



AIMS

African Institute for
Mathematical Sciences

NEXT EINSTEIN INITIATIVE

African Institute for Mathematical Sciences
Next Einstein Initiative (AIMS-NEI)

IDRC Project No. 106490

IDRC Project No. 107185

Final Technical Report

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Submitted on: 30 October 2017
Resubmitted on: 8 November 2017

1. Executive Summary

The Government of Canada and the United Kingdom Department for International Development (DFID) recognize the vital role that science, technology and innovation can play as drivers of the modern economy in Africa. In 2011, Canada contributed USD 20 million over five years for the International Development Research Centre (IDRC), as the implementing agency, to support the replication and scale up of the African Institute for Mathematical Sciences (AIMS) in South Africa through its Next Einstein Initiative (AIMS NEI). In 2012, DFID contributed £18 million to complement and build on Canada's contribution to AIMS-NEI, also to be implemented by IDRC. With this support, AIMS has:

- **Expanded from one centre in 2011 to six in 2016:** South Africa, Senegal, Ghana, Cameroon, Tanzania and Rwanda;
- **Increased the pool of highly qualified mathematical scientists who are critical thinkers and problem solvers** from 54 graduates/year in 2011 to 291 graduates/year in 2017, over 30% of whom are women;
- **Established a Secretariat for the network and positioned itself to expand to 15 centres across Africa by 2023**, each one a hub for education, research and innovation, with 1000+ graduates annually, 50% of whom will be women¹;
- **Leveraged complementary funding internationally, in Canada, and from host governments.** This includes USD 25 million from the MasterCard Foundation in 2014, CAD 6.3 million from Global Affairs Canada (GAC) for the Skills for Employability program in 2016; CAD 20 million from GAC/IDRC for the Mathematical Sciences for Climate Resilience program in 2017; and USD 10.7 million from host country governments over 2011 to 2017, which contributed to the objectives of the grant, strengthened host country engagement, and reinforced the results achieved;
- **Established itself as a leader in higher education in STEM** with 1,513 alumni to date, over 30% of whom are women, and is well on its way to building a global partnership with 200+ universities, 300+ distinguished researchers, and a faculty of 500 world class lecturers;
- **Facilitated a total of 117 internships for AIMS alumni** to enhance the transition of students and alumni from the classroom to the workforce in Africa where they can apply their skills in mathematics to the private, public or academic sectors;
- **Supported Canada's development priorities in economic growth, food security and children & youth** by producing mathematically skilled graduates who are applying their training in the fields of finance, IT, food security, climate change, and human health;
- **Fostered increased Canadian involvement**, including academic and research partnerships with 11 Canadian universities², 29 visiting lecturers and 5 visiting tutors from Canada to AIMS centres, and 51 AIMS alumni (including 15 women) currently

¹ Being positioned to expand to 15 centres by 2023 does not imply that AIMS-NEI will continue to expand till it reaches this goal. While AIMS strives to achieve the target of 1000+ graduates annually by 2023 (50% of whom will be women), it will equally maintain a strong emphasis on the quality of its centres and diligently and prudently ensure the sustainability of existing Centres as the network continues to expand across Africa.

² Université de Montreal, University of Guelph, University of Ottawa, University of Victoria, University of Waterloo, Simon Fraser University, McMaster University, Université de Moncton, University of British Columbia, University of Ottawa, and University of Victoria.

furthering their studies at the Master's, PhD or Post-Doc level or employed as lecturers in Canada. AIMS collaborated with the University of Ottawa and the University of Waterloo to establish a pilot Co-op Master's in Mathematical Sciences at AIMS Senegal that builds on the foundation laid by DFID and the AIMS Industry Initiative. Through the QEII Scholarship Program, AIMS partnered with the University of Ottawa and the University of Victoria to offer internships to 13 young Canadians (including 10 women) at the Secretariat and Centres to support their transition to work and growth in global citizenship and increase the network's own understanding of work integrated learning;

- **Supported the UK's development priority of 'promoting global prosperity'** by helping to build a skilled workforce to contribute to the economic development of Africa; and
- **Fostered increased British involvement**, including partnerships with four British academic and research institutions³ and 36 AIMS alumni (including 15 women) currently furthering their studies at the Master's, PhD or Post-Doc level or employed as lecturers in the UK.

Through its support of AIMS NEI, the Government of Canada and DFID have demonstrated their leadership in investing in talented young Africans and building scientific and technical capacity across the continent through the development of a network of centres of excellence in mathematical sciences. A solid foundation has been laid which has taken AIMS from proof of concept into a consolidation phase in preparation for further scale up of the model into other African countries.

2. Introduction

The African Institute for Mathematical Sciences (AIMS) is an innovative network of post-graduate centres for education, research and public engagement in mathematical sciences, providing advanced and broadly applicable mathematical skills to talented students from all over Africa. Founded in 2003 in Cape Town, South Africa, AIMS offers a one-year Master's in Mathematical Sciences that trains over 250 talented women and men from across the continent each year, preparing them for leadership positions in academia, government, civil society, private sector and entrepreneurship. Research is also an integral part of the AIMS mandate and ecosystem for transformation. Since its launch, AIMS has won global recognition as a centre of excellence for post-graduate education and research⁴. Building on its success, AIMS launched the Next Einstein Initiative (NEI) in 2008, to build a critical mass of scientific and technical talent in Africa, capable of driving progress across the continent. With a plan to expand to 15 centres in Africa by 2021, AIMS currently operates a global secretariat plus six centres of excellence: AIMS South Africa (2003); AIMS Senegal (2011); AIMS Ghana (2012); AIMS Cameroon (2013); AIMS Tanzania (2014); and AIMS Rwanda (2016).

3. Development Challenge

The lack of opportunities in higher education in Africa and the acute shortage of a skilled workforce are critical factors limiting the continent's economic growth, good governance and educational advancement. Traditional approaches to aid have ignored the importance of investing in human capacity and building local skills at a level where the graduates have been equipped to intervene and serve as agents for sustainable

³ Durham University, Royal Statistical Society, University of Oxford, and University of Cambridge

⁴ Science Forum South Africa 2016 Science Diplomacy Award

transformational change. By providing access to world-class centres of excellence and generating a strong, pan-African highly-skilled community, this grant has contributed to the continent's educational, political and economic self-sufficiency⁵.

Building on the success of AIMS South Africa established in 2003, the support received from the Government of Canada and DFID through IDRC allowed for this innovative and proven concept to be rolled out to an additional five centres through AIMS NEI. By establishing multiple centres, AIMS NEI provided access to advanced training in mathematical sciences to over 1,500 talented young Africans, contributed to a rise in standards in academia, government, business and industry engagement, and enhanced the continent's ability to achieve future scientific and economic self-sufficiency.

AIMS has raised awareness, influenced the political landscape, and moved the dialogue forward on the importance of higher education in mathematical sciences in Africa. This has been acknowledged and endorsed at the highest levels of government. AIMS was designated as a New Partnership for Africa's Development (NEPAD) Centre of Excellence by the African Ministerial Conference on Science and Technology in 2003 and won significant ongoing support from the South African Ministry of Education and Ministry of Science and Technology. AIMS is a flagship program in the African Union (AU)/NEPAD Science & Technology Consolidated Plan of Action. The AU recognized AIMS in June 2015 as a critical tool for the implementation of the Science, Technology and Innovation Strategy for Africa (STISA 2024), adopted by the Assembly of Heads of State and Government of the AU in 2014. Host country governments have shown increasing recognition of the contribution of AIMS to higher education and have invested USD 10.7 million to date, complementing Government of Canada and DFID funds and contributing to build the foundation for financial sustainability of the network.

4. Communications and Knowledge Materials

As the AIMS network has rapidly expanded across the continent and impacted an increasing number of young African mathematical scientists, the communications team's focus has been on the following four areas:

i. Internal communications and knowledge management

It has become increasingly important, as the AIMS network grows, that all internal stakeholders are aware of the various moving pieces of work being done across the organization. Strengthening internal information and knowledge management and increasing internal communications has been a priority.

Growing from just one centre to a pan-African network, AIMS had to develop its own information and knowledge management system. This has included developing tools and resources such as the centre start-up manual; cross-cutting policies and procedures on finance and human resources; a standardised accounting system; streamlined governance framework; M&E Framework; Theory of Change; and the annual alumni survey. This has allowed AIMS to build its internal knowledge capacity and take a more systematic approach to its growth and development.

⁵ The Mid Term Evaluation of AIMS-IDRC/DFID Partnership Program Report, 2015

The communications team has also launched a digital newsletter to inform staff of developments across the network. An intranet for the organization is currently being mapped out in collaboration with AIMS' IT department. The communications team continues to engage colleagues for more frequent feedback and sharing of information.

ii. Media engagement to continue raising AIMS' profile

AIMS continues to drive a steady drumbeat in terms of media engagement, both in the countries that host AIMS centres and on a pan-African scale. Increasingly, the international media, including tier one outlets such as Al Jazeera⁶ and CNN⁷, have shown an interest in the stories of AIMS alumni in particular and the organization's work in general. This has enabled the communications team to build an extensive media list that is kept abreast of publicly released news from the network. The media outreach extends to AIMS' social media platforms, where the network is growing a sizeable following who engage with the content posted on a regular basis.

iii. Thought leadership

In addition to media engagements, the communications team has made a deliberate effort to develop and sustain thought leadership for AIMS. AIMS President and CEO spoke at the World Conference of Science Journalists in California, where he challenged the assumption that Africans have not contributed extensively to science and mathematics. AIMS is also increasingly invited to be represented on important panel discussions on STEM, education, and general African development themes, not just as a higher learning institution, but as a thought leader in the transformation of Africa, including the World Economic Forum on Africa, Rebranding Africa Forum, and Falling Walls Conference.

iv. Message repositioning

With the launch of the AIMS ecosystem for transformation in Rwanda, which expands on the concept of AIMS being a network of centres of excellence in Africa to one that places AIMS programs at the centre of developmental transformation through science on the continent, the communications team has also worked to tailor the organization's key messages to fit this narrative. Communications materials have been updated to speak of the ecosystem as a whole, including the Next Einstein Forum, Quantum Leap Africa and the AIMS Industry Initiative. The gap between public relations and public engagement is also being bridged, as both efforts begin to merge under the responsibilities of the communications team.

5. Synthesis of Results and Development Outcomes

**Objective 1: To support two existing AIMS Centres (South Africa and Nigeria);
Objective 2: To establish three new AIMS Centres (Senegal, Ghana and Ethiopia);
and DFID Objective 2: To establish two new AIMS Centres (Tanzania and Rwanda)**

Government of Canada funding supported the growth and development of AIMS South Africa, which served as the model for the establishment of five new AIMS centres in Senegal, Ghana, Cameroon, Tanzania and Rwanda. The proposed AIMS centre in Nigeria was not opened since the partner institution, the African University of Science and Technology in Abuja, failed to agree on a shared framework for the implementation of the scholarship program and the need

⁶ <http://www.aljazeera.com/news/2016/03/einstein-forum-aims-stem-africa-brain-drain-160310095834426.html>

⁷ <http://edition.cnn.com/2016/03/21/africa/africa-next-einstein-forum-feat/index.html>

for a 24-hour learning environment. While Ethiopia had initially been selected to host an AIMS centre, it was replaced by Cameroon, due to political unrest and a change in leadership in Ethiopia.

Through a systematic and strategic outreach during this grant, the number of students interested in studying at AIMS has grown substantially. AIMS received 400 applicants (330 men and 70 women) from 36 countries for the 2011/2012 academic year, growing to 4,909 applicants (3,956 men and 953 women) from 47 countries for the 2017/2018 academic year.

Through this grant and the roll-out of five new centres, the number of AIMS graduates per year has grown from 54 (39 men and 15 women from 21 countries) from AIMS South Africa in 2011 to 290 graduates (193 men and 97 women from 30 countries) in 2017, an increase of over 500%. To date, AIMS has a total of 1,513 alumni, (1,029 men and 484 women) from 43 countries across Africa.

Significantly contributing in building a knowledge-based economy for Africa, this grant has enabled AIMS to provide the foundational training for 378 alumni (98 women) who have pursued further studies at the PhD level, of whom 131 (21 women) have completed PhDs to date. The majority of those alumni (180 alumni, 57%) attend universities in Africa post-AIMS with South Africa (147 alumni) being the most popular. The UK and Canada have hosted the largest number of alumni pursuing PhDs outside of Africa (32 and 25 alumni, respectively). AIMS alumni are applying their training in mathematical sciences in a variety of fields of research, including cryptography, biomathematics, laser technology, climate change, forestry, ecology, physics, civil engineering, and epidemiology.

AIMS alumni are contributing to the development of Africa through their chosen careers, both on and off the continent. A total of 365 alumni are working in sectors in-line with Africa's development priorities, in particular education (206), research (59), information and communications technology (32), and banking and finance (15). The majority of employed alumni are working in Africa (87%).

AIMS alumni have achieved considerable success in their research and professional pursuits following graduation. A total of ten alumni hold senior positions of leadership (7 in Africa, 3 outside Africa), including research chairs, founders of non-profit organizations, managing directors, and senior research scientists in the transmission of HIV/AIDS and malaria. (Table 1).

AIMS alumni have received numerous accolades for their research in STEM. AIMS alumni have produced over 300 peer-reviewed publications in a wide range of journals showing a diverse application of mathematical sciences, including cosmology, infectious disease control, ICT, genetics, cryptography, climate change, and energy. Nine alumni have received awards and fellowships for their contribution to advancing research in STEM at the Master's, PhD and Post-Doc levels, as detailed in Table 2. Alice Ikuzwe secured a patent in solar light reflectors. Together with Prof. A.B. Sebitosi at Stellenbosch University, Ms. Ikuzwe developed an innovative light collimator designed to enhance the amount of light captured and transported through tubular skylights. This improved light tube design offers more illuminance in buildings for substantial energy savings while increasing occupants' productivity and comfort.

Objective 3: To develop and implement an M&E plan

An independent external evaluation of AIMS South Africa was conducted in 2012, focusing on the programming supported by the Government of Canada and DFID through IDRC. The results

of the evaluation informed the development of the AIMS Theory of Change, Logic Model and M&E Plan, which guided the Government of Canada and DFID's investments and served as a baseline study for the roll-out of the subsequent five centres. Building on this, the AIMS Strategic Framework "AIMS Vision 2020" and the AIMS Balanced Scorecard were developed in 2015.

The IDRC/DFID Mid-term Evaluation was conducted in 2015, which assessed the progress to date, early results achieved, and recommendations going forward as AIMS continues to grow and expand its reach across Africa. One of the recommendations emerging from the evaluation was a review of the initial AIMS M&E Plan, including strengthening the alumni monitoring strategy and database and completing a more comprehensive knowledge management and learning framework. A revised M&E Framework was finalised in May 2017 and provides a strategic, overarching framework set at the level of the organisation to track information from across the network, in line with the AIMS Strategic Framework. AIMS is currently developing a web-based, collaborative platform for the network to share and manage information and knowledge as well as a network database to capture data reflected in the revised M&E Framework – together, these will serve as the foundation for the Information and Knowledge Management Framework, being developed.

The IDRC/DFID End of Program Evaluation was conducted in 2017. With an eye to both compliance and organizational learning, the objective of the evaluation was to assess the relevance, effectiveness, sustainability and impact of the academic program and industry initiative and determine the extent to which alumni are helping to overcome Africa's development challenges.

The End of Program Evaluation served to highlight the areas where AIMS is having an impact, namely its relevance to the African development agenda, the high quality and innovative nature of its Master's program, the importance placed on combining practical work skills with technical expertise in maths, and its 24/7 learning environment. It also reminded AIMS of already known challenges, namely the critical importance of ensuring financial sustainability, while identifying other areas where AIMS may wish to pay closer attention, including ensuring greater consistency in grading of student assignments across centres, putting in place full-time in-country academic directors at each centre, developing an Industry Initiative that's demand driven and more reflective of market needs, greater focus on gender equality and inclusion, strengthening the M&E system, and developing online information and knowledge management system.

IDRC's initial support for establishing an M&E Plan laid the groundwork for all future grants, including those with DFID and the MasterCard Foundation, who both aligned with the M&E Plan already in place. AIMS was therefore better placed to manage and measure progress against objectives and results achieved, allowing for greater accountability to all stakeholders, both internal and external.

Objective 4: To support and contribute to the development of a Secretariat for the Initiative

The AIMS NEI Global Secretariat was established in 2011 to provide an overarching structure and centralized services to support the development of new AIMS centres and network coordination. Operating under the leadership of the AIMS NEI President & CEO, the Secretariat has provided the following functions to the network:

- Ongoing coordination, harmonization, quality assurance, and evaluation to all AIMS centres;
- Centralized and standardized processes, including student/tutor/lecturer applications and selections;
- Development of common systems, including accounting and auditing;
- Fundraising and building international partnerships;
- Advising the AIMS International Board of Directors (IBOD) on the selection and development of new AIMS centres; and
- Implementing decisions taken by the AIMS IBOD.

The Secretariat is a proxy indicator of the success observed across the AIMS network with respect to building an institution capable of managing and overseeing the strategic growth of a coordinated network from multiple perspectives including the quality of training and research at AIMS centres and the impact of alumni in science and development. It has served as the launching pad for establishing new centres and fundraising to ensure their long-term sustainability. As further discussed in Section 6 below, the Secretariat relocated from Cape Town, South Africa to Kigali, Rwanda in 2016 upon invitation from the Government of Rwanda and with the approval of the AIMS International Board of Directors. This served to address the need to consolidate the Secretariat staff in one location for increased efficiency and effectiveness and to overcome the recurrent challenges faced by foreign nationals in obtaining work permits in South Africa.

Objective 5: To develop a common set of administrative and operating procedures for the Initiative

AIMS has made significant progress in developing its administration and operating procedures but more work needs to be done to fully roll-out and implement these procedures and put in place a framework for monitoring compliance. With the establishment of the Secretariat, the necessary administrative and operating procedures have been put in place, including procurement, accounting, auditing, budgeting, work planning, and Information Technology. The remaining policies including communications and gender are yet to be finalized.

The network is now operating with increased efficiency, coherence and consistency and this has served to facilitate the replication of the AIMS model from South Africa to five additional countries across Africa through this grant. The credibility of AIMS as a network has been enhanced, which has allowed for the sharing of data and information, lessons learned, and staff support across centres.

Objective 6: To help AIMS Centres form a unified learning network, with an appropriate balance between a central approach and local variation that responds to specific needs and opportunities

The AIMS NEI Global Secretariat has provided the framework and enabling environment for a unified learning network. Incorporating centres, chapters and the Secretariat itself, the following have been put in place: consistent branding, coherent online presence, coordinated communications, centre development, grant management, and agreement on the core competencies required of AIMS graduates.

The governance structures for academic oversight and centre management have been established at each centre. Centre governance and relationships with host country government

and academic partners remain flexible and relevant to the local context. Academic governance is now consistent across centres, given the uniformity required in the Master's program and the oversight provided by the network-wide AIMS Academic Committee to each of the Academic Councils at centres. Work continues to progress positively in fully defining the overall governance of the AIMS network with a decentralized but well-coordinated central IBOD.

Objective 7: To enhance post-graduate opportunities for AIMS Centre graduates and (DFID Objective 7) ...particularly private sector employment in key areas of development for Africa

Post-AIMS support is a key element of the AIMS model and an important differentiator of AIMS from most other tertiary institutions. It represents a turnkey point; a strategic engagement tool between the AIMS network and its alumni, for their continuous professional development.

The post-AIMS bursary program offered through this grant has enabled alumni to pursue their studies in Africa, thereby contributing to maintaining capacity on the continent and avoiding the potential for 'brain drain'. It has directly contributed towards travel grants and bursaries to recent graduates who wish to further their studies at the Research Master's or PhD level.

Post-AIMS bursaries valued at up to USD 9,000 are available to recent graduates who have been accepted to pursue a Master's or PhD degree at an institution in Africa. Awards have been on a matching basis to students who have already secured partial funding for their studies.

The travel grant component of the post-AIMS bursary program is a mechanism through which AIMS extends its support to students wishing to study outside of Africa, but require support for a flight ticket to enable them take up these study opportunities. AIMS offers travel grants valued at up to USD 2,000 to recent graduates who wish to pursue a Master's or PhD degree at an institution outside of Africa.

A total of 467 post-AIMS bursaries have been awarded since 2003/2004 for AIMS graduates to pursue further studies at the Master's (401) and PhD level (66). The majority of bursaries have been awarded to AIMS South Africa graduates (352), followed by AIMS Senegal (59), AIMS Ghana (44), AIMS Tanzania (9), and AIMS Cameroon (4), which reflects not only the length of time each centre has been in operation but also the availability of post-graduate opportunities in-country with more being available in South Africa. Interested students are free to apply for opportunities across the continent, including South Africa, not just in their host country.

Building on the post-AIMS bursary program supported by IDRC, AIMS expanded its post-graduate opportunities to include the AIMS Industry Initiative through support from DFID. The Industry Initiative supports AIMS graduates in their transition to the workforce through practical work placements in private sector, academic, non-profit, public and research organisations. Graduates have the opportunity to apply their skills in mathematical sciences to relevant fields through internships and co-op placements. The Industry Initiative is supported at the Centre-level by Student Development Officers, who serve as a key resource for students, providing career guidance on the transition to the workforce. The academic program has been revised in light of the Industry Initiative, with new courses introduced aimed at building skills to succeed in the workplace, including communication, team building, CV writing, interviewing, entrepreneurship and leadership skills. A total of 117 internships have been offered to AIMS graduates to date across Africa, Canada and Germany and in the fields of IT, academia, research, engineering, finance, and health.

The DFID-supported AIMS Industry Initiative laid the foundation for AIMS to pursue a pilot Co-op Master's Program, in partnership with the MasterCard Foundation. The first Co-op Master's program was launched at AIMS Senegal in 2016 and rolled out to AIMS Rwanda and Cameroon in 2017. The Co-op Program focuses on particular streams of mathematical sciences, including big data, computer security, optimization and financial mathematics, and industrial mathematics. The curriculum has been modified to include courses in these areas to help build the skills of co-op students and prepare them for their placements.

DFID Objective 8: To improve the financial sustainability of AIMS NEI

Over the course of this grant, AIMS was able to build relationships with new donor partners to help secure the long-term financial sustainability of the network. As outlined above, AIMS was successful in securing USD 25 million from the MasterCard Foundation in 2014, CAD 6.3 million from Global Affairs Canada (GAC) in 2016; CAD 20 million from GAC/IDRC in 2017; and USD 10.7 million from host country governments over 2011 to 2017.

Looking forward, AIMS is working towards a strong pipeline for funding over the immediate to medium term, including USD 54 million over six years from the African Development Bank, USD 35 million over five years from the African Capacity Building Foundation, USD 2.5 million from the Carnegie Corporation, and USD 15 million over five years from host country governments. Over the long-term, AIMS has proposed the development of an endowment fund with the goal to mobilise USD 1 billion by 2025.

The financial management processes of AIMS NEI have matured and strengthened significantly over the course of this grant. In particular, AIMS NEI's processes have evolved from:

- Excel spreadsheet-based accounting system to a full-fledged SAGE ACCPAC system;
- Manual tracking of donor funding to a systematic coded allocation of expenses at sources;
- Fragile and fragmented financial management processes (policies and procedures) to well documented policies and procedures;
- Small team of financial officers to a diverse team of more qualified financial professionals – the new CFO in fact comes to AIMS from IDRC; and
- Cumbersome and manual management information system marred with delayed financial information to a better management information system that is supported with more current financial information.

6. Challenges

AIMS NEI Global Secretariat: At the inception of this grant, the creation of a Secretariat to oversee the establishment of the network was strategic and key. However the nature and capacity that would be required by a Secretariat for this to be successful was hugely underestimated. Only three staff members were anticipated and it quickly became apparent that this was neither viable nor sufficient to achieve the expected results. Support from IDRC allowed AIMS to build the necessary capacity within the Secretariat to provide coordination and oversight for building a well-coordinated and efficiently run institution.

The establishment of the Secretariat occurred following the existence of AIMS South Africa for eight years and, at the time, South Africa was the logical location for the Secretariat. Over time it proved to be difficult for the AIMS Secretariat to attract highly-skilled and multilingual staff,

given the restrictive work permit conditions imposed by the Government of South Africa. AIMS provided support to its staff to enable them to acquire work permits through support letters and other necessary documents. The AIMS CEO met with representatives at the South African Ministry of Home Affairs and the associated challenges were also brought to the attention of South Africa's Minister of Science and Technology. The work permit application process is lengthy and the outcome is often negative - as a result, key staff members have had to relocate to countries where they are eligible to work. This global distribution of the Secretariat team was not optimal from an efficiency and productivity perspective. Following a comprehensive search for an alternative location, Rwanda was selected as the new host country for the Secretariat. In April 2017, AIMS officially opened its doors in Kigali, Rwanda. The Government of Rwanda's work permit conditions have proven to be much more enabling for the physical consolidation of the Secretariat staff in one location.

Mobilising Host Government and AIMS For Excellence Funding: The Government of Canada funding through IDRC was committed on the principle that host government funding would scale up progressively from 20 to 100% of core costs over five years. Whilst, through the efforts of AIMS, host governments have committed support through pledges, these pledges have not been converted to cash within the expected time frame. AIMS is now taking a more strategic and targeted approach to increase host government engagement. Project documents are being developed for each country, providing a detailed budget and outlining how government funds will be spent. This is intended to enhance and influence decision-making within the national budget process. Increased host government engagement and funding is critical not only for the long-term financial sustainability of the AIMS model, but also to ensure ownership and the eventual long-term devolution of the management of centres to host countries themselves.

Furthermore, AIMS overestimated the ease of securing funding from Canadian universities under the One For Many Initiative, now AIMS For Excellence. The realization of cash transfers has been delayed. A total of CAD 2.75 million was expected, however just under CAD 1 million was received during the duration of this funding. In order to address this challenge, AIMS rebranded the program as AIMS For Excellence and strengthened engagement to bring on board more partners. The program has also made inroads in the United States with Michigan State University and the University of Chicago being the first to come on board.

Network Coordination: AIMS underestimated the time and effort required in building a unified learning network, given the diversity between centres including geopolitical histories, language, and academic environments. The dynamic between AIMS South Africa, which had been operating independently for eight years, and those centres established under the umbrella of AIMS NEI also proved challenging in the early stages. It took time to build a coordinated network of new centres that recognised the historical outset and experience offered by AIMS South Africa.

The standardisation of processes and procedures at centres across the network has proved challenging given the decentralized governance framework embodied by AIMS. AIMS has learned to be mindful of the local contexts in host countries and has remained flexible and adaptable to allow each host country to maintain ownership. This is critical for government buy-in and support and the long-term sustainability of the centres.

Centre Development: When AIMS was considering expansion to Nigeria, there was a need to undertake additional due diligence and time to determine whether the AIMS model would work within the proposed institution to host an AIMS centre in Nigeria. Similar due diligence was

needed in Ethiopia – this was compounded by AIMS’ limited understanding of the political landscape and the implications of establishing a centre while Ethiopia and its leadership were in a state of flux. Looking back, more time was required for AIMS to better understand the academic and political contexts in both Nigeria and Ethiopia. As a result, AIMS has learned not to focus its effort and energy on solely one country when considering expansion, but rather to investigate opportunities in multiple countries before selecting the best suited location for a new centre based on well-defined criteria. The key criteria being the government’s commitment to become a full contributing partner - financial and otherwise. This must be demonstrated by a signed agreement and upfront financial contribution.

When AIMS South Africa was established, it was fully embedded within the Stellenbosch University system and received administrative support to assist with day-to-day operations at the centre. This was not fully factored in when developing the costs associated in replicating the AIMS South Africa model and establishing new centres. As a result, there were additional costs related to administrative support that were not foreseen for centres that did not have this existing support in place.

The Development vs. Academia Lens: AIMS originated as purely an academic institution and was subject only to academic-based objectives, outputs and outcomes. With the grant from the Government of Canada (IDRC) and the use of Canada’s development assistance for the roll-out of the Next Einstein Initiative, a development lens was being applied to an academic program. The AIMS Secretariat in rolling out this grant had to work out a fine balance between the academic perspective and the need to view the initiative as a development, results-based program with new accountability measures in place. As host country governments witness the early results of AIMS and its role in promoting greater access to higher education in STEM in Africa, they have begun to appreciate the development outcomes of the program and the reach it is having when the development and higher education agendas come together.

Post-AIMS Opportunities: The post-AIMS bursary program was conceived in South Africa where there is a high absorptive capacity within the academic ecosystem for graduates to pursue Master’s and PhD degrees. The same absorptive capacity does not exist in other countries across Africa, given the limited number of post-graduate institutions. This led to the need for AIMS to expand its post-AIMS opportunities to beyond academia and include more options in industry in all host countries. AIMS Research Chairs provide opportunities for students and alumni to pursue post-graduate study and research at AIMS centres. A wide range of postgraduate opportunities across Africa are regularly publicised through the alumni network.

7. Administrative Reflections and Recommendations

Devaluation of the Canadian dollar: The grant was signed at a time when the CAD and USD were almost at par. Over the life of this grant, the CAD lost almost 30 % of its initial value – this has had a significant impact on the network’s budget, which is officially managed in USD. However, there have been some insignificant gains from other currencies. In future, it will be important for AIMS to develop strategies to appropriately manage its foreign exchange risk.

All of AIMS-NEI's local currency accounts at each entity are re-valued at the end of each fiscal year against the Bank of Canada rate for USD on that day. Gains and losses are accounted for in the same way and either debited or credited to the expense line of exchange gains/losses. The majority of fund balances are held at the Chapter offices in Canada, the UK and Germany and

not at the Centres. This has helped to minimize the impact of large fluctuations at the country level.

IDRC provided a considerable amount of flexibility in their support and oversight, allowing AIMS to take risks and show innovation as it built upon the AIMS South Africa model to roll out across the continent. IDRC was focused on both the results and the opening of new centres whilst also ensuring that all systems and processes were being put in place to support the new institution that was being built. IDRC took the time to invest in working with the Secretariat to put in place the necessary systems and processes in particular the financial system, including the training of staff. This included training in project management, Results Based Management⁸, gender equality⁹, IT¹⁰, financial systems and procurement¹¹, and resource mobilization. This grant also made provision for annual leadership development meetings, Program Implementation Planning meetings, annual planning and learning meetings, and new staff orientation. This support by the Government of Canada and DFID through IDRC has contributed to build a strong foundation internally upon which AIMS has been able to grow and continue to expand its reach.

⁸ 15 staff members trained from AIMS South Africa, Senegal, Ghana and Cameroon.

⁹ 30 staff members trained from AIMS Global Secretariat, South Africa, Senegal and Cameroon.

¹⁰ 5 IT Managers trained from across the network.

¹¹ 15 staff members trained from the AIMS Network Finance Team at the Secretariat and Centres.

Table 1: AIMS Alumni in Senior Positions of Leadership

Name	Gender	Title	Organisation	Country	Comments
1. Dr. Antoine Tambue	Male	AIMS ARETE Junior Research Chair	AIMS	South Africa	Key applications of Dr. Tambue's research are oil and gas recovery from hydrocarbon reservoirs; groundwater contamination; the sustainable use of groundwater resources; carbon sequestration; storing radioactive waste in the subsurface; and geothermal energy.
2. Mr. Matli Matlotlo Justice	Male	Managing Director	Oceans Laboratory Supplies Ltd.	Lesotho	Oceans Laboratory Supplies (Pty) Ltd is laboratory equipment, medical/surgical supply company in Lesotho. Justice is in charge of the company's overall strategic operations including the management of finance, human resource, logistics and customer services. He provides the overall leadership to the company to ensure it sustains its standards of quality and continues to grow in the market. He ensures the company delivers quality product in a timely and cost effective way and stays ahead of its competitors.
3. Dr. Gaston Kuzamunu Mazandu	Male	IDRC Research Chair in Bioinformatics	AIMS	South Africa	Dr. Mazandu is investigating relationships between susceptibility to infectious diseases and the use of existing drugs for new therapeutic applications, commonly referred to as drug repositioning.
4. Hassan Maisson Mohamed Zeinelabdien	Female	Founder & Managing Director	Fandora	Sudan	Fandora is a non-profit organisation that trains disadvantaged women and women in prison to produce handicrafts from recycled materials. See Facebook page here .
5. Dr. Daphney Singo Thifhelimbilu	Female	Research Scientist and Experimental Nuclear Physicist	iThemba Labs	South Africa	Dr. Thifhelimbilu heads a research group at iThemba Labs that is studying the properties of unstable short-lived nuclei in order to better understand the nature of nuclear structure.
6. Dr. Martial Loth Ndeffo Mbah	Male	Research Scientist (Epidemiology)	Yale School of Public Health	United States	Dr. Ndeffo is a research scientist in epidemiology at the Yale School of Public Health. He studies a variety of infectious diseases, including schistosomiasis and its double interaction with HIV and malaria in Africa. Recently, Dr. Ndeffo developed a mathematical model to track the interaction between schistosomiasis and HIV and the potential impact of schistosomiasis control for reducing both schistosomiasis and HIV transmission in sub-Saharan Africa. He also supported Liberia's Ministry of Health in making decisions in response to the recent Ebola outbreak in the country in 2014.
7. Dr. Shehu AbdusSalam	Male	Researcher	National Institute of Nuclear Physics	Italy	Dr. AbdusSalam is a researcher at the National Institute of Nuclear Physics in Rome focusing on Bayesian fit of SUSY models; supersymmetry breaking phenomenology; implications for collider; and dark matter search experiments.
8. Dr. Angelina Lutambi	Female	Lead Researcher	Ifakara Health Institute	Tanzania	Dr. Lutambi is a Lead Researcher at Tanzania's Ifakara Health Institute where she is developing and simulating mathematical models to investigate the role of mosquito dispersal on malaria transmission and vector control. She is leading research on models to explore the impact of health interventions to help inform policies in Tanzania. She also works on mathematical modelling of a range of infectious diseases including HIV/AIDS.

Name	Gender	Title	Organisation	Country	Comments
9. Dr. Tendai Mugwagwa	Female	Researcher (Epidemiology)	Imperial College London	United Kingdom	Dr. Mugwagwa's research focuses on the mathematical modelling of data on T lymphocyte dynamics driven, for example, by HIV infection. She works in developing mathematical models to interpret experimental data as well as to quantify turnover rates of different cell subsets.
10. Dr. Emmanuel Osalusi	Male	Senior Metocean Engineer	Shell Nigeria Exploration and Production Company Ltd.	Nigeria	Dr. Osalusi's work focuses on the field of fluid mechanics and the hydrodynamic modelling and interpretation of oceanographic data.

Table 2: AIMS Alumni receiving awards and recognition for their research in mathematical sciences

AIMS Alumni	Award	Details	Gender	Country
Randriafanomezantsoa-Radohery Georges Ferdinand	Southern African Association for the Advancement of Science Bronze Medal of the North West University - 2013	The Bronze Medal is awarded annually to the best overall Master's student at North West University, South Africa. Mr. Ferdinand's completed a Master's in Mathematics. His thesis was entitled "Designs and codes from certain finite simple groups."	Male	Madagascar
Franklin Djeumou Fomeni	Lancaster University Kingsman Prize – 2014	The Kingsman Prize is awarded annually for the best PhD in Management Science at Lancaster University. Fomeni's PhD, <i>The Quadratic Knapsack Problem and Related Problems</i> , examined a complex optimisation problem with both non-linear and combinatorial aspects. It has important applications in the location of facilities, such as freight terminals, warehouses, and satellites. Franklin designed and implemented several new solution algorithms for this problem, both exact and heuristic. These algorithms represent a major advance in the state of the art, significantly extending the range of instances that can be solved to optimality or near-optimality.	Male	Cameroon
Prosper Ngabonziza	Southern Africa Association for the Advancement of Science Medal for Original Research at the Master's Level – 2013	The Master's Medal is awarded annually to the most outstanding research student in a scientific subject graduating at the Master's level at each South African university. Ngabonziza graduated from the University of Johannesburg in May 2013 with an MSc (Physics). His thesis was entitled <i>Angle resolved photoemission spectroscopy study of the three-layered strontium ruthenate</i> .	Male	Rwanda
Ayoub Basheer Mohammed Basheer	Southern Africa Association for the Advancement of Science Medal for Original Research at the Master's Level – 2009	The Master's Medal is awarded annually to the most outstanding research student in a scientific subject graduating at the Master's level at each South African university. Basheer graduated from the University of Kwazulu-Natal in 2009 with an MSc (Chemistry). His thesis was entitled <i>Character tables of the general linear group and some of its subgroups</i> .	Male	Sudan
	North West University, South Africa, Post-Doctoral Research Fellowship in Mathematics - August 2014			
Elsheikh Samar Salah Mohamedahmed	Organisation for Women in Science for the Developing World, Postgraduate Training Fellowship - 2014	The Fellowship is offered to women scientists from Sub-Saharan Africa and Least Developed Countries to pursue postgraduate research in a field of natural sciences.	Female	Sudan

AIMS Alumni	Award	Details	Gender	Country
Oluwasola (Mary) Fasan	African Network of Scientific and Technological Institutions Post-Graduate Training Fellowship – 2011/2012	The Fellowship Award allowed Fasan to pursue her PhD in Computer Science at the University of Pretoria, South Africa.	Female	Nigeria
	Organisation for Women in Science for the Developing World, Postgraduate Training Fellowship – 2011			
	Google Anita Borg Scholarship – 2012	The Scholarship is awarded to a female student studying computer science at a university in Europe, the Middle East or Africa.		
	L'Oreal-UNESCO Women in Science Regional Fellow – 2012	The Fellowships are awarded annually to ten women scientists in Sub-Saharan Africa pursuing research in STEM.		
Aminat Oyiza Suleiman	Best poster presentation at the workshop <i>Fundamentals of Photonics: Theory, Devices and Applications</i> in Trieste, Italy - 2014.	Suleiman was awarded the best poster presentation by a student member of the International Society for Optics and Photonics for her poster: <i>Observation of structural dynamics of 1T-TiSe2 using femtosecond electron diffraction.</i>	Female	Nigeria
	Best oral presentation at <i>Photonics & Nanotechnology for Africa - African Laser Centre Annual Workshop & 3rd Moroccan Days on Nanoscience and Nanotechnology</i> , Rabat, Morocco – 2-5 November 2014	Suleiman was awarded best oral presentation for her presentation entitled: <i>1T-TiSe2 and Femtosecond Electron diffraction.</i>		
Daphney Singo Thifhelimbilu	South Africa's Department of Trade and Industry Technology Awards – Best PhD research project by a black or female student, 2010	Ms. Thifhelimbilu completed her PhD in Nuclear Physics at the University of Stellenbosch, 2012.	Female	South Africa
Fareo Adewunmi Gideon	RAND Merchant Bank Gold Medal – 2014	Awarded for the best PhD thesis in Computational and Applied Mathematics. Mr. Gideon completed his PhD in Applied Mathematics at the University of Witwatersrand, 2013.	Male	Nigeria