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Science Diplomacy as a Catalyst for Regional Cooperation in Africa – A Case of DSTI and the NRF

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Abstract:

This article examines science diplomacy as practiced by South Africa's DSTI and the NRF, demonstrating a shift from symbolic political gestures to structured, co-funded partnerships in regional collaboration across Africa. It highlights considerable advances in human capital development, knowledge generation, and infrastructure sharing throughout the continent, based on data from cooperative funding efforts. Furthermore, the article proposes a novel methodology for evaluating bilateral partnerships, emphasising science diplomacy as a vital tool for converting Africa to a knowledge-based economy. The analytical approach consists of historical policy analysis, a programme-level evaluation of DSTI-NRF projects, and a case study of the South Africa-Tanzania Joint Research Programme. It examines the evolution of South Africa's science diplomacy since 1994, including scholarship initiatives, inter-agency agreements, and governance institutions such as Joint Committees. The methodology converts these findings into criteria for analysing variables such as strategic alignment, institutional preparation, and collaboration intensity, providing assistance for the design and administration of bilateral science diplomacy initiatives. Finally, the article shifts science diplomacy from a mostly state-centred and aid-driven approach to a collaborative model of regional governance and knowledge generation. It defines scientific diplomacy as a meso-level governance mechanism that promotes reciprocal partnerships and establishes a reproducible evaluation approach to deepen scholarship on globalisation and the political economy of knowledge in the Global South.

Keywords:

Science Diplomacy, Regional Collaboration, Internationalisation, Bilateral Engagement Framework, Knowledge Based Economy

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Introduction

Internationalisation and science diplomacy arise as indispensable responses to globalisation and the evolving knowledge society (Aguirre-Bastos, 2023). As higher education expands and evolves, universities increasingly engage in cross-border collaborations to attract talent, undertake joint research, and compete for resources, all while promoting social equity and cultural diversity within academia (Barbosa and Neves, 2020). This process of internationalisation shifts from a reactive stance to a strategic, managed approach designed to enhance content, methodologies, human resources, and international frameworks, thus integrating higher education institutions into global knowledge networks and requiring them to contribute to both economic competitiveness and societal cohesion.

In Africa, internationalisation and science diplomacy serve as catalysts as developmental objectives align with the pressing need to bolster scientific capacity and innovation systems. They function as transformative forces within scientific ecosystems, extending beyond mere financial or symbolic contributions to realign institutional priorities and enhance capabilities. The existence of shared infrastructure, interdisciplinary expertise, and emergent research fields further incentivises collaborative engagements (Heleta et al., 2024).

Since 1994, South Africa's internationalisation and science diplomacy strategies regarding science, technology, and innovation (STI) in collaboration with African partners have faced obstacles stemming from insufficient finances, colonial legacies, and institutional challenges. The lack of sufficient support has undermined majority of South Africa's historically universities and the broader African higher education landscape's ability to engage in meaningful collaboration. Many research institutions continue to rely on external financing from the Global North, often aligning their research agendas with donor interests rather than regional needs, thereby fostering a "donor-recipient" dynamic (Del Biondo, 2020). This challenge is heightened by an imbalance between STI policy goals and the resources allocated to achieve them, ultimately leading to restricted actions.

To mitigate these challenges, South Africa has established over 24 bilateral and multilateral science and technology agreements across Africa, spearheaded by the (DSTI). Implementation is facilitated by DSTI entities such as the Council for Scientific and Industrial Research (CSIR), the Human Sciences Research Council (HSRC), and the (NRF), which, in addition to their respective mandates, coordinate collaborative research initiatives with continental partners.

The South African experience, rooted in science and technology (S&T) agreements and implemented through the NRF's bilateral programmes, and increasingly connected through the Science Granting Councils (SGCs) initiative (Nxumalo, 2025b), illustrates how an intentional blend of diplomacy, funding design, and institutional learning can shift the trajectory of a knowledge economy. Early investments in

scholarships and regional projects laid the foundational groundwork; inter-agency agreements translated intent into action; and thematic, co-funded calls transformed bilateral goodwill into replicable research value (Luruli and Mouton, 2016).

Using the DSTI and the NRF's strategies in Africa, this article examines the impact of science diplomacy on promoting collaborative research initiatives and addressing shared challenges across African nations. It further posits that a well-supported S&T internationalisation strategy, underpinned by consistent policy frameworks, funding mechanisms, and reciprocal obligations, can enhance knowledge generation, skills development, and infrastructure sharing. The article ends by suggesting a framework to assess and guide bilateral engagements in Africa and/or other regions.

Methodology

Mixed-methods approach were used to evaluate the role of science diplomacy in promoting regional cooperation in Africa. The methodology comprises three key components: historical policy analysis, programme-level evaluations, and a focused case study.

Historical Policy Analysis

To contextualize the evolution of science diplomacy in South Africa since 1994, a historical policy analysis is undertaken. This involves a thorough review of policy documents, strategic plans, and bilateral agreements related to science, technology, and innovation (STI). By examining these materials, the study delineates shifts from symbolic political gestures to structured, financially supported partnerships within the African scientific landscape.

Programme-Level Evaluation

Programme-level evaluations are conducted on specific DSTI-NRF initiatives, quantitatively assessing human capital development, knowledge generation, and collaborative efforts across various projects. Data is sourced from previous publications, funding records, participation metrics, and output analysis of co-funded research initiatives. This evaluation identifies strategic alignment, institutional readiness, collaboration intensity, and impact pathways, offering concrete metrics to evaluate the effectiveness of the partnerships.

Case Study Analysis

The South Africa-Tanzania Joint Research Programme serves as a detailed case study to illustrate the principles of successful science diplomacy implementations. This analysis examines key operational aspects, including the governance structures, peer review processes, and the engagement of diverse stakeholders in project design.

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Limitations

The methodology above has notable strengths but also several limitations, including a historical focus that may miss recent developments in science diplomacy, and the specificity of the South Africa–Tanzania Joint Research Programme case study, which could restrict the generalisability of findings to other African contexts. Measuring the true impact of science diplomacy initiatives is complicated due to the diverse nature of human capital development and knowledge production, and the focus on formal agreements may overlook crucial informal networks.

The Policy Evolution and Early Collaborative Instruments

South Africa's dedication to African science and technology (S&T) collaboration was formalised in the late 1990s, following policy initiatives commissioned by the Department of Arts, Culture, Science, and Technology (DACST, 1996). Two flagship programmes viz, the National Innovation Fund and the Science and Technology Lead Programme were launched to promote innovation and strengthen partnerships between science councils, higher education institutions, and industry, both domestically and internationally (Luruli and Mouton, 2016). These initiatives, later managed by the (NRF), laid a solid foundation for bilateral science and technology agreements and their implementation into joint research projects, initially focused on the Southern African Development Community (SADC).

In practice, the DSTI and the NRF established two key mechanisms in the mid-2000s to promote continental cooperation. The Africa Scholarship Programme (2007-2009), with a budget of over R12 million, supported over 70 Master's and Doctoral students from other African countries to study at South African universities (NRF, 2006). Concurrently, the Africa Regional Cooperation Programme (2006-2007) allocated R24 million to support 51 collaborative projects across SADC member states. These programmes were transformative and reflected South Africa's strategic emphasis on human capital development and pan-African research networks, while simultaneously showcasing the NRF's capability to coordinate large-scale regional initiatives.

Bilateral S&T Agreements and Joint Funding

Over time, the DSTI expanded its portfolio of science and technology (S&T) agreements, transitioning from symbolic political commitments to operational partnerships supported by structured three-year co-funding mechanisms (SANSA, 2018). The NRF launched its first co-funded joint research calls with African partners, including collaborations with Mozambique and Kenya, in 2008, guided by strategic oversight from the DSTI and partner ministries (Senona and Nxumalo, 2018). By 2020, the NRF had instituted joint funding programmes with ten African countries, while the extensive network of 24 DSTI-

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led S&T agreements (see Table 1) served as a diplomatic foundation for pan-African scientific collaboration (Senona and Nxumalo, 2018).

Partner Country	Year
Algeria	1998
Angola	2008
Botswana	2005
Democratic Republic of Congo (DRC)	2022
Egypt	2006
Ethiopia	2021
Eswatini	2020
Ghana	2012
Kenya	2004
Lesotho	2005
Mauritius	2023
Madagascar	2015
Malawi	2007
Mali	2006
Mozambique	2006
Namibia	2005
Nigeria	2005
Rwanda	2009
Senegal	2005
Tanzania	2011
Tunisia	2010
Uganda	2009
Zambia	2007

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Zimbabwe	2007

Table 1: South Africa's S&T Agreements on the African continent

Some of the S&T bilateral relations resulted in inter-agency agreements between the NRF and its counterparts. Fo example, in 2015, the NRF signed inter-agency agreements with Namibia's NCRST, Zambia's NSTC, and Mozambique's FNI, marking a significant milestone in regional collaborations. These agreements established critical aspects of collaboration, including cost-sharing arrangements, peer review protocols, researcher mobility funding, intellectual property frameworks, and joint monitoring mechanisms that are essential for translating memoranda of understanding into actionable research pathways.

The first joint research calls were launched in 2008, with a focus on 13 priority areas. In just 10 years, more than 250 joint projects were supported across various themes, including Material Science and Nanotechnology, Space Sciences and Remote Sensing, Information and Communication Technology, Indigenous Knowledge Systems, Biosciences and Biotechnology, Health Sciences, Social Sciences and Humanities, Geosciences and Mineral Resources, Energy, Environment and Climate Change, Mathematical Sciences, Agriculture, and Laser Technology (Senona and Nxumalo, 2018).

Governance Architecture

The DSTI's ongoing political stewardship of implementation and accountability has long been a hallmark of South Africa's S&T collaboration strategy. Joint Committees (JCs), comprising ministry officials and representatives from both partner countries' science councils, serve as platforms for governance, priority alignment, and adaptive management (PMG, 2025). This dual structure safeguards enduring bilateral political commitment while technical agencies like the NRF oversee execution, including call design, co-funding, peer review, contracting, and impact reporting.

Many agreements, originally conceived as diplomatic gestures, have evolved into substantive joint research programmes, particularly as partner countries leveraged them to promote institutional and human capital development. South Africa has also been approached to deliver technical assistance, including training programmes for officials and students, access to advanced research infrastructure, and policy advisory services. Maintaining the DSTI's leadership role is crucial for sustaining diplomatic influence and ensuring policy consistency for long-term partnerships, even as the NRF and science councils retain operational flexibility to innovate funding mechanisms and enhance implementation efficiency.

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Science Diplomacy as a Catalyst for Knowledge-Based Economies

Across the continent, three interrelated mechanisms facilitate the transformation of science diplomacy into benefits for the knowledge economy:

1. **Human Capital Development**: Scholarships and mobility initiatives facilitate talent circulation, co-supervision, and joint doctoral training, resulting in cohorts of African researchers who share standards and networks. Early NRF scholarships attracted students to South African laboratories and universities, enhancing absorptive capacity both in South Africa and within their home institutions once they returned to collaborate.
2. **Research Excellence and Relevance**: Co-funded bilateral calls stimulate collaboration on research topics of mutual strategic interest, such as agriculture, energy, health, water, climate resilience, and space science, effectively bridging excellence and impact. Joint peer review processes enhance quality and fairness, while binational teams that combine different methodologies and contexts increase the external validity of findings. Standardised methodologies and evaluation processes improve the consistency and credibility of research outcomes (Chataway, 2019). Furthermore, involving policymakers, local governments, and private-sector actors in research design ensures that projects address pressing societal issues, ultimately boosting their real-world relevance (Nxumalo, 2025a). Decentralised, cross-national networks provide stability, facilitating long-term progress even amidst volatile political or funding landscapes.
3. **Infrastructure Leverage and System Building**: Access to cross-border research infrastructure such as laboratories, observatories, and data centres enhances the efficiency of regional investments and promotes technical standardisation. Inter-agency agreements and Joint Committees foster institutional memory, enabling iterative improvements to funding models and governance practices, which include ethics, open science, and intellectual property management. Platforms such as the SGCs not only accelerate policy learning but also enhance the science funding function throughout Africa, which is a critical public good for the knowledge economy.

From Political Intentions to Operational Value

The establishment of science and technology (S&T) agreements with a diverse array of African countries reflects the evolution of South Africa's diplomatic engagement since 1994. Under this broad framework, the NRF has managed co-funded programmes with ten African partners. However, the tangible results of these collaborations have varied significantly due to disparities in research infrastructure, institutional capacity, language barriers, and funding agency expertise.

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Several key principles elucidate how successful collaboration yielded tangible results for those that operated effectively (see Table 2):

Principle	Description
Co-funding Symmetry	When both counterparts commit funds, agencies run joint calls that promote equitable selection and mutual accountability, enhancing researcher buy-in and improving project quality.
Inter-agency Agreements	These delineate eligibility criteria, budget envelopes, peer review criteria, and reporting processes, promoting transparency and structure.
Mobility	Dedicated budgets for exchanges, workshops, and co-supervision embed collaboration into project design, sustaining networks beyond the life of projects.
Alignment with Domestic Strategies	Calls co-designed with input from ministries and aligned with national strategies (e.g., energy security, food resilience, health innovation) increase the likelihood that research outputs will be utilized by policymakers and industry.
Continuous Relationship Management	Regular multi-level engagements (by ministry leaders, agency executives, and programme managers) foster resilience amid personnel turnover and political fluctuations.

Table 2: Principle matrix for succesful collaboration

Strategic Revitalisation of NRF's Africa Initiatives

Two pivotal developments underscore the necessity for the (NRF) to revitalise and expand its Africa-focused initiatives. First, the NRF's active involvement in the SGCs solidifies its role as a vital player in pan-African efforts to improve research governance. By collaborating with peer agencies across the continent, NRF contributes to advancing shared priorities such as funding excellence, evidence-based policymaking, and the enhancement of data infrastructure. This initiative represents an invaluable

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platform for co-developing innovative funding mechanisms and standardising practices, nurturing a cohesive African research ecosystem.

Second, the NRF has established significant relational capital through decades of bilateral partnerships, interagency agreements, and iterative project cycles. This wealth of experience provides actionable insights into effective collaboration models, addresses systemic bottlenecks (e.g., mismatched capacities or funding delays), and illuminates pathways for evolving from fragmented, ad hoc projects to sustainable, institutionalised programmes. Leveraging on this knowledge, the NRF can fine-tune its strategies, align investments with partner priorities, and expand impact throughout the continent.

The Case of SA-Tanzania Collaboration

A representative case that demonstrates the effectiveness of science diplomacy in Africa is the South Africa-Tanzania Joint Research Programme (JRP), jointly implemented by the NRF and Tanzania's Commission for Science and Technology (COSTECH) (Nxumalo, 2016). This collaboration illustrates how strategically designed bilateral partnerships can translate diplomatic goodwill into tangible research outcomes across priority areas such as health, agriculture, nanomaterials, information and communication technologies (ICT), and paleontology.

The SA–Tanzania JRP was structured through joint funding, monitoring, and capacity-building activities and created a trusted framework for researchers from diverse systems to co-create knowledge, share resources, and address mutual socio-economic challenges. The collaborative framework aligned scientific priorities with broader development goals, reflecting the potential of science diplomacy to catalyse action and generate measurable benefits across nations.

During its two years in operation, the JRP facilitated exchanges involving 32 faculty members/researchers/students and accommodated 11 doctoral and 7 post-doctoral participants. Furthermore, it engaged with 54 partner organisations, including some outside Africa, showcasing how structured partnerships can extend networks beyond bilateral contexts and stimulate regional and global collaborations.

While most co-authored outputs were produced within the respective countries, the initiative led to the launch of joint projects and high-visibility engagements, such as collaborative workshops and interest from international stakeholders like the World Health Organization. These results underline a practical pathway for bodies similar to the DSTI and NRF to stimulate regional collaboration by incentivising joint research and enhancing Africa-based science on the global stage.

Looking ahead, the SA–Tanzania case provides concrete lessons for broadening science diplomacy as a driver of continental collaboration. Key takeaways include the importance of clearly defined collaboration roles, integration of gender considerations in project leadership, and explicit incentives for

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cross-border co-authorship and joint publications. Recommendations arising from the programme, including profiling of grantees, improved collaboration terms, transparent budgeting, and stronger expectations for co-authorship, serve as a comprehensive blueprint for expanding analogous engagements across Africa and other regions.

A Practical Methodology for Evaluating and Guiding Bilateral Engagements for Science Diplomacy

To translate lessons learnt from the cases above into actionable strategies, I propose a structured assessment methodology outlined below in Table 3. This framework can be applied to evaluate each bilateral partner and the overall portfolio.

Key Area	Strategy
Strategic fit	• Alignment with the country's STI priorities and the partner's national strategies • Potential to address continental public goods (health, climate, food, energy, digital)
Institutional readiness	• Existence and autonomy of a counterpart funding agency • Strength of inter-agency agreement and JC functionality • Track record of co-funding and timely disbursement
Research quality and capacity	• Peer review calibre and participation of expert panels from both countries • Research infrastructure accessibility, including data and facilities • Doctoral and postdoctoral training components embedded in projects
Collaboration intensity and inclusivity	• Mobility metrics which include exchanges, co-supervisions, joint publications • Inclusion of early - career researchers and underrepresented institutions • North – South - South triangulation opportunities without overshadowing African leadership

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Adoption and impact pathways	• Engagement with policy and industry stakeholders from proposal stage • Co-developed translation plans (pilots, standards, policy briefs) • Evidence of uptake: citations in policy, prototypes, datasets in use
Financial and operational health	• Execution risk indicators: delays, variance in cost-sharing, currency risk • Administrative overhead and time-to-contract • Portfolio diversification across themes
Learning and sustainability	• Data collection for monitoring, evaluation, and learning (MEL) • Continuity of programmes beyond single calls • Pathways to scale successful pilots regionally

Table 3: Proposed framework to assess and guide bilateral engagements

Utilising a traffic-light rating system across these dimensions can allow each partnership to make informed decisions about scaling, consolidating, or restructuring efforts. At a portfolio level, this method facilitates balanced resource allocation between immediate-impact projects and long-term capacity-building initiatives.

Conclusion

South Africa's involvement in science diplomacy through the DSTI and NRF illuminates the transformative potential of international collaboration in bolstering Africa's knowledge economy. Over the years, intentional strategies have not only facilitated excellent research initiatives but also contributed significantly to critical infrastructure and human capital development across the continent. The shift from mere diplomatic agreements to robust co-funding structures exemplifies a collaboration model that other African nations can emulate.

To harness the ongoing momentum in these partnerships, sustained investment in long-term platforms and integrated strategies emphasising information sharing and resilience will be paramount. The evolving landscape of global scientific diplomacy requires African governments to adapt to emerging challenges by leveraging existing relationships and exploring novel funding strategies. Initiatives

spearheaded by the DSTI and NRF signalled that a focused approach on human capital, research quality, and collaborative governance frameworks can foster integrated scientific ecosystems in African countries. The lessons learned from initiatives like the SA-Tanzania JRP and broader strategies implemented by the DSTI and NRF can catalyse a culture of collaborative innovation, positioning Africa not just as a participant in the global knowledge economy, but as a leader capable of addressing its unique challenges through science diplomacy.

Theoretically, the article shows science diplomacy in Africa moving from a state-centric, symbolic and aid-driven paradigm toward a networked, co-productive model of regional governance and knowledge production. By foregrounding the DSTI–NRF architecture, co-funding symmetry, and inter-agency agreements, it conceptualises science diplomacy not merely as foreign policy "branding" but as an institutional mechanism that redistributes agenda-setting power, mitigates donor–recipient hierarchies, and embeds reciprocity and mutual accountability in collaboration. The conceptual analysis implies that science diplomacy can function as a meso-level governance tool that links national STI policies, regional public goods (e.g., health, climate, food etc.), and the micro-dynamics of research projects through structured instruments like scholarships, joint calls, mobility, and shared infrastructure. It therefore extends science diplomacy theory by framing it as a long-term capacity- and system-building process, where adaptive governance, learning-oriented evaluation frameworks, and strategic portfolio management are as central as diplomatic intent, positioning African actors as co-designers of the continental knowledge economy.

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