promote technology transfer at bilateral and multilateral levels within the context of diplomacy?

- a) To a great extent []
- b) To a moderate extent []
- c) To a less extent []
- d) Not at all []

Give a reason for your answer above:

6. How effective has the current STI legal and policy framework provided strategic partnership linkages as part of a national strategy to promote diplomacy in Kenya?

- a) Effective []
- b) Fair []
- c) Not effective []
- d) Poor []

Give a reason for your answer above:

END-Thank you

APPENDIX II: INTERVIEW SCHEDULE

STI TRENDS

1. What are the new trends in STI influencing Kenya's diplomacy?
2. What key projects has Kenya prioritized in line with new STI trends, with regards to emerging technologies (IoT, AI, Big Data, nanotechnology) Vaccine Science and GMOs.
3. To what extent has these new trends in STI influence: a) FDI inflows; b) technology transfer; c) strategic partnership linkages.
4. What challenges exist with regards to the uptake of these new trend in STI?

ROLE OF STI IN PROMOTING DIPLOMACY

1. What key area has STI played in promoting diplomacy in Kenya?
2. Which key sectors/ national projects have been explored with regards to STI (for research and development, bilateral and multilateral cooperations, green technology) initiatives as part of a national strategy to promote diplomacy in Kenya?
5. To what extent has STI influenced Kenya's diplomacy with regards to: a) FDI inflows; b) technology transfer; c) strategic partnership linkages.

LEGAL/POLICY FRAMEWORKS ON STI

1. What are the existing legal and policy framework on STI. To what extent are they promoting Kenya's diplomacy?
2. Does the existing legal and policy framework provide avenues for enhancing: a) FDI inflows; b) technology transfer; c) strategic partnership linkages to promote Kenya's diplomacy?
3. What gaps exist in the current STI legal/policy framework? What suggestions can be undertaken to ensure STI policy provides an effective platform in promotion of Kenya's diplomacy?

APPENDIX III: KENYA STI ACT



THE REPUBLIC OF KENYA

LAWS OF KENYA

SCIENCE, TECHNOLOGY AND INNOVATION ACT

NO. 28 OF 2013

Revised Edition 2014 [2013]

Published by the National Council for Law Reporting
with the Authority of the Attorney-General

www.kenyalaw.org

NO. 28 OF 2013

SCIENCE, TECHNOLOGY AND INNOVATION ACT

[Date of assent: 14th January, 2013.]

[Date of commencement : 24th June, 2013.,
Parts VI and VII: 1st October, 2014.]

An Act of Parliament to facilitate the promotion, co-ordination and regulation of the progress of science, technology and innovation of the country; to assign priority to the development of science, technology and innovation; to entrench science, technology and innovation into the national production system and for connected purposes

[L.N. 94/2013, Act No. 18 of 2014, L.N. 129/2014.]

PART 1 – PRELIMINARY

1. Short title and commencement

This Act may be cited as the Science, Technology and Innovation Act, 2013, and shall come into force on such date as the Cabinet Secretary may, by notice in the *Gazette* appoint, and different dates may be appointed for the coming into force of different provisions.

2. Interpretation

In this Act, except where the context otherwise requires—

“**acquisition**” means the process by which the rights to use, employ and exploit a technology for the purpose of improving or renewing processes, products or services are acquired;

“**Cabinet Secretary**” means the Cabinet Secretary for the time being responsible for matters relating to science, technology and innovation;

“**Commission**” means the National Commission for Science, Technology and Innovation established under section 3;

“**Director-General**” means the Director-General of the Commission appointed under section 8;

“**eminent scientist**” means person who has made distinguished contributions in the field of science;

“**Fund**” means the National Research Fund established under section 32;

“**incubation**” means the maintenance of enabling environmental conditions for the purpose of facilitating the growth or development of infant technologies ideas or industries;

“**industrial park**” means an area designed and zoned for manufacturing and associated activities;

“**innovation**” includes—

APPENDIX IV: KENYA STI DRAFT POLICY



REPUBLIC OF KENYA

MINISTRY OF EDUCATION

DRAFT

SCIENCE, TECHNOLOGY AND INNOVATION POLICY

2020-2030

Revitalizing and Harnessing Science, Technology and Innovation in Kenya

SEPTEMBER 2020

FOREWORD

Kenya's Vision 2030 is founded on intensification in the application of science, technology, and innovation to raise productivity and efficiency levels across the three pillars. The Vision recognises the critical role played by research and development (R&D) in accelerating economic development in all the newly industrialising countries of the world. Kenya's national research institutes, universities and non-governmental institutions generate knowledge in different areas with varying levels of complexity. Kenya intends to become a knowledge-led economy wherein, the creation, adaptation and use of knowledge will be among the most critical factors for rapid economic growth. New knowledge will play a central role in the nation's wealth creation and social welfare. Effective exploitation of knowledge is envisaged to provide a regime that will provide a package of incentives for the efficient use of the existing knowledge, creation of new knowledge, and flourishing entrepreneurship. An educated and skilled population will create, share, and use knowledge well in an effective innovation system at the research centres, universities, think tanks, private enterprises and community groups.

This Science, Technology and Innovation (STI) Policy is geared towards the realization of the Country's long-term development goal of Vision 2030. The object of the policy being to mainstream science, technology and innovation in all the sectors of the economy through carefully targeted investments. This will create a strong base for enhanced efficiency, sustained growth and promotion of value addition in goods and services. The Policy measures take into consideration the Government's focus implemented in the five-year Medium-Term Plans that articulate the priorities formulated to address the immediate needs for the period under implementation. This paves the way for a measurable, achievable and relevant purposeful application of science and technology in national growth and development.

The Policy implementation will require additional investment in STI, better coordination of actors, increased technology transfer, improved capability and capacities and increased collaborations among actors devoted to research, technical capabilities of the workforce, and in raising the quality of teaching mathematics, science, technology and engineering in schools, polytechnics and universities. There is also need to raise awareness and ensure that the objectives of this policy are understood and fully owned by the various stakeholders and implementing partners.

The process of policy development involved wide consultations with stakeholders, led by the National Commission for Science, Technology and Innovation (NACOSTI) who provided the needs of every sector and gave an indication of the direction we need to take in order to align research and development to national aspirations. There was public participation by way of workshops for research and development stakeholders from various public and private sector Institutions.

The Government is committed to the implementation of STI in Kenya and invites all actors to foster strong partnerships that will accelerate the pace of national development through adoption of technological and scientific processes and outputs.

Prof. George A. O. Magoha, EGH, MBS, EBS, CBS
Cabinet Secretary

APPENDIX V: KENYA FOREIGN POLICY



PREFACE AND ACKNOWLEDGMENT



The Ministry of Foreign Affairs and International Trade is mandated to pursue Kenya's foreign policy and international trade affairs in accordance to the Constitution of Kenya, with the overarching objective of protecting, promoting and projecting the nation's interests abroad.

In pursuing of this objective, my Ministry has developed this Foreign Policy to guide Kenya's foreign relations and diplomatic engagements with our partners. The Policy is inclined towards upholding the country's sovereignty, promoting universal peace and fostering better relations with our neighbors, the rest of the African continent and the world at large. In this regard, Kenya will continue to consolidate and strengthen its foreign relations and diplomatic engagements with other countries as well as international and multilateral organizations at the regional, continental and international level.

This Policy is anchored on five interlinked pillars of diplomacy namely: Economic; Peace; Environmental; Cultural and Diaspora. Economic diplomacy aims to realize a robust and sustained economic transformation so as to secure Kenya's social economic development and prosperity in line with the goals and aspirations of the Kenya Vision 2030. Peace Diplomacy seeks to consolidate Kenya's legacy in promoting peace and stability as necessary conditions for development and prosperity in countries within the region. Environmental Diplomacy recognizes Kenya's enormous stake in the sustainable management of its own natural resources, both regionally and globally. Cultural Diplomacy aims to use culture as a vital tool in international relations especially through the use of cultural heritage and endowments as the pedestals of our foreign engagement. Lastly, Diaspora Diplomacy recognizes the importance of harnessing the diverse skills, expertise and potential of Kenyans living abroad, and facilitating their integration into the national development agenda. These pillars inform the core priorities and strategies for our bilateral and multilateral engagement so as to strengthen relationships, enhance social cultural cooperation and promote our national interests.

APPENDIX VI: REFERENCE LETTER FOR PERMIT

RESTRICTED

Telephone: 254-2-884036
Fax: 254-2-884036
E-mail: ndc@ndc.go.ke



National Defence College
Warai North Road
P.O Box 24381
Karen - Nairobi
Kenya

When replying please quote:

Ref: NDC/A/141

10 November 2022

TO WHOM IT MAY CONCERN

**FACILITATION FOR DR CHRISTOPHER CHUMBA ADM No.
ND601/0038/2022**

The above Senior Officer is a course participant at the National Defence College and has been admitted for Masters of Arts in National Security and Strategy, under the National Defence University- Kenya Programme.

As part of academic requirements, Dr Christopher CHUMBA is required to undertake a research project in partial fulfillment of MA degree programme he is enrolled in. His approved research topic is **“Science, Technology and Innovation in Promotion of Kenya’s Diplomacy”**.

The purpose of this letter is to kindly request your office to facilitate the Officer as he conducts his research project.

Submitted for your kind consideration and facilitation.

Mr F M MABEYA
Head of Programme
for Commandant

APPENDIX VII: RESEARCH PERMIT

 REPUBLIC OF KENYA NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION Ref No: 381735	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION Date of Issue: 06/December/2022
RESEARCH LICENSE	
	
This is to Certify that Dr. Christopher CHUMBA CHUMBA of National Defense University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: SCIENCE, TECHNOLOGY AND INNOVATION IN PROMOTING KENYA'S DIPLOMACY for the period ending : 06/December/2023.	
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