



# Canada-South Africa Science, Technology, Innovation and Knowledge (STIK) Cooperation

**A Report for Innovation, Science and  
Economic Development Canada (ISED)  
and South Africa's Department of  
Science, Technology and Innovation  
(DSTI)**

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# Glossary of Abbreviations

AAU	Association of African Universities
AIMS	African Institute for Mathematical Sciences
AU	African Union
AUCC	Association of Universities and Colleges Canada
CCA	Council of Canadian Academies
CeSTII	Centre for Science, Technology and Innovation Indicators
CIHR	Canadian Institutes of Health Research
DACST	Department of Arts, Culture, Science and Technology
DST	Department of Science and Technology
DSTI	Department of Science, Technology and Innovation
ECRs	Early Career Researchers
ESI	Essential Science Indicators
G7	Group of Seven
G8	Group of Eight
G20	Group of Twenty
GERD	Gross Expenditures on Research and Development
HSRC	Human Sciences Research Council
IDRC	International Development Research Centre
IP	Intellectual Property
ISED	Industry, Science and Economic Development Canada
MOU	Memorandum of Understanding
NACI	National Advisory Council on Innovation
NEPAD	New Partnership for Africa's Development
NESTI	National Experts on Science and Technology Indicators
NGO	Non-Governmental Organisation
NRC	National Research Council
NRF	National Research Foundation
NSI	National System of Innovation
OECD	Organization for Economic Cooperation and Development
PDRF	Post-Doctoral Research Fellowships
R&D	Research and Development
S&T	Science and Technology
STI	Science, Technology, and Innovation
SACRI	South Africa Canada Research Initiative
SACUN	South African-Canada Universities Network
SARChI	South African Research Chairs Initiative
SCGI	Science Councils Granting Initiative
SKA	Square Kilometre Array



SKAO	Square Kilometre Array Observatory
STI	Science, Technology and Innovation
STIK	Science, Technology, Innovation and Knowledge
WoS	Web of Science



# Foreword

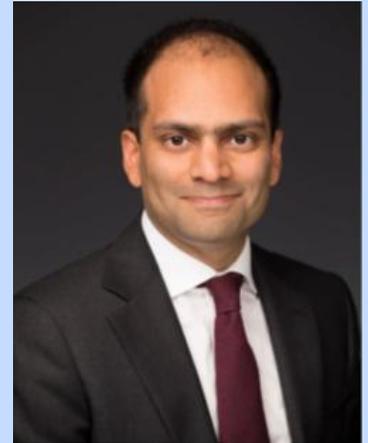
It is with great pleasure that we receive this report celebrating the over 30-year relationship between Canada and South Africa in the fields of science, technology, and innovation (STI). Over the past three decades, Canada and South Africa have shared a deep commitment to advancing knowledge, fostering innovation, and creating lasting solutions to the global challenges of our time.

The breadth of our partnership has spanned diverse domains, including astronomy, health, Indigenous knowledge, ocean science, and researcher mobility, with the potential to explore and enhance cooperation in emerging areas such as polar research. Since signing a Memorandum of Understanding (MOU) in 2019, our regular Joint Committee meetings and enhanced engagements have demonstrated the vital role of science diplomacy and strengthened cooperation between our scientific communities, thereby enhancing our collective capacity for research and development.

During the most recent 10-year period, from 2014 to 2023, data on scientific publications indicates that our co-publications have increased by over 130%. The strength of our collaboration lies in our ability to learn from one another, share best practices, and exchange knowledge that drives scientific advancement while remaining open to exploring new avenues for cooperation. Guided by a renewed MOU, updated in 2024, and as we look ahead to the next 30 years, we are inspired by the opportunities that lie ahead and recognise that our scientific communities stand to benefit significantly from deeper and more strategic engagement.

We extend our heartfelt gratitude to the authors, Paul Dufour and Michael Kahn, for showcasing the richness of Canada and South Africa’s remarkable STI achievements and for presenting ideas for growing our collaboration.

We look forward to the next chapter in this relationship.



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# Executive Summary

With the November 2024 renewal of the five-year bilateral MOU on STI cooperation between Canada's ISED and South Africa's DSTI, this report explores past and future directions. It reviews the over thirty year partnership between Canada and South Africa that emerged through the work of the International Development Research Centre (IDRC) and South Africa's Mass Democratic Movement. IDRC-supported missions lead to the Green and White Papers on science and technology (S&T) that introduced the innovation systems approach. Bilateral efforts to strengthen STI cooperation between Canada and South Africa continued earnestly during the Mandela Administration into the early 2000s. The 2003 state visit by President Mbeki to Canada led to a larger commitment through a joint declaration of intent between the two countries. The then Department of Science and Technology (DST), with the National Research Foundation (NRF) drew on Canadian experience in creating its Canada Research Chairs programme, and in 2006 established the South African Research Chairs Initiative (SACRI). Canadian experience on managing intellectual property (IP) rights was also accessed and influenced the drafting of South Africa's *IP Rights From Publicly Funded Research and Development Act of 2008*. Other support was given to developing Africa-wide expertise in science policy and STI indicators. IDRC, along with other donors, in 2015 launched the Science Granting Councils Initiative (SGCI) as a response to gaps in the African science funding landscape. IDRC and its partners now work with 17 African granting councils. In 2017, the IDRC and the NRF supported SACRI through the South Africa-Canada Research Chairs Trilateral Partners Initiative and the South Africa-Canada Research Chairs Mobility Initiative. In May 2021, the NRF entered into an agreement with Canada's Mitacs to kick-start the implementation of the NRF Industry Partnership Strategy.

Bibliometric analysis reveals extensive research collaboration between the countries. Canada is South Africa's ninth most important science and research partner; from the Canadian perspective South Africa is 24<sup>th</sup>. Canadian and South African researchers mainly collaborate in the area of human medicine, with physics and astronomy coming in second, and agricultural and biological sciences coming in third. There are also growing partnerships offered by Canada's granting councils.

Following the International Astronomical Union General Assembly in Cape Town a major collaboration has emerged with South African and Canadian joint ventures in the SKA infrastructure development and astronomy research. The convergence of AI and big data offers a significant area for joint exploration. Important opportunities in six key priority areas between the two countries have been outlined in the 2023 South Africa-



Canada Universities Network (SACUN) summit in Ottawa and Toronto, as well as the hybrid joint consultative committee meeting later that year in South Africa. The Canada-South African science, technology, innovation, knowledge (STIK) partnership goes well beyond bilateral efforts. Canada and South Africa have played a strong role in helping shape a pan-African approach to STI partnerships – especially through New Partnership for Africa’s Development (NEPAD) and the African Union (AU), but also through Group of Seven (G7)/Group of Eight (G8) - Group of Twenty (G20) science ministers meetings and Carnegie Group meetings of science advisors and ministers.



# 1. Introduction

Over the past three decades considerable effort has been deployed to shape and reimagine the special STIK partnership that has evolved between Canada and South Africa. With the November 2024 renewal of the five-year bilateral MOU on S&T cooperation, a review is in order.

New challenges have emerged with the rise of disruptive geopolitics, research security concerns, the need for inclusive innovation, and the increasingly critical role of science diplomacy as a tool in enhancing trade and research collaboration. Hence, there is a need for a roadmap to guide next steps and a report that can explore new opportunities.

Included in the potential list of new and revised policy intersections are: joint developments in talent and skills, joint research proposals, research chairs and centres of excellence; reimagined national systems of innovation which emphasize use-oriented basic research and that incorporate Indigenous knowledge as integral to the ecosystem; open science; learning from respective research and development (R&D) tax incentive and intellectual property rights (IPR) systems; enhanced support for research infrastructures, including the Square Kilometre Array Observatory (SKAO) and space science; the long-standing support for African Institute for Mathematical Sciences (AIMS), as well as developments in science metrics and indicators for knowledge production and innovation.

There are possibilities for greater cooperation in emerging technologies such as energy technology including green hydrogen, biosciences and vaccine production, new agricultural techniques as well as ongoing developments in nuclear medicine, mining and critical minerals. Grand societal challenges in the areas of artificial intelligence (AI), global polar research, and climate change also merit more attention.

At the heart of ensuring a more strategic focus and foresight in this partnership is the need to enhance effective talent support that is inclusive, especially through joint exchanges and the mobility of next generation scholarship across all disciplines. Novel policy support for start-ups and entrepreneurship could be explored under joint trade and innovation exchanges. Finally, extended science diplomacy leadership from South Africa and Canada may also play a key role in improving statecraft through the evidence-base of science and knowledge.



Our approach is multi-method, largely based on the interrogation of secondary sources and enhanced by interviews with some key individuals. This paper suggests emerging areas for future collaboration, including joint global leadership centred on the forthcoming G7 and G20 Summit processes. It also underscores the need for a high-level complementary study with experts chosen from both Canada and South Africa.

The 30<sup>th</sup> anniversary celebrations by the new National Unity Government and Canada's role in supporting science and research policy developments over that period offers an opportunity for a high-level announcement. Such studies – to better assess key selected areas of joint STI collaboration– have been developed in the past with India, Japan and Mexico in the Canadian context based on a well-established methodology. The mechanism for this is quite flexible, but it does require leadership at high levels within the STI advisory and policy ecosystems of each country.

The exploration could be a key initiative during the 2025 G20 and/or G7 Summits between the two countries. Indeed, there is an emerging opportunity to strengthen cooperation in the domain of science diplomacy where both countries have experimented with new policy developments including the appointment of professorial chairs in science diplomacy as well as the development of the Science Diplomacy Capital for Africa initiated by DSTI and the Council for Scientific and Industrial Research.

As former Minister Pandor argued: having an agenda that is sufficiently focused in order to ensure an optimal investment of resources, but sufficiently flexible in order to respond to the rapidly changing dynamics of international relations in the twenty-first century which, if not driven by science, most certainly will require a science based response.

The recent announcement by the DSTI Minister requesting the National Advisory Council on Innovation (NACI) to convene a summit to discuss a transformation within South Africa's National System of Innovation (NSI) along with Canada's forthcoming changes to its overall research and innovation support and policy apparatus offers an opportunity to reimagine our respective joint partnerships.

This report briefly reviews the evolving Canada-South Africa STIK partnership from its earliest years in the 1990s to its present and then offers a forward look.



## 2. Institutional Development: 1993-2010

In the early 1990s, Canada was reassessing its domestic approach to knowledge and research investment, as well as redeploying its major STI assets for a larger vision of research in the future and for its society. In 1994, a comprehensive review of federal research spending on S&T was undertaken and a national dialogue aimed at formulating a new national S&T process was taking place. There was also a reappraisal of Canada's position in the international space in S&T and an advisory panel to the Prime Minister had presented a report on the role of Canada's support for global partnerships. That report highlighted the need for a strategic approach to the country's trade and technology collaboration and was followed by several other similar reports over the following decades focused on Canada's evolving role in international S&T.

As part of its international development outlook, Canada's efforts to review SA's research system took the form of several key missions (1991-1995) jointly led by the IDRC and the Mass Democratic Movement, in particular the 1993 OECD-style review of innovation policy (*Building a new South Africa. Volume 3: Science and Technology Policy*, IDRC: 1995). That mission advocated freedom for science by advocating philosopher Michael Polanyi's 'Republic of Science' as a guiding principle.

The 1994 democratic elections brought Nelson Mandela to the Presidency of a Government of National Unity whose administration duly created the hybrid Department of Arts, Culture, Science and Technology. The new Ministry then embarked on a stakeholder-based policy formulation process that led to public consultation to frame a Green Paper on Science and Technology, then introduced a White Paper on Arts and Culture (DACST, 1996a), a White Paper on Science and Technology (DACST, 1996b), the Research and Technology Audit (DACST, 1997), and the Research and Technology Foresight (DACST, 1999).

IDRC supported the processes leading to the Green and White Papers on S&T through the secondment of expert Jim Mullin who had facilitated the 1993 engagement. Mullin, with his deep experience of STI policy in Canada and with the OECD contributed new thinking on the management of R&D and innovation that led to the adoption of the innovation systems approach. This shift was explicitly acknowledged: 'This White Paper is built upon the twin concepts of "innovation" and a "national system of innovation"... (we note) the 1994 Report of the Auditor General of Canada, which



captures a particular spirit which we would like to see suffused through the proposed policy' (DACST, 1996b: 7).

The White Paper suggested a broad definition of the NSI “as a set of functioning institutions, organizations and policies which interact constructively in the pursuit of a common set of social and economic goals and objectives” (DACST, 1996b: 20). It scoped the role of government in policy formulation and regulation, funding, research and innovation promotion, technology transfer correcting market failure, foresight and forecasting methods for priority setting. But it was silent on coordination failure, perhaps expecting that new organizations - the National Advisory Council on Innovation in 1997, the National Innovation Fund in 1997, and the NRF in 1999 could address this matter. The White Paper urged that attention be given to objective performance management and measurement. Three decades on, the first White Paper '*Preparing for the 21<sup>st</sup> Century*' retains its richness and insights, reading as a visionary statement, mission, policy and plan.

Next up was the National Strategy for R&D (DST, 2002: 68) that flagged the need for new institutions, notably what later emerged as the Technology Innovation Agency. Consideration was given to managing IPR that derived from publicly-financed research. Informed by emerging practice in the United States, the Strategy laid out the parameters of a new legal and regulatory framework for IPR and benefit sharing. The scoping of the legal and regulatory framework was informed by national and international studies, including a study tour to Canada that entailed meeting with nine institutions.

Arguably one of the most important findings of the study tour was learning from the negative experience associated with Canada's 1947 decision to vest ownership of publicly-funded IP in the hands of the State. The advice was rather to lodge ownership in the institutions where the IP was generated and to incentivize exploitation and possible commercialization through benefit-sharing.

In the meantime, Canada was undergoing its own reviews and reflection on governance and institution building in STI policy. A landmark period for the country were the years leading into the Millennium where several key policy experiments and institutions were put in place including the Canada Research Chairs, Millennium Scholarships, Networks of Centres of Excellence, Genome Canada, and novel policy and research infrastructure institutions such as an Advisory Council for Science and Technology, the Council for Science and Technology Advisors, and the Canada



Foundation for Innovation. These all provided impetus to a more articulated approach in the country's dealing with its global research partners.

As well, with various statements examining new directions in Canada's foreign policy, the bilateral efforts to strengthen STI cooperation between Canada and South Africa began earnestly in the early 2000s. The 2003 state visit to Canada by South African President Mbeki led to a larger commitment under a joint declaration of intent between the two countries.

In 2006, building on a newly created international STI partnerships programme, Canada's National Science Advisor to the Prime Minister subsequently arranged for various visits of South African delegates to key Canadian research organizations. Ongoing IDRC support was facilitated in key initiatives of the DACST, including consultancies toward:

- A Framework for Regional Cooperation in S&T; and
- Performance indicators for the Science Councils.

The latter introduced the Balanced Scorecard approach into the Science Councils. This schema was adopted, evaluated after five years, and re-adopted, and continues to shape current performance measurement systems.

Subsequent project support included:

- The Environmental Scan carried out by IDRC in 2006; and
- A Scoping Study to Establish the South African Observatory for Science, Technology and Innovation by the Human Sciences Research Council (HSRC) in 2006.

The positive working relationship between Canadian and South African policy makers and scientists gave impetus to NGO and statutory body initiatives with lasting impacts, examples being the AIMS, and the HSRC Centre for Science, Technology and Innovation Indicators (CeSTII). AIMS is a five nation AU flagship programme that was founded in 2003 by Canadian Prof Neil Turok, former Director of Canada's Perimeter Institute and internationally renowned professor of theoretical physics. Initial support for the founding of AIMS in Cape Town, South Africa arose from discussions with Minister of Education Kader Asmal. The South African chapter of AIMS grants its postgraduate diploma as a joint award of the Universities of Cape Town, Stellenbosch



and the Western Cape. Canada, with support from IDRC, also contributed funding for the AIMS centre in Senegal.

In 2002, the now standalone DST re-started the series of R&D Surveys that had been moribund since 1996. This mandate led to HSRC attendance at the OECD Committee of National Experts of S&T Indicators (NESTII) chaired by Dr. Fred Gault of Statistics Canada. Having completed a first R&D Survey, HSRC capability was strengthened through the founding of the CeSTII, whose work benefited from linkages with Statistics Canada. A study tour to Statistics Canada took place in 2004, deepening the working relationship. In due course, CeSTII elected to share its new expertise first with the members of the South African Development Community, and then further across Africa through the NEPAD, and eventually the AU and its African Observatory for STI Indicators. Statistics Canada played no small role in these thrusts, some of which were supported by IDRC.

The Canada Research Chairs Program was launched in 2000-2001 with a clearly-defined allocation framework – two tiers; broad field specific; all universities based on federal grant size. DST with the NRF noted the Canadian experience and in 2006 established the South African Research Chairs Initiative (SARChI) to attract and retain excellence in research and innovation at her public universities. The key objectives of SARChI were to:

- Expand the scientific research and innovation capacity of South Africa;
- Improve South Africa's international research and innovation competitiveness while responding to social and economic challenges of the country;
- Attract and retain excellent researchers and scientists;
- Increase the production of masters and doctoral graduates; and,
- Create research career pathways for young and mid-career researchers, with a strong research, innovation and human capital development output trajectory.



SARChI was designed to bring new research leadership capacity into public universities, while at the same time retaining those that were already at the universities. Since inception, 275 Research Chairs have been awarded to 23 public universities and nine science councils across the country in open and directed categories; priority research areas; S&T for poverty alleviation; innovation, engineering and technology development; and within the national S&T missions.

SARChI gave substance to the coordinating role that the DST began to play in the economic cluster introduced during the Mbeki Administration, through DST direct influence on the agenda of university research. It is to be noted that main government funding flows to the universities continue to come through the higher education National Funding Formula that reflects 'disinterested' academic research. System consolidation took the form of the Ten-Year Innovation Plan (DST, 2008) that was rolled-out across various sub-sectors over the next decade. Since the early White Paper exercise, the South African national system of science and innovation has been re-shaped, evolving through implementation of ongoing national S&T policy development as well as experiments in research capacity and institution-building.

### **3. Partnership Developments: 2011 onwards**

The NRF has performed its agency role in managing grant financing on behalf of its principal through supporting the host of STI bilateral agreements. The development of knowledge infrastructure was notable, which included high-speed communications and computing, science diplomacy, performance measurement, and regular STI indicator compilation to assess progress. This is reflected in the various assessments, road mapping and foresight exercises over the years, that inform South Africa's Decadal Plan for STI (DSI, 2021).

Building on its long history of supporting science systems, IDRC, along with other donors, in 2015 launched the SGCI as a response to gaps in the African science landscape. In particular, the lack of funding structures continues to limit research and innovation development in support of national priority objectives, such as ensuring transparency and effectiveness of funding instruments, developing partnerships between countries and with the private sector, and using research to advance gender equality and benefit marginalized communities.



IDRC and its partners now work with 17 African granting councils and as highlighted in a recent external evaluation has improved research governance and how management is governed in these countries.

With funding from IDRC, NRF, the United Kingdom's Foreign, Commonwealth and Development Office, the Norwegian Agency for Development Cooperation and the Swedish International Development Agency, new councils have been created in several countries - Sierra Leone and Botswana, while more established councils such as Tanzania's Commission for Science and Technology and Côte d'Ivoire's Fonds pour la Science, la Technologie et l'Innovation are emerging as national and regional leaders.

The second phase of the SGCI (SGCI-2), from 2018–2023, was more demand-led and responded to the priorities identified by the councils individually and collectively. In a recent review of the continent's STI strategy, the AU highlighted the importance of national funding structures and initiatives such as SGCI in achieving "[The Africa We Want](#)" by 2063. There is an opportunity for SGCI participating countries to continue to lead in informing and delivering on future regional S&T policies.

The Canada-South African STIK partnership goes well beyond bilateral efforts. Canada and South Africa have played a strong role in helping shape a pan-African approach to STI partnerships— especially through NEPAD and the AU, but also through G7/G8 science ministers meetings and Carnegie Group meetings of science advisors and ministers. These latter meetings could certainly be reinvigorated to discuss new, emerging global issues and partnerships in STI, especially in the Global South.

The 2004 work with the Association of Universities and Colleges Canada (AUCC) and the Association of African Universities (AAU) to formulate a joint concept paper on Africa-Canada Research Chairs and the efforts of the South African-born UK science advisor Sir David King around the Africa Commission are other examples of mobilizing global efforts in helping to grow the STI capacity of Africa.

In this period, Canada's National Science Advisor was tasked by his Prime Minister to mobilize efforts around supporting S&T for development in Africa with the objective of devoting up to 5% of Canada's total R&D spending towards the needs of the developing world including South Africa. A major conference regarding Africa-Canada-UK collaboration on Building Science and Technology Capacity with African Partners took place in 2005, followed by an expert meeting convened in Berlin as part of the



2007 G8 Summit process to build transnational cooperation networks and fostering innovative partnership models among the countries engaged.

In 2017, the IDRC and the NRF joined forces to support the SACRI through two modalities: the South Africa-Canada Research Chairs Trilateral Partners Initiative; and the South Africa-Canada Research Chairs Mobility Initiative.

In May 2021, the NRF entered into an agreement with Canada's Mitacs to kick-start the implementation of the NRF Industry Partnership Strategy to secure and leverage additional resources and promote graduate upskilling in industry settings.

In other multilateral initiatives, the Canadian research councils have undertaken a large-scale, multinational project on climate change under their New Frontiers Research Fund programme that includes South Africa as a key partner. This International Joint Initiative for Research in Climate Change Adaptation and Mitigation represents a collaboration among research funders from Brazil, Canada, Germany, South Africa, Switzerland, the United Kingdom and the United States to leverage international expertise in tackling the global challenges caused by climate change. The Trans-Atlantic Platform promotes collaboration between humanities and social science research funders from South America, North America, Europe and Africa.

International exposure for doctoral students, post-doctoral research fellows (PDRFs) and early career researchers (ECRs) is an integral component of the NRF's strategic goal to create an internationally competitive, transformed, and representative researcher cohort.

The NRF will continue to monitor, offer, source and exploit new, and realign existing programmes to facilitate opportunities for outstanding doctoral students, PDRFs, and ECRs in South Africa to spend between 3 to 18 months abroad, i.e., in Africa and beyond. The programme is premised on the need to accelerate the development of a diverse young researcher cohort into world-renowned experts and a globally competitive workforce through the provision of platforms and pathways that offer opportunities for outstanding young researchers to access international networks, mentorship, global research funding streams, industry, and infrastructure. The programme will be realized through the guiding framework of the Global Knowledge Partnerships (GKP) programme, a DSI-NRF initiative which was implemented in 2020.



## 4. Scientific collaboration

The common approach for detailed measurement of scientific collaboration makes appeal to bibliographic databases such as the Clarivate Web of Science™ (WoS), Elsevier Scopus™, Public Library of Science, ScieELO and others. Bibliometric analysis of these databases allows for the construction of metrics to inform the extent, focus and impact of scientific collaboration. Our analysis draws on the WoS using the filter ‘articles.’

In the period 1996 - 2020 Canada (average GERD: GDP of 1.8%) produced 1,608,508 whole count articles; South Africa (GERD: GDP 0.7%) produced 160,508. In the case of South Africa, her 0.9% contribution to world scientific publications was just short of the target of 1% set in the 2008-2018 Ten Year Innovation Plan.

Whole counts for the top 25 WoS Categories are displayed below in Figure 1. Both countries host diversified science systems areas with a maximum concentration of 3.8% (Canada – Engineering, Electrical Electronic) and 4.3% (South Africa – Environmental Sciences). The Canadian science system might be described as technical-biological with a bias toward studying the health of an ageing population; the South African system is Biomedical with an emphasis on infectious disease.

It is to be noted that the Category ‘Multidisciplinary Sciences’ captures articles that are in Nature and Science, and other leading multidisciplinary journals. South Africa overlaps with 14 of Canada’s 25 most important categories of science.

To provide an indication of potential areas of collaboration Figure 1 maps the 25 leading categories between the two countries. Collaboration may arise through directed government actions or through the self-organizing efforts of scientists through what has been termed ‘the invisible college of science.’



Figure 1: Mapping potential areas for collaboration

Canada				South Africa			
	WoS Categories	P	P=1608508 %		WoS Categories	P	P=293,611 %
1	Engineering Electrical Electronic	60438	3.757	1	Environmental Sciences	12753	4.344
2	Biochemistry Molecular Biology	60336	3.751	2	Public Environmental & Occupational Health	11403	3.884
3	Environmental Sciences	59644	3.705	3	Multidisciplinary Sciences	11373	3.873
4	Neurosciences	56423	3.508	4	Ecology	10216	3.479
5	Materials Science Multidisciplinary	51881	3.225	5	Plant Sciences	9403	3.203
6	Public Environmental & Occupational Health	44568	2.771	6	Astronomy & Astrophysics	8803	2.998
7	Multidisciplinary Sciences	43495	2.698	7	Infectious Diseases	8696	2.962
8	Oncology	37504	2.323	8	Education & Educational Research	8189	2.789
9	Chemistry, Physical	37003	2.3	9	Materials Science, Multidisciplinary	7267	2.475
10	Clinical Neurology	36364	2.261	10	Medicine, General & Internal	6607	2.25
11	Ecology	34110	2.121	11	Zoology	6469	2.203
12	Physics, Applied	32641	2.029	12	Chemistry, Multidisciplinary	6325	2.154
13	Geosciences, Multidisciplinary	32544	2.023	13	Immunology	6178	2.104
14	Chemistry, Multidisciplinary	31680	1.97	14	Chemistry, Physical	6080	2.071
15	Astronomy & Astrophysics	31499	1.958	15	Biochemistry & Molecular Biology	6004	2.045
16	Surgery	29595	1.84	16	Religion	5965	2.032
17	Cell Biology	29106	1.81	17	Microbiology	5586	1.903
18	Psychiatry	28835	1.793	18	Geosciences, Multidisciplinary	5486	1.868
19	Genetics & Heredity	27046	1.681	19	Economics	5205	1.773
20	Pharmacology & Pharmacy	27005	1.679	20	Water Resources	5106	1.739
21	Engineering, Chemical	26968	1.672	21	Engineering, Chemical	5027	1.712
22	Cardiac & Cardiovascular Systems	26498	1.647	22	Pharmacology & Pharmacy	4970	1.693
23	Mathematics	26232	1.631	23	Mathematics	4896	1.668
24	Economics	25487	1.585	24	Marine & Freshwater Biology	4503	1.534
25	Radiology, Nuclear Medicine & Medical Imaging	24475	1.522	25	Mathematics, Applied	4428	1.508



Figure 1.1 lists 14 common categories as an indication of suggested potential mutual areas of future collaboration for Canadian and South African researchers.

Figure 1.1

1.	Biochemistry Molecular Biology
2.	Environmental Sciences
3.	Materials Science Multidisciplinary
4.	Public Environmental & Occupational Health
5.	Multidisciplinary Sciences
6.	Chemistry, Physical
7.	Ecology
8.	Geosciences, Multidisciplinary
9.	Chemistry, Multidisciplinary
10.	Astronomy & Astrophysics
11.	Pharmacology & Pharmacy
12.	Engineering, Chemical
13.	Mathematics
14.	Economics

## Time Trends

During the period (1996-2020) Canadian scientific output increased 2.5 fold; South Africa’s output increased five-fold, largely as a result of increased international co-authorship.

## Co-authorship

Care is required in unpacking the meaning of scientific co-authorship involving multiple parties. The keyword search ‘Canada AND South Africa’ captures activities in which scientists from both countries appear. This yields 13,265 incidents. Since one is mainly interested in the bilateral partnership that involves university-university links, the keyword search ‘South Africa AND (any Canadian university)’ provides a more accurate picture of the scale and nature of co-authorship. This restricted search (Figure 2) yields 4,856 articles of which the top ten categories are distributed as follows:



Figure 2: Main categories - South Africa AND (any Canadian university)

WoS Category	%
Astronomy Astrophysics	12.4
Physics Particles Fields	10.0
Public Environmental & Occupational Health	6.9
Ecology	4.8
Environmental Sciences	4.4
Medicine General Internal	4.3
Multidisciplinary Sciences	4.3
Infectious Disease	3.7
Physics, Nuclear	3.2
Immunology	2.8

\*Engineering Electrical Electronic and Geosciences are around 2% each.

Arguably the top three most prolific areas (Astronomy Astrophysics; Physics Particles Fields; Public Environmental & Occupational Health) arise from the participation of scientists from both countries in Big Science projects. The same holds for Infectious Disease and Physics, Nuclear. Research areas that may be more aligned with commercial activities, such as Plant Sciences or Engineering, do not feature strongly.

## Top Papers

A final snapshot is provided by examining the distribution of most highly-cited papers recorded for each country on the WoS Essential Science Indicators (ESI) database of 22 aggregated fields of study.

Figure 3 records ESI fields for Canadian or South African papers of which more than 2% are highly-cited. "Rank" denotes the number of citations in the field. Percent is the proportion that are highly-cited.



Figure 3: Highly-cited papers

WoS ESI Field	Canada Rank	Canada %	South Africa Rank	South Africa %
Clinical Medicine	1	2.96	1	3.34
Physics	11	2.30	8	2.01
Space Science	15	3.23	6	3.33
Molecular Biology & Genetics	7	1.88	13	2.19
Neuroscience & Behavior	5	1.84	18	2.92

## 2019 - 2021 SciVal Profile

It is useful to appraise more recent data, for which purpose appeal is made to Clarivate SciVal™. This analysis shows that Canada is South Africa’s ninth most important science and research partner; from the Canadian perspective South Africa is 24<sup>th</sup>.

From 2019 to 2021, there were 3,884 co-authored publications between Canada (5,909 researchers aligned with 166 institutions) and South Africa (7,052 researchers aligned with 73 institutions), with a Field-Weighted Citation Impact of 4.13. Collaboration rose by 34.1% over the given period. Additional performance indicators are presented in Figure 4.

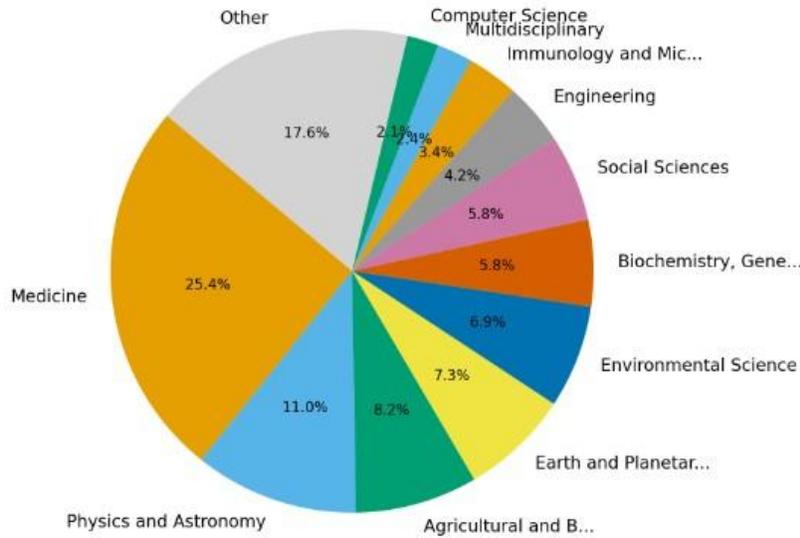
Figure 4: Performance (2019-2021)

Measurement	South Africa	Canada
Outputs in Top Citation Percentiles	11.5%	14.4%
Publications in Top Journal Percentiles	22.0%	36.1%
International Collaboration	52.0%	55.3%
Academic-Corporate Collaboration	2.4%	4.2%

As seen in Figure 5, Canadian and South African researchers collaborated mainly in the area of human medicine, with physics and astronomy coming in second, and agricultural and biological sciences coming in third.



Figure 5: Areas of Collaboration (2019-2021)



The main collaboration area, medicine, produced 1,586 articles in 2019-2021. By contrast, in this same period, South Africa produced 22,118 articles in medicine and Canada 124,121. Collaboration with South Africa is negligible to Canada’s overall research publications.

Figure 6 records the top three collaborating institutions in Canada and South Africa.

Figure 6: Canada-South Africa Top Three Collaborating Institutions (2019-2021)

Canada	South Africa
University of Toronto	University of Cape Town
University of British Columbia	University of the Witwatersrand
McGill University	University of Johannesburg

In conjunction with these metrics, it is important to underscore the growing partnerships that exist based on the grants, fellowships and research awards for South African scholars offered by Canada’s granting councils that serve to promote new talent and development of key research areas. For instance, based on recent information from Canada’s granting councils, Canada provided funding for partnership activities over 2004-2023 in the amount of CAN \$193 million, mainly directed toward the research and comprehensive universities with additional support to the HSRC. Funds were also made available to South Africa’s Medical Research Council through the Canadian



Institutes of Health Research (CIHR) in the amount of CAN \$2.5 million to the Healthy Life Trajectories Initiative and CAN \$5.2 million toward the work of the Global Alliance for Chronic Diseases. CIHR also provided CAN \$0.75 million for training and another CAN \$2 million as open grants. South African co-funding for these activities was in the order of CAN \$4.5 million.

## 5. Forward Look

The forthcoming G7 and G20 Summits to be hosted in 2025 by Canada and South Africa respectively will offer a unique opportunity to cement key areas of the joint partnerships (inspiration here may come from the 2005 G8 Summit and the then NEPAD agenda and Commission for Africa report focusing on emerging technology and innovation collaborations).

Cooperation through science diplomacy can be a pivotal area to explore. One could also further explore the blending of key technology areas where both Canada and South Africa have ongoing strategies – especially in critical technologies, AI, astronomy and space science, vaccines development research, the biosciences and green hydrogen. For example, Canada’s Hydrogen Strategy of 2020 outlines goals to become a leading producer, user and exporter of clean hydrogen with recent budget allocations of almost CAN \$21 billion for clean technology, and tax credits for green hydrogen projects. South Africa’s Hydrogen Society RoadMap 2021 seeks to stimulate demand for renewable hydrogen, to build green hydrogen and ammonia markets to decarbonise heavy industry, transport and power generation– with thrusts that support gender, equality and social inclusion.

Following the International Astronomical Union General Assembly that took place for the first time in Cape Town in August 2024, a major opportunity has emerged with South African and Canadian joint ventures in the SKA infrastructure development and related astronomy research with both countries providing significant funding and developing renewed partnerships. Indeed, the convergence of AI and new digital analysis technology of massive data sets within this field offers a major area of joint exploration for both countries.



Important opportunities between the two countries have been outlined in the 2023 SACUN summit in Ottawa and Toronto, as well as the hybrid joint consultative committee meeting later that year in South Africa. Indeed, according to the report from the SACUN meeting, five key priorities have been identified that offer opportunities for South African and Canadian cooperation namely:

- Implementation of transformative international joint research and Innovation partnerships: Renewed commitment of bilateral research and Innovation partnerships and multilateral cooperation (i.e., Eureka).
- Build human resources for international mobility: Increased mobility between South Africa and Canada.
- Strengthen and grow the research infrastructure capabilities: Investing in continental and regional large-scale research infrastructures through partnerships with Canada (i.e., the SKA telescope).
- Promote STI capabilities in Africa: Through extensive collaboration with IDRC and AIMS.
- Stimulate STI and trade synergies: Through for example hydrogen or perhaps the ocean economies.

As a result of this summit, SACUN proposed collaboration in research across five prioritized themes:

- Just and Resilient Societies (topics: reconciliation, diversity, gender equality, rule of law, democratization, security, good governance, addressing poverty, ethical environmental practices, quality education, Indigenous knowledge systems)
- One Health (topics: right to healthy environment, access to health resources, mental health, gender and access to health resources, climate change and health, pandemics)
- Environmental Sustainability (topics: sustainable and climate resilient agricultural systems, food security, pollution, clean energy, renewable energy, energy transitions, clean water, sustainable sourcing)



- Fourth Industrial Revolution (topics: technological futures, smart transport systems, nanotechnology, urbanization – smart cities, informed policy-making, digital economy, digital innovation, digital infrastructure, big data and data science)
- Sustainable Growth (topics: critical minerals and supply chains, innovation in the Blue Economy, infrastructure, green economy, labour supply/skills development)

The NRF of South Africa has committed ZAR 9 million (CAN \$705,000<sup>1</sup>) over the next three years to support this initiative. Canadian funding has yet to be confirmed. And, in this direction, it is important to highlight the recent announcement by the South African President for the Presidential PhD Programme to send young people to leading science and research institutions to various parts of the world for training and exposure so that they can come back and serve South Africa.

But these, along with many other partnerships listed during the SACUN summit and a forthcoming call for research proposals between the two countries simply serve to highlight the need for a more strategic approach along with critical funding to the bilateral and multilateral STI engagements with South Africa.

To take the growing partnership forward, a roadmap and/or high level complementary study targeting key emerging areas in strategic fields of the sciences, Indigenous knowledge and technology will be required.

The newest figures available for the number of publications in selected areas between South Africa and Canada indicate that medicine is by far the most prominent area on international co-publications, followed by astronomy, earth and planetary sciences and agriculture and this could provide a nascent framework. These metrics will need to be updated.

Efforts to strengthen cooperation through Canada's research granting councils and those of South Africa along with the multi-donor SGCI within Africa could be further explored.

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<sup>1</sup> Exchange rate as of November 2024.



In South Africa, a new governance system is evolving through the establishment of the Science, Technology and Innovation Presidential Plenary and the Science, Technology and Innovation Inter-Ministerial Committee for consultations, agenda setting and coordination. The DSTI and NACI support these structures.

In Canada, a recently announced plan for a capstone organization bringing together the efforts of the research granting councils, as well as a revised Council for Science and Innovation along with a new Canada Innovation Corporation offer an opportunity to bring these organizations together to mount a well-focused complementarity study for STIK.

This will entail a consultative process with key individuals who have knowledge of the existing partnership both on the joint consultative committee but also within the business, higher education and development arenas. In Canada's case, the Council of Canadian Academies (CCA) expert panel report of February 2024 on international priorities in STIK can be an important guide as will the ongoing foreign policy review of the government of Canada's relations with Africa.

With this growing potential for increased collaboration between Canada and South Africa, it is worth underscoring the speech given by the South African Minister of Higher Education, Science and Innovation at a UNESCO event in 2023:

*In order to make science count for Africa, it must disrupt these historical patterns of uneven and contradictory development. In short, African science has to become a source of Africa's renewal and transformation. I suggest at least three key actions are critical to make science count for Africa.*

*Firstly, Africa needs to raise the levels of aggregate investment in both basic and applied sciences, including in scientific infrastructure and human talent to support its developmental goals. ...Simply put, as African Governments, we must significantly increase our own investment in science and this is what we are committed to in South Africa and this is a cause that I am championing.*

*Secondly, in our effort to enhance public understanding, awareness and support for science in Africa we also need to put in place enabling policy*



*frameworks, notably, supporting the UNESCO Recommendation on Open Science.*

*Thirdly, we need increased participation of African scientists in international cooperation programmes. Science has always progressed through the sharing of experience and expertise, and African science needs global partnerships to progress, but also African science too is an important and indispensable source of knowledge needed to make our world a more inclusive and sustainable one.*

Today, Canada and South Africa are well-poised to grow and strengthen their existing collaboration and STI partnerships. The forthcoming joint consultative meeting offers a strong opportunity to enable a vibrant and constructive dialogue for the future, as well as exploring the need for a strategic complementarity study.

This brief paper clearly cannot do full justice to the scale and scope of this remarkable partnership over the years. The authors would like to thank the collaboration of key individuals who agreed to provide comments on the evolving partnership as well as for the professional support of the ISED and DSTI teams who offered cogent commentary and ideas while ensuring sound steerage of this project

Paul Dufour

Michael Kahn

25 November 2024



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# Annex A: List of Selected Interviews - Consultations

High Commissioner to South Africa, Chris Cooter, Global Affairs Canada

High Commissioner to Canada, Riaz Shaik, Government of South Africa

Professor David Hornsby, Vice Provost & Associate Vice-President (Academic)

Professor, Norman Paterson School of International Affairs, Carleton University

Professor Kristine Spekkens, Canadian Science Director, Square Kilometre Array,  
Queen's University

Caroline Bolduc, Trade Commissioner, Global Affairs Canada

Garth Williams, Director, CRCC, Social Sciences and Humanities Research Council

Matthew Wallace, Senior Advisor, IDRC

Remi Quirion, Chief Scientist, Government of Quebec

Sandy Hanna, Senior Advisor, Office of the National Science Advisor, Canada

Bernie Fanaroff

McLean Sibanda

David Kaplan

Rob Adam



# **Annex B: Selected Historical Reports and Articles on Canada - South Africa Science, Technology, Innovation and Knowledge Collaboration**

Investigation into South Africa's National Research System– Overview of the System,  
October 1992

Towards a science and technology policy for a Democratic South Africa– Mission  
Report IDRC, July 1993

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SA Green Paper on Science and Technology - Preparing for the 21st Century, 1995,  
and White Paper– Preparing for the 21st Century, 4 September 1996

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Placing South Africans on Top, THRIP impacts reported in 2003

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On Knowledge Partnerships with Africa: A Canadian Vision, Building science and technology capacity with African partners: An Africa-Canada-UK Exploration 2005, National Science Advisor for Canada, Arthur Carty remarks, and summary report, London, March 2005

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OR Tambo African Research Chairs Initiative- Framework and application guidelines, June 2019