Assessing the influence of Kenya's space exploration on its foreign policy dynamics with the United States

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ABSTRACT

The USA, Russia, and China have historically dominated the space race, with the African continent recently venturing into it. Kenya formed its own Kenya Space Agency to spearhead the process. This study investigated the influence of Kenya's space exploration on its foreign policy dynamics with the United States. The objective was to evaluate challenges and opportunities of Kenya-USA relations in space exploration in regard to foreign policy. The research adopted a correlational method of study to examine relationships between the countries, borrowing from systems theory and grounded theory. The study adopted a stratified random sampling method. It involved stratifying the population, defining a number of separate partitions using sample size, and combining the results to obtain the required stratified sample. By ensuring that each stratum is represented in the sample, stratified sampling helped to ensure that the sample reflects the diversity of the population. A total of 200 respondents were selected from different types of stakeholders. A sample size of 200 provides sufficient power to detect meaningful effects or relationships. A sample of 100 respondents was drawn from the Ministry of Foreign Affairs; 50 were space experts and 50 were diplomats drawn from the two countries. Data was collected through the conduct of interviews with the various respondents from the sampled population. Data collected was analyzed qualitatively before making desirable conclusions. The research established that Kenya benefits through technological exchanges, international cooperation, and educational and scientific exchanges. Security agencies benefit through enhanced Earth observation, intelligence gathering, improved communication and navigation systems, and space situational awareness. The study concluded that space benefits are vast and are drivers of economic liberty and development in an economy. Mutually beneficial relationships are an avenue for individuals to freely interact with others for a joint development. These all greatly shape policies adopted as well as the justification of the policies. The benefits outweigh the losses for Kenya, considering the national interests as well as the future, which will be space technology-driven. The researcher suggests exploring long-term effects of space exploration on the regional influence of Kenya, the role played by the private sector partnerships, and comparative studies with other African countries that are pursuing space exploration. Studies are to be conducted on the long-term collaboration impacts not only with Kenya but with the entire African continent.

Keywords: Challenges, Exploration, Foreign Policy, Opportunities, Space

I. INTRODUCTION

Space race has been on the rise globally. Kenya as a country is a no exception in securing its position in space activities. Over fifty (50) nations globally own space crafts and satellites (Organisation for Economic Co-operation and Development [OECD], 2020). Over the past 6 decades, the issue of space exploration has pushed the frontiers of both science and technology in various nations across the world Kenya included. This is because repeatedly, the issue of space science has proved that it has the advantage and capability of driving forward the growth of both science as well as technology in countries which are applicable themselves to it as well as in ways which had a significant as well as positive impact on the other sectors and spheres of the economy (Nzinga *et al.*, 2019). The foreign policy of Kenya as a country is known to rest on five major pillars which are interlinked and these are the: economic diplomacy pillar, peace diplomacy pillar, environment diplomacy pillar, cultural diplomacy pillar, and the Diaspora diplomacy pillar (Ministry of Foreign Affairs Kenya, 2014). Kenya's foreign policy pillars and space exploration efforts are closely linked, with space technology supporting diplomatic relations, economic development, scientific advancement, national security, and sustainable development. By advancing its space program, Kenya strengthens its global presence, fosters international partnerships, and leverages space technology for economic and societal benefits, aligning with its broader foreign policy objectives (Munyua, 2021).

Studies have shown that Kenya's foreign policy toward the United States has long been a major determinant of investment in space research as well as the growth and extension of Kenya's space industry (McEwan & Spielman, 2021). Furthermore, it was claimed that Kenya's exploration of space had an impact on the nation's foreign policy towards the United States of America because it had made it possible for its domestic space industry to contribute to many areas of technological advancement, research, manufacturing capabilities, and even innovation. As a result, Kenya is now in a better position to actively contribute to the development of the entire nation (Berger-Kern *et al*., 2021). In the end, this has benefited the nation. This has helped the country to positively contribute towards research and technology-based growth strategies which is indeed a central and vital tenet of its vision 2030 "production-oriented growth" which is expected to underpin the entry of Kenya into a medium-based income economy. This was mostly driven by Kenya Space Agency that has played a crucial in realizing the same. Space exploration promotes the development of high-technology industries. Kenya's investment in space technology has the potential to stimulate innovation and foster a technology-driven economy. This is consistent with Vision 2030's goals of industrialization and the creation of a knowledge-based economy (Schindler & Kanai, 2021).

Space missions, such as satellite launches, aid in the development of advanced infrastructure. Satellites deliver critical data for a variety of applications, including telecommunications, weather forecasting, and resource management (National Aeronautics and Space Administration [NASA], 2021). This aligns with Vision 2030's goal of improving national infrastructure and technological capabilities (Government of Kenya, 2007). Space exploration initiatives offer opportunities for education and skill development in science, technology, engineering, and math (STEM). Kenya's space program has the potential to inspire and train a new generation of scientists and engineers, aligning with Vision 2030's emphasis on educational advancement and skill development (Kenya Space Agency [KSA], 2023). Space technology can help with healthcare by collecting data to monitor environmental health factors and disease outbreaks (World Health Organization [WHO], 2020). This aligns with Vision 2030's goals of improving healthcare systems and public health (Government of Kenya, 2007).

Through the provision of information on crop health, soil conditions, and weather patterns, satellites can improve agricultural productivity (Food and Agriculture Organization [FAO], 2021). This helps achieve Vision 2030's goals of increasing food security and modernizing agriculture. Space-based data aids in disaster management and response. By improving the ability to monitor and respond to natural disasters, space technology contributes to Kenya's resilience and sustainability goals outlined in Vision 2030 (Kenya Space Agency [KSA], 2023).

While studies have been conducted in assessing the influence of space exploration on the foreign policy dynamics between Kenya and the USA, limited comparative studies have been conducted between Kenya's space initiative and the USA in regards with other African countries. The historical examination of the past initiatives between the two countries may be limited and may pose a challenge in assessing the policy changes over time. Finally, a lack of an analysis on existing policies governing space exploration and their impact on foreign policies

1.1 Statement of the Problem

Kenya as a country needs to be stable in space related activities as space technology has become the epitome for the provision of all modern infrastructure. The two countries have in the long run had bilateral agreements in regards to exploring the outer space. Exploration is an expensive venture for Kenya to explore on its own due to her economic standing. The exploration race requires complex technology and highly qualified expertise that Kenya, as a country, has limited capacity to provide (Mutambo, 2022). In addition to the high expenses associated with space navigation, the dynamic technological innovations in space exploration make it difficult and complex for Kenya to execute research and other vital activities independently (Owalla, 2021). It is therefore on this basis that there is need for cooperation in various areas such as finance, technology, science, training, and policy formulation in outer space initiatives with the US, so that Kenya can accrue the benefits of space like other nations. The 14 July 2022 Kenya–US Strategic Trade and Investment Partnership (STIP) saw enhanced engagements in increasing investment, agriculture, digital trade, environment and climate change action, and entrepreneurship (Office of the United States Trade Representative [USTR], 2022). The need for cooperation in space exploration calls for a well-established platform to realize integrated technological advancement. This partnership shapes the policies to be formulated and enables Kenya to tap into the US's well-established space infrastructure, helping position the country as a future regional and continental space hub

Studies have examined the role played by space exploration in both countries highlighting the benefits accrued from the same. Pearson (2023) projects that Kenya has been able to modernize its airspace infrastructure, ensuring that it meets international standards and can accommodate growing aviation traffic, by incorporating American technology and best practices. Nthenya (2023) explored the endowment of Kenya with natural resources as pathway guiding her as a host country of the US in the space industry making and influencing it to become an active contributor towards the development of both space as well as space-based technologies across the African continent. The various studies however majorly focused on the benefits and opportunities exploited by the countries in venturing into the industry.

Therefore, this study goes to the extent to analyze the diplomatic effects by looking at the foreign policy implications that are of a long-term effect and shapes future relationships in the industry.

1.2 Research Objective

The specific objective was:
Evaluating the challenges and opportunities of Kenya USA relations in space exploration in regard to foreign policy.

II. LITERATURE REVIEW

2.1 Theoretical Framework

The theoretical framework is known to highly dwell on the time-tested theories that embody findings of various investigations regarding the occurrence of a phenomenon. The study was guided by both grounded and systems theory (Glaser, 1967).

2.1.1 Grounded Theory

Barney & Anslem (1967), introduced grounded theory in response to the limitations of existing research methods. The use of Grounded theory aimed at studying a phenomenon to discover new developments that come with it. The study employed ideas from the Grounded theory to assess the impacts of space exploration on bilateral agreements and therefore the policies adopted. Space activities are a new phenomenon in the region hence relevance of the theory.

2.1.2 Systems Theory

Burrows (2022), Systems theory gives a construction to understanding and looking at complex structures by overview them as solid wholes made from interconnected and dependent parts. Systems theory portrayed society as a system with individuals and groups who have different believes. However, society has to overcome this to prevent conflict. The perception of space activities varies and may not be in line with a country's norms hence affects policies to be adopted by her counterparts. Kenya and USA have different ideologies and believes hence formulated foreign policies should be in line with each nation's interests.

2.2 Empirical Review

The study borrowed from the structural realist theory. Structural realist theory offers insights into future space relationships. Kenneth (2012), the international structure shapes the options available to states. Levels of interdependence have increased greatly. The foreign policy options available to states differ between bipolar and multipolar international systems. Structure shapes how states align with or against each other. States will strategically position themselves into space if they have not already started doing that and this provides an important basis for theorizing about their relative importance themselves, other states and regions. Space activities and exploitation will create interactive patterns and power relationships.

Structural realism provides a framework for understanding the space exploration dynamics between Kenya and the USA by focusing on the impact of the international system's structure on state behavior. It highlights how the anarchic nature of the international system, power dynamics, strategic interests, and global governance structures influence the actions and strategies of both nations in the space domain. Dalman (2002), Space control is held by many to be indispensable to power on earth. Space power will therefore become the essential basis for earth power. This is why any country that has a positive economic development track record including those in Africa strive to be represented in space as well.

Anantatmula (2013) The USA's space policy emphasizes maintaining its leadership in space, which influences its interactions with other nations, including Kenya. Kenya's space ambitions, such as launching satellites and participating in international space missions, reflect its desire to enhance its own standing and capabilities. The USA's collaboration with Kenya can be seen as part of a broader strategy to extend its influence and foster cooperation, while Kenya seeks to leverage this partnership to achieve its own strategic goals.

2.2.1 Aid by the US to Kenya in Achievement of Set Targets

Kenya's space exploration is truly a significant determinant of the country's foreign policy and has been deemed as a crucial partner for the US in helping it hit set targets. This is attributed to the fact that Kenya is indeed bestowed with a unique variety of vital resources because of not only its geographic location or positioning at the equator but also because on the East, it borders with the Indian Ocean which the US sees as being an easy facilitator towards the tracking and launching of space crafts and its set targets (Kenya Space Agency [KSA], 2023). Kenya's foreign policy with the US has further seen it be in a better position of developing essential space programs that are duly guided by the

international or global Treaties and Conventions to which Kenya is a state party. This has helped Kenya be in a better position of observing national principals in airspace that have eventually helped in promotion of peaceful usage of the outer airspace for the benefit of the general humanity across the world.

2.2.2 Use of Telemedicine as a result of Space Exploration

Kenya's exploration of the airspace has further been enhanced as a result of putting in place constructive practices which have helped the country to be in a better position of exploring its airspace. This has been through enhancing the manner in which the country handles a wide range of natural disasters and hazards through forecasting, monitoring, evacuation, relief support services, and effective management. This has also seen Kenya advance its use in telemedicine where space technologies are used in taking of health services to the remote parts of the nation with more ease. This has also played a beneficial role in the country in that it has helped individuals' access education. For instance, space technologies have been used in Kenya in enhancement of space technologies which have helped in enhanced distance learning as well as taking education closer to the people and more so those who come from the remote areas of Kenya (Mhalla, 2020). Through space exploration, Kenya has been capable of borrowing skills and knowledge from the US for land use planning in aspects of mapping and surveying thus made the issue of both rural and urban planning easier.

Kovach (2020) the technology of telemedicine, which enables remote diagnosis and treatment, is one of these fields. The requirements and innovations brought about by space exploration have had a significant impact on the growth and development of telemedicine. Remote health monitoring and diagnostics need to be improved in order for space medicine to progress. NASA spearheaded the utilization of different remote detecting advances to screen space explorers' wellbeing, including wearable gadgets that could follow crucial signs and physiological boundaries. These advances were intended to guarantee space explorers wellbeing and security during missions and laid the foundation for far off wellbeing checking frameworks utilized in telemedicine today.

Gray (1997), Space exploration has driven the advancement of remote diagnosis of various ailments and diseases. For instance, today's telemedicine platforms make it possible for healthcare professionals to carry out virtual consultations, diagnose conditions, and offer treatment recommendations without having to be physically present with the patient. Patients who live in rural or remote areas with limited access to healthcare facilities now require this capability. To this account, wearable health monitors have evolved into sophisticated telemedicine devices. These devices are able to send real-time data about a variety of health metrics, including heart rate, blood pressure, and glucose levels, to healthcare providers. This consistent checking takes into consideration ideal mediations and better administration of ongoing circumstances.

The study acknowledges the profound impact that technological innovation has on various aspects of life is demonstrated by the advancements in telemedicine brought about by space exploration. The requirements of space missions prompted the development of remote monitoring systems, data transmission technologies, and emergency medical support, all of which have changed the way healthcare is provided on Earth. As a result of space exploration, telemedicine gives patients and healthcare systems around the world more access to healthcare, better care, and lower costs. Gray (1997) Space exploration's influence on telemedicine will likely continue to drive innovation and improve healthcare outcomes as technology advances, underscoring the crucial link between space exploration and terrestrial well-being.

2.3 Conceptual framework

A conceptual framework implies the idea of the researcher regarding how the research problem will ultimately be explored. This is usually founded or based on the theoretical framework that lies on a much wider resolution scale. The conceptual framework was written based on a theoretical framework that was reviewed. Space activities determine the scope, role and benefits Kenya accrues from working with the US. Foreign policy forms the dependent variable entirely being determined by the space exploration activities in place.

Schindler & Kanai (2021) Kenya's KalifaSat project, which involved collaboration with the USA and other international partners, exemplifies how space collaboration supports foreign policy objectives. The project not only advanced Kenya's space capabilities but also strengthened its ties with international partners, including the USA. It demonstrated how space collaborations can enhance diplomatic relations, provide technological benefits, and support broader strategic goals.

Massé & Margulies (2020) the scope of how foreign policy relies on space collaboration between Kenya and the USA encompasses strategic, economic, scientific, security, environmental, and international dimensions. Space collaboration serves as a means to strengthen bilateral relations, achieve mutual benefits, advance scientific research, enhance national security, support environmental and humanitarian goals, and contribute to global space governance. By leveraging space exploration partnerships, both Kenya and the USA can achieve their foreign policy objectives and enhance their global standing.

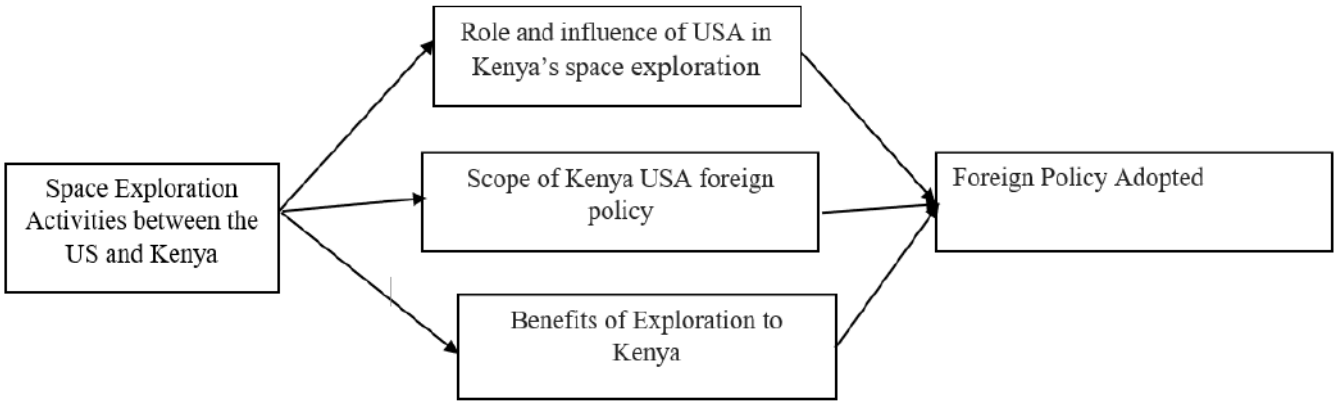

Figure 1
Conceptual Framework

III. METHODOLOGY

3.1 Research Design

The researcher employed the use of a qualitative research design which utilized case studies, expert interviews, and even document analysis in order to effectively explore the influence of space exploration by Kenya on its foreign policy with the US. In addition to that, the use of primary data was also made and this was through carrying out of interviews with officials from the KSA, space policy experts, and the US State Department. In addition to that, the use of secondary data was also made and this was through the analysis of academic journals, government documents, and even credible news sources. There was usage of thematic analysis which was used in the identification and interpretation of patterns which were associated with economic factors, diplomatic engagements, and even technological collaborations.

The use of qualitative methods is important in analyzing how variables interact in real-world situations. By examining the mechanisms and causes of particular relationships, qualitative research can provide additional context. Qualitative methods can be used to develop theories or explanations about why these relationships occur. This helps in developing a more complete understanding of the research problem. Qualitative data offers practical insights into how these findings apply in real-world settings and how they might be addressed.

3.2 Location of the Study

The study area refers to the area which is related directly to the research that will be carried out (Mishra & Alok, 2022). This is thus an area where the researcher deems as being essential for the research study to be carried out. The study area comprised of Kenya as a country, focusing on Nairobi region. While undertaking this research study, the researcher put into consideration all the aspects of space and airspace activities from all parts of the world. Kenya, specifically Nairobi was the best location of the research study since most of the space activities are centralized within the area offering a god platform for the research. The researcher selected this area for the study because Nairobi capital is most engaged in space activities. The space agencies have primarily been located in the area and most of the experts are located here. The area also offers a big, diverse population both from the local and international arena who provided a varied opinion on the study topic, providing a variety of opinions. The location has diverse institutions including the Kenya Space Agency, the Diplomatic offices, Security Institutions and Foreign affairs offices from which the researcher drew the population samples. The institutions have their headquarters within Nairobi hence providing an ideal location for the study.

3.3 Target Population

The target population is defined as being a group of individuals in the research study that the intervention by the researcher will intend to carry out the research study on as well as draw viable conclusions from. Target population implies to a population from which the subjects are drawn from (Kothari, 2019). The research targeted persons from the Ministry of Foreign affairs, diplomats and persons working in space industry. Ministry of Foreign affairs being responsible for creating a good relationship with partners were important to inform on the extent of the bilateral agreements between the countries in place. Diplomats are the negotiators and promoters of a country's interests hence their input was greatly required. Again, being a technical field, experts from the industry were of help to address the technicalities and operation ability of equipment. These target groups are most important in this research as they have

first-hand information regarding their field of expertise. A total of 200 respondents were selected from different types of stakeholders in the Airspace industry in Kenya. A sample size of 200 provides sufficient power to detect meaningful effects or relationships. Statistical power refers to the probability of correctly rejecting the null hypothesis when it is false. With a sample size of 200, the researcher is able to achieve a high level of power, which reduces the risk of Type II errors.

3.4 Sample Population

Table 1

Sample Population

SER. NO	TARGET GROUP	SAMPLE NUMBER
1.	Ministry of Foreign Affairs	100
2.	Space experts	50
3.	Diplomats	50
TOTAL		**200**

3.5 Sampling Procedure and Techniques

The study adopted stratified random sampling method. According to DeVault (2017), a stratified random sample consists of homogeneous subgroups that are distinct but important in ways. A collection of them is called strata. The technique was appropriate as the study had different subgroups for sampling. The respondents were of different categories hence biasness was be minimal. It involved stratifying the population, defining a number of separate partitions using sample size, and the combining of the results to obtain the required stratified sample. By ensuring that each stratum is represented in the sample, stratified sampling helped to ensure that the sample reflects the diversity of the population. The sampling reduced sampling error because it ensured that all important subgroups are included. This results in more precise and reliable estimates for the entire population, as the variability within each stratum is typically less than the variability in the overall population.

3.6 Research Instruments

Instrumentation ensures that data collected is good and thus leads to viable conclusions (Bougie & Sekaran, 2019). Data collection instruments were both primary and secondary. Primary collection tool was conducting interviews to the sampled population.

3.6.1 Interviews

Creswell (2009) defines interviews as face-to-face conversations between a researcher and a participant involving a transfer of information to the interviewer. Interviews were conducted to the managerial groups of the sampled population while questionnaires were administered to the rest. The questions were structured to address the benefits that comes with the collaboration as well as looking into the challenges faced. The managerial groups mainly gave their feedback on the strategic implications while the rest were giving their feedback based on the hands-on experience. The experts gave their views on the operationalization of the space industry as well as the expertise. The study made use of electronic sources that contained discussions on space developments and past publications that had been done on the topic to collect data.

3.7 Testing for Validity and Reliability

3.7.1 Validity

This depended on the researcher ensuring that the research is carried out carefully and consistently. The study applied content valid as measures of the degree to which data from the research instruments meaningfully and accurately represent the theoretical concept. The content validity was subjected to experts in the Department and the supervisor who cross checked information to ensure accuracy, relevance, completeness and consistency. Content validity ensured that the measurement tool covered all relevant aspects of the construct being studied. By ensuring that the measurement tool includes all necessary content, content validity improves the accuracy of the findings. If the tool captures the full range of the construct, the data collected are more likely to reflect true variations in the construct, rather than missing or incomplete aspects. This leads to more relevant and actionable results, as the findings are based on a more accurate representation of the construct. High content validity enhances stakeholder confidence in the research results by demonstrating that the measurement tools are accurately capturing the intended construct. This credibility is crucial for the acceptance and application of research findings in real-world settings.

3.7.2 Reliability

The study employed re-test technique, to ensure reliability. This enabled the researcher to ensure that the instruments that were used in the research are reliable and therefore can be duly be depended on. Test-retest reliability assessed how stable and consistent the results of a measurement are over time. If a measurement tool produces similar results on repeated administrations, it indicates that the tool is reliable and that the data it collects are stable across different times. High correlation between the two sets of scores suggests that the tool reliably measures the construct, as the results do not fluctuate significantly over time. This consistency is essential for ensuring that the data collected are dependable and not subject to random errors or fluctuations. Test-retest reliability helped identify random errors or inconsistencies in the measurement process. Identifying and addressing these errors helped improve the accuracy and reliability of the measurement tool.

3.8 Data Collection Methods and Procedures

They are defined as the process of gathering information regarding the respective variables of research interest in a well-established as well as systematic fashion which enables the researcher to be in a better position of answering the research questions that have been stated, test the hypotheses, and even evaluate outcomes (Bakker, 2018).

3.9 Proposed Data Analysis Techniques and Procedures

The researcher ensured only appropriate and most viable methods and procedures of data collection were used in carrying out research (Bell et al., 2022). Data collected was analyzed qualitatively before making desirable conclusions.

3.10 Ethical Considerations

These are defined as principles which guide the researcher in both the research designs and practices. The study ensured informed consent of the respondents, voluntary participation of the respondents, confidentiality and anonymity. Data collected was only used for the intended study. The researcher was to seek for relevant authorization from appropriate offices and departments in order to be allowed to collect data. The researcher applied Data Anonymization and De-identification. This was through removing personal identifiers from the data so that individual participants cannot be identified and replacing sensitive identifiers with pseudonyms or codes that cannot be traced back to the individual without additional information.

Access to the institutions: Permission to carry out the study shall have approval by the institutions that is KSA, Ministry of Foreign affairs and the security installation. Considering that every organization has rules governing their policy and practice it was mandatory that the researcher seeks permission before carrying out the research. The researcher ensured they have the relevant authorization to access the institutions either through written or verbal consent by the management. A pre-visit was conducted to ensure familiarization with the areas before scheduling the main meeting.

IV. FINDINGS & DISCUSSION

4.1 Benefits and the Encountered Challenges

Kenya's space program has enabled it to enhance its disaster management and response capabilities through usage of enhanced satellite imagery and it has enabled the country to be in a better position of boosting its agricultural productivity through use of satellite data in monitoring of soil conditions and weather patterns. In addition to that, an enhanced space program for Kenya has been influenced as a result of the US and this has enabled the country to be in a better position of improving communication infrastructure and more so in remote places. The space program has helped the country in fostering of education and capacity building especially in STEM fields and also positioned it as a key and an essential player in the space sector in Kenya thus fostering development and regional cooperation (Johnson, 2014).

"The USA has utilized this opportunity to advance its interests in the African continent. United States has depicted immense interests in collaboration with African countries on matters to do with space initiative" Noted a diplomat. It was ascertained that such interests were highly driven as a result of a wide range of factors that include strategic geopolitical interests especially in countering the influences of the other global powers and more so Russia and China as well as in other countries in Africa. Other reasons include economic activities that burgeon in the African space markets as well as enhancement of security through satellite cooperation technologies. The interests of the US in collaborating with Kenya on matters to do with space exploration is largely seen as an avenue of having a permanent footprint in a key world order development that would see it extend its tentacles to the rest of the African region with ease, outshining other space domains from her counterparts from the East (Maertens et al. 2021).

It is prudent to note that even though space exploration by Kenya has brought about positive changes especially in its aspects to do with foreign policy dynamics with the US, challenges still persist. For instance, the need for having

sustainable long-term strategies coupled with limitations in financial resources, and technological constraints still pose significant hurdles which must be addressed collaboratively with both countries (McLauchlin et al. 2022). However, it is important to note that such challenges also present viable opportunities for increased technology transfer, cooperation, and even joint research initiatives which can further help in the solidification of diplomatic ties between Kenya and the US.

It was noted that while the Kenya-US space cooperation holds lots of challenges in that the sustenance of long-term funding for the space projects indeed remains a major challenge. “A lot of money is required to fund a single project, this is relatable to the recent launched space craft by the county” noted a Space experts. In addition to that, challenges are prevalent is issues to do with technological transfers as well as capacity building. This is because Kenya’s space program can only be more effective in cases where technological transfers are duly accompanied by valid capacity building as this is crucial. Geopolitical tensions are also the challenges that affect the exploration of space by Kenya in that the evolving or dynamic landscape and more so the United States-China Rivalry could ultimately have a great impact on the extent of space cooperation between the two countries. “The longstanding rivalry between the East and the West plays a significant role. The collaboration affects policies that will be adopted as well as the collaboration due to the fear of causing diplomatic feuds with other interested parties” stated a diplomat. Kenya’s venturing into aspects of space exploration can be deemed to undeniably play a significant role in influencing its foreign policy dynamics, especially in the relations that it has with the United States. Indeed, the achievements by Kenya in aspects of Space Technology has greatly have not only positioned the country as a regional leader but has also helped in strengthening of strategic, economic, and diplomatic ties with the United States (Mkutu, 2020). “As the two countries continue navigating the complexities that are associated with the global space arena, the collaboration in aspects of space exploration ultimately stands out as a testament and evidence to the mutual benefits which emanate when nations invest in a wide range of scientific endeavors which transcend national borders” stated a Diplomat.

However, in order to effectively maximize the influences of space explorations on the foreign policy by Kenya with the US, there is need to address the challenges despite of the potential benefits. “The challenge of resource constraints actually needs immense technological and financial resources. Ensuring sustainable infrastructure development and funding is quite vital for the success of space initiatives made by Kenya. On the other hand, the development of a robust policy as well as regulatory framework is essential in guiding international space activities and collaborations” noted a Foreign affairs respondent. Balancing of national interests was also one of the significant challenges in the exploration of space by Kenya since the country must always ensure that it balances its national interests with those of its international or global partners. While collaborating with the United States offers Kenya with a wide range of advantages, the country must also ensure that it safeguards its sovereignty as well as ensure that its development goals are always prioritized (Mkutu, 2020).

4.2 Educational and Scientific Exchanges as well as Soft Power and Diplomacy

Space programs invented by Kenya could help in stimulation of scientific research as well as development in Kenya. On the other hand, collaborative projects with institutions in the US by Kenya could ultimately result to educational and scientific exchanges thus helping foster a deeper relationship and understanding between Kenya and the US. That apart, attainments in space exploration can also significantly help in contribution to the soft power of Kenya a country (Ushie et al 2021). The successful space missions by Kenya could also have a positive and significant influence on the country’s image on the global stage thus having a potential impact on the diplomatic relations with not only the United States but also with other nations.

It was established that Kenya and the United States have engaged in a wide range of space cooperation initiatives and some of them include the NASA partnerships that have seen Kenyan institutions and researchers participate in a wide range of NASA programs (North Atlantic Treaty Organization [NATO], 2019). This helped the country to not only build to but also benefit from the wealth of technological advancements and knowledge. “The two countries collaborate in a wide range of capacity building initiatives and for instance, the United States has duly supported educational programs in Kenya which are aimed at helping foster skills in space science and technologies. Through the space cooperation between Kenya and the United States, several joint collaborative satellite projects have been established and these include the data sharing initiatives and joint satellite launches which has been vita areas of cooperation” noted a Space expert.

Collaborative programs were capable of facilitating scholarships, joint research initiatives, and exchange programs which could help enhance human capital in “Science, Technology Engineering, and Mathematics” which are commonly known as STEM. “Kenya’s KSA could be better positioned in collaborating with American Universities on matters to do with satellite technology as well as space sciences and even easily foster a new generation of Kenyan engineers and scientists” said a space expert. Such kind of educational exchanges apart from building capacity, also helps in strengthening of academic and cultural ties between the two countries (Munyua, 2021).

On issues to do with soft power and geopolitical positioning, it was ascertained that space exploration was capable of enhancing the geopolitical positioning as well as soft power of Kenya on the global scene. Through active participation in matters to do with space exploration, Kenya as a country demonstrated its scientific and technological capabilities thus making it gain respect and recognition globally. This helped bolster its reputation and enhancement of its diplomatic leverage thus allowing the country (Kenya) to even play a greater and influential role in global organizations like the United Nations Committee on the Peaceful Use of Outer Space or COPUOS (NATO, 2019). A diplomat noted, "the alignment of Kenya with the US in various space endeavors helped in the solidification of its position as a strategic partner in security and global space governance".

According to an examination about the role played by space programs in foreign policy in Africa, it was noted that the collaboration of Kenya with the U.S in aspects to do with space science has played a significant role in strengthening of diplomatic ties. It was suggested that space exploration programs served as a form of "soft power" that enabled Kenya to effectively assert its position in global forums as well as securing of agreements with the US which were favorable (Mosteshar, 2019).

4.3 Defense Considerations and Security

The United States sees Kenya's space capabilities as being relevant to regional security as well as defense (Callahan, 2000). This ultimately results in increased cooperation and collaboration in various aspects such as surveillance, satellite communication, as well as other technologies that are associated with defense. On the other hand, space exploration usually involves applications like environmental monitoring. If Kenya as a country focus on such kind of initiatives, it could ultimately help in aligning with a wide range of global priorities that includes those of the United States in addressing issues to do with environmental challenges and climate change (Regilme, 2021). It is important to note that the actual impacts of the exploration would highly depend on a wide range of factors that include the scale as well as success of not only Kenya's space exploration efforts but also geopolitical developments as well as the specific policies that are associated with both Kenya and the United States.

4.4 Technological innovations

In matters to do with technological innovations, it was established that the exploration efforts by Kenya presented opportunities for the country to have technological collaborations with the US. This is because KSA and the US's NASA can effectively engage in joint missions, data sharing, and satellite developments. Such collaborations are capable of enabling technology transfer and thus providing Kenya with more access to cutting edge expertise and technologies. This is a clear pointer that enhanced collaboration of Kenya with NASA could ultimately result to more sophisticated projects that not only foster innovation but also strengthens bilateral ties. On aspects of economic investments and developments (NATO, 2019).

4.5 Discussion

4.5.1 Geopolitical Significances

It is no secret that the geopolitical significance of space exploration of Kenya cannot be duly overstated. Kenya being a regional leader in aspects of space endeavors has made it to become highly positioned as a key and vital player in the space landscape in Africa (Stone & Moloney, 2019). This not only helped in influencing the influence of Kenya but also helps in provision of a viable avenue for the US to strengthen its regional partnership through collaboration and teamwork with Kenya on various projects related with space.

The collaboration makes Kenya becomes a major player in the global scientific and technological community by participating in space exploration. It raises Kenya's international profile by demonstrating its capability and ambition in advanced fields that require space-based platforms to operate. Githaiga and Bing (2019) Kenya, as one of Africa's leading space powers, can use its influence on the continent to its advantage by encouraging regional cooperation in space technology and research.

Kenya's strategic partnerships can be strengthened and international support and investment attracted by working together with space-faring nations like the United States. Again, Space capabilities can bring in partnerships and investments from abroad, which can help Kenya's economy as a whole.

Stone and Moloney (2019) noted that global space policy and norms are influenced by the United States' leadership in space exploration, enhancing its position as a technological and scientific leader. Additionally, The United States of America is able to influence international space treaties and regulations because of its achievements in space.

On the other hand, the USA gains a lot through the collaboration at the geopolitical arena. From satellite manufacturing to space tourism, the space industry provides American businesses with opportunities, fostering economic expansion and technological advancement. The United States of America is able to build and maintain strategic alliances, foster international cooperation, and support joint space objectives through collaborations with other nations, including emerging space players like Kenya (Flint, 2021).

4.5.2 Mutual Benefits

The collaboration between the United States and Kenya in issues to do with space exploration has ultimately led in mutual benefits. This is because Kenya as a country gains immense access towards advanced space technologies as well as expertise, thus fostering its economic and scientific developments (Stone & Moloney, 2019). Simultaneously, the US greatly benefits from Kenya as a strategic partner in the African continent thus opening new avenues for cooperation in different fields beyond issues to do with space exploration, development, trade, and security.

Space collaborations have the potential to benefit the economy. This could lead to opportunities for job creation, the improvement of infrastructure, and the stimulation of the local aerospace industry for Kenya. It is an opportunity for the United States to forge strategic partnerships in emerging markets.

4.5.3 Benefits to Other Pillars/Sectors of the Country

Space applications in telecommunications will support the automation of legal and judicial services, as well as surveillance, in the political pillar by providing space data and information that supports security and law and order. Additionally, it aims to promote accountability in the public sector by supporting access to information and data through open data initiatives and enhancing transparency in service delivery. Additionally, it will aid in devolution program and seeing an achievement of the same. Previously, county boundaries were delineated with the help of geospatial data, which will be enhanced by the evolving new technology brought by this venture (Schindler & Kanai, 2021).

The space program will aim to improve health by identifying, tracking, and monitoring the spread and patterns of health risks and diseases through the social pillar. Space projects will also help map population and human settlements and let people choose where to build affordable housing. Digital education and Konza Technopolis's role as a regional technology hub will also be supported by Space Science & Technology. Space science is expected to be most beneficial to the economic pillar (Schindler & Kanai, 2021) Manufacturing, agriculture, and the blue economy, which uses space technologies to monitor marine life and traffic in the ocean and lakes, are among the industries that are expected to make use of satellite data.

4.5.4 Future Prospects on Space Exploration Kenya

While looking ahead, it can truly be ascertained that the future prospects of the space program in Kenya and the impact that it has on foreign policy appear to be quite promising. A continuous collaboration with the US is thus anticipated to result in further advancements which provides both countries with competitive edge in the international space arena (Schindler & Kanai, 2021). Indeed, the evolving nature associated with space exploration is capable of offering a dynamic platform for sustained cooperation which further positions the US and Kenya as being major contributors towards issues to do with space science and technology.

The United States of America and Kenya could expand their roles on international space platforms like the International Space Station. Kenya's participation in ISS-based research experiments, astronaut exchanges, and technical collaborations would not only demonstrate Kenya's expanding space capabilities but also advance scientific knowledge. Collaboration in space exploration between Kenya and the United States holds a lot of potential and promise for the future (Massé &Margulies, 2020). The partnership has the potential to significantly benefit the international space community by concentrating on technological advancements, joint missions, capacity building, commercial opportunities, and geopolitical impacts. Both countries' capabilities and influence will grow as a result of continued collaboration, as will innovation and new discoveries in space exploration. As Kenya and the USA plan ahead, their partnership will assume a vital part in propelling space science, encouraging financial development, and reinforcing global ties.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

Space benefits are vast and are drivers of economic liberty and development in an economy. Individual benefits are also inherent as they benefit from employment opportunities to the individual exploitation of technological advancements that come with it. Mutual benefiting relationships are an avenue for individuals to freely interact with others for a joint development. These all greatly shapes policies adopted as well as the justification of the policies. The study concludes that the benefits outweigh the loses on Kenya considering the national interests as well the future which will space technology driven.

5.2 Recommendations

Future research should aim at exploring the long-term impacts or effects of space exploration on the regional influence of Kenya, the role played by the private sector partnerships, and even the comparative studies with other African countries which are pursuing space exploration. In addition to that, the role played by the private sector

partnerships in advancement of space exploration as well as potential for multilateral collaborations which involved other African countries could be duly investigated. This is quite important since it helped in provision of even a deeper comprehension of the wider implications that are associated with space diplomacy as well as the role that it played in shaping of international relations. it is no secret that enhanced space collaboration by Kenya could ultimately result in new bilateral agreements that focus on capacity building, joint missions, and technology transfer. Kenya's endeavors in space exploration were ascertained as having significant impacts on its foreign policy dynamics with the US which helped position it as being an emerging player in the global or international space arena. As a result, future research should aim at focusing on the long-term implications of such developments as well as the potential for an expanded global cooperation.

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