IMPACT ECONOMIC STUDY OF THE GLOBAL CLEANTECH INNOVATION PROGRAMME GCIP 1.0

Final Draft Report 1.2

08 July 2022

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LIST OF ACRONYMS AND ABBREVIATIONS

ABBREVIATION	***DEFINITION***
GCIP 1.0	Global Cleantech Innovation Programme Phase 1
GCIP 2.0	Global Cleantech Innovation Programme Phase 2
GEF-IEO	Global Environmental Facility-Independent Evaluation Office
GHG	Greenhouse Gases
IDC	Industrial Development Cooperation
IKS	Indigenous Knowledge System
Other-LGBTQQIP2SAA)	Lesbian, Gay, Bisexual, Transgender, Queer, Questioning, Intersex, Pansexual, two-spirit(2s), androgynous and asexual
NYDA	National Youth Development Agency
OECD	Organisation for Economic Cooperation and Development
PMU	Project Management Unit
SAHPRA	South African Health Product Regulatory Authority
SEDA	Small Enterprise Development Agency
SEFA	Small Enterprise Finance Agency
SME	Small, Medium, and Micro-enterprises
SMS	Short Message Services
TIA	Technology Innovation Agency

UNIDO-GCIP	United Nations Industrial Development Organisation-Global Cleantech Innovation Programme
USA	United States of America
ZAR	South Africa Rand

EXECUTIVE SUMMARY

I. Evaluation background and purpose

The Global Cleantech Innovation Programme (GCIP) is a global flagship programme on cleantech for small and medium-sized enterprises (SMEs). It was jointly developed by the Global Environment Facility (GEF) and United Nations Industrial Development Organization (UNIDO). SMEs constitute the backbone of developing economies, where they account for most of the employment and jobs created. GCIP supports SMEs in developing clean technologies and solutions to deliver global environmental benefits. The programme was launched in 2013 across six countries: South Africa, Armenia, India, Pakistan, Malaysia, and Turkey. Thailand and Morocco joined in 2016, and Ukraine joined in 2017.

In South Africa, the Technology Innovation Agency (TIA) was chosen as the Project Management Unit (PMU) and key implementing partner of GCIP-SA. TIA is a national public entity whose mandate is to support the development and commercialisation of competitive technology-based services and products, leading to the creation of sustainable jobs and diversification of the economy. TIA officially launched GCIP-SA 1.0 in 2014, and the implementation was originally intended to run up to September 2018, but it was extended to 2020 under the full control of TIA.

This report presents a summary of the results of an independent evaluation of GCIP-SA 1.0, commissioned by TIA and conducted by Break the Chains Development Services. The purpose of the evaluation is to profile the GCIP-SA 1.0 Alumni; review the extent to which the programme is supporting its mandate and the objectives of its partners; examine the effectiveness in achieving the intended outputs and outcomes, and the impact it is having on beneficiaries, communities and the economy; and to build on the learnings and recommendations in implementing GCIP 2.0 (the second phase GCIP-SA 1.0 to be implemented from 2022). More specifically, the evaluation addresses the following questions:

(a) Which programme alumni are still active? What is their progress to date? What are the next steps and challenges to achieve them?
(b) How effective was the programme in achieving its "intended" outputs and outcomes?
(c) What impact is the programme having on participants, communities, and the economy? Have skills been learned and jobs and wealth created? Any evidence of a reduction in GHG emissions?
(d) What are the gaps and recommendations that can influence the effectiveness and impact of GCIP 2.0?

II. EVALUATION METHODOLOGY

II.1. Evaluation Methods

The evaluation used qualitative and quantitative methods to collect data through desktop review, online survey, key informant interviews, and site visits *(Details of the data collection tools are found in Appendices 2: Data collection tools).* The process below was followed to collect data.

Qualitative tools

(a) **Desktop review:** A review of the programme documents includes programme design documents, terminal review reports, promotional material and UNIDO-GCIP materials.

(b) **Alumni Profiling-** The review used the database provided by TIA of 139 Alumni, of which 89 (64 percent) were contactable. Out of the 89 contactable alumni, 61 (69 percent) were reached and responded to the survey either through online surveys or site visits.

(c) **Key informant interviews:** Semi-structured interviews with programme implementing partners were conducted. Evaluators received input from 5 individuals who worked as judges, mentors, programme advisors and programme partners; experts in business acceleration, entrepreneurship, and intellectual property rights ecosystems, some of whom have invested in the programme's enterprise.

(d) **Site visits and enterprise profiling:** Site visits or online interviews were done with 34 (56 percent) of the 61 GCIP alumni who responded, and written profiles were completed. The written profiles capture information about the enterprises' site details, stage of the technology, progress, next steps, and financial and non-financial needs.

Quantitative tools

(a) **Online SurveyMonkey:** An online survey was sent to the GCIP Alumni who went through the programme between 2014 and 2020. 89 contactable alumni were sent the survey, 3 emails bounced, and 50 (56 percent) completed the survey.

(b) **The database-** The database of the 61 (70.8 percent of 89 contactable) Alumni was updated with the contact and status information of those provided through survey monkey or site visits. 11 Alumni did not provide complete information on contact details, such as names, company names and addresses.

II.2. Evaluation sample

The evaluation sample was derived after following an online survey to establish active Alumni in Provinces. The Terms of Reference indicated that the programme has capacitated up to 162 candidates across all 9 provinces from 2014 to 2020. The evaluators were provided with a database containing

the telephone, cell phone numbers and email addresses of 149 alumni. After cleaning the list, 10 duplicates were found, reducing the list to 139 Alumni. From the list of 139 Alumni, only 89(64 percent) were reachable. The rest, 50 innovators, were not reachable due to outdated contact details, and as a result, the status of their enterprises is unknown.

From the 89 contactable alumni, 61 (69 percent) of the 89, which we hereafter refer to as the "evaluation sample", responded to either the online survey, the site visit/interview, or both. Of the 61 Alumni, 50 (82 percent) responded to the online survey and 11 did not. Among the 61 Alumni, 34 (56 percent) were fully profiled (i.e., their site locations, contact details, statuses, types and stages of the technologies, next steps, and challenges) were documented. The study shows that the highest number of active alumni are found in Gauteng, KwaZulu Natal and Western Cape provinces.

The alumni's details are provided in appendices (GICP *All Innovators surveyed 28 of June 2022 in Appendices 3).*

II.3. Data Analysis

The evaluators used statistical analysis in this report from the 50 (82 percent of 61) of the Alumni who completed the online survey. Triangulation of the data was derived from quantitative 50 who completed the online survey, and the qualitative data from site observations and interviews with 34 Alumni, 5 mentors and partners. The was sufficient data to provide an objective review and conclusions on the GCIP programme.

III. SUMMARY OF MAIN FINDINGS

III.1. Programme Design

Following a review of the programme documents and review reports,[1] evaluators find that:

- The programme objectives and intended outputs are well defined.
- Target indicators of measures of the success of the programme are not fully defined. The success indicators for the programme's intended impact were defined at the global level (i.e., for all 9 countries where the programme was implemented) but not nationally.

[1] More specifically, the programme design documentation that includes the programme's Business Case Review; Agreement and Acknowledgement Letters; Programme Brochures and the Commemorative Booklet and Stories of GCIP-SA 2014-2017; and the 2018 GCIP evaluation report by the Global Environment Facility Independent Evaluation Office.

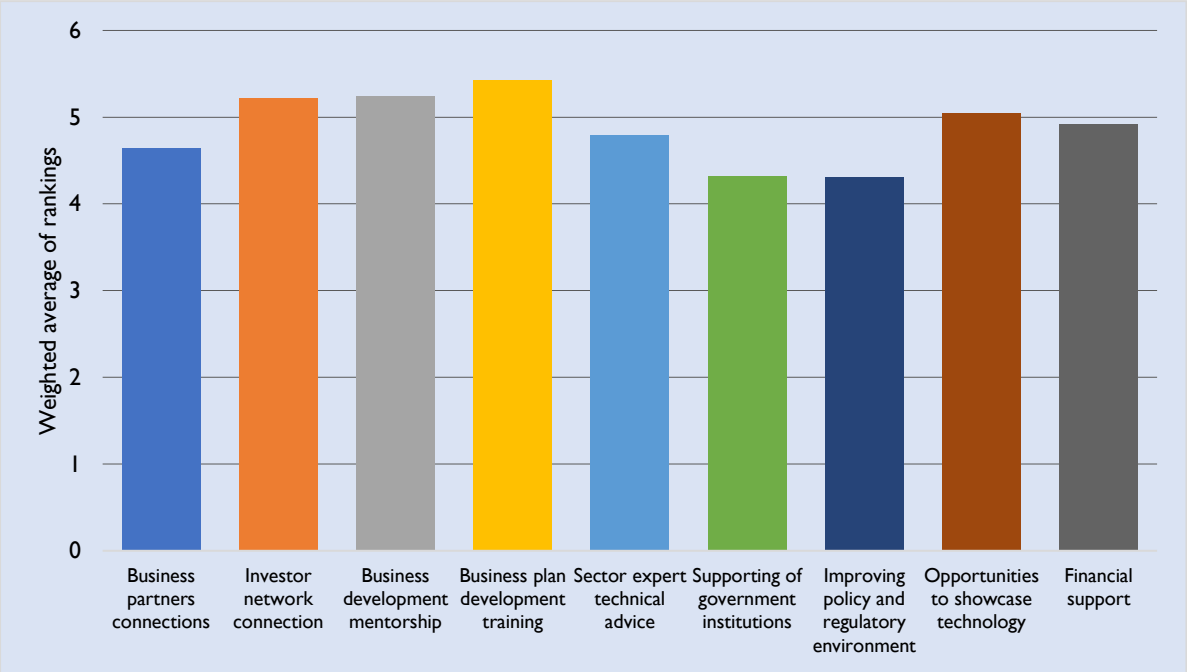
- There is no clearly defined plan or system for keeping track of and engaging with the programme's alumni. This is necessary for both programme evaluation purposes and for maintaining the programme's sustainability.

III.2. Relevance

- GCIP is strategically relevant to South Africa's national development goals. It is consistent with South Africa's 2010 New Growth Plan (NGP) framework, whose objectives are to enhance growth, employment creation and equity. "Green economy" is among the five priority areas identified in the NGP with the potential to create jobs through partnerships between the state and the private sector.
- Beyond strategic relevance, GCIP addresses the lack of the necessary elements of a functioning entrepreneurial ecosystem in South Africa. Through the implementation of the competition-based accelerator and the coordination activities of the Project Management Unit, GCIP aims to establish a robust cleantech ecosystem. A functioning ecosystem would then mitigate the barriers faced by cleantech entrepreneurs in South Africa.
- Innovators ranked the components of the competition-based accelerator from the most to least beneficial to their enterprise. The results, reported in **Figure III.1**,[2] show that the business skills development components of training for business plan development, and mentorship on business development, were ranked the most beneficial components by most innovators. This is followed by connecting with an investor network and the opportunity to showcase technology.
- However, the difference between the weighted average rankings across the programme components is relatively small. This indicates that innovators find most, if not all, of these components relevant in one way or another.
- Innovators appreciated the knowledge learned through business skills development activities, the experience and confidence gained through business pitching and national and international travel, and the business connections and partnerships created during the national retreat-style national workshops and international competitions. Innovators also highlighted the relevance of the programme in creating the opportunity to meet like-minded entrepreneurs who face similar challenges and the opportunity to win prizes.

[2] The results are reported as weighted average rankings, where the component with the largest weighted average ranking is the most preferred. More specifically, given that there are 9 components of the programme, let $n_1^i, n_2^i, \dots, n_9^i$ be the sequence of the number of respondents that ranked component i as the first, second, …, ninth choice respectively. Then the weighted average of component i is $(9 * n_1^i + 8 * n_2^i + \cdots + 1 * n_9^i)$/Total number of respondents.

Figure III.1. The distribution of the weighted averages of the responses to the question "Please rank the following components of GCIP from most to least beneficial to your enterprise."

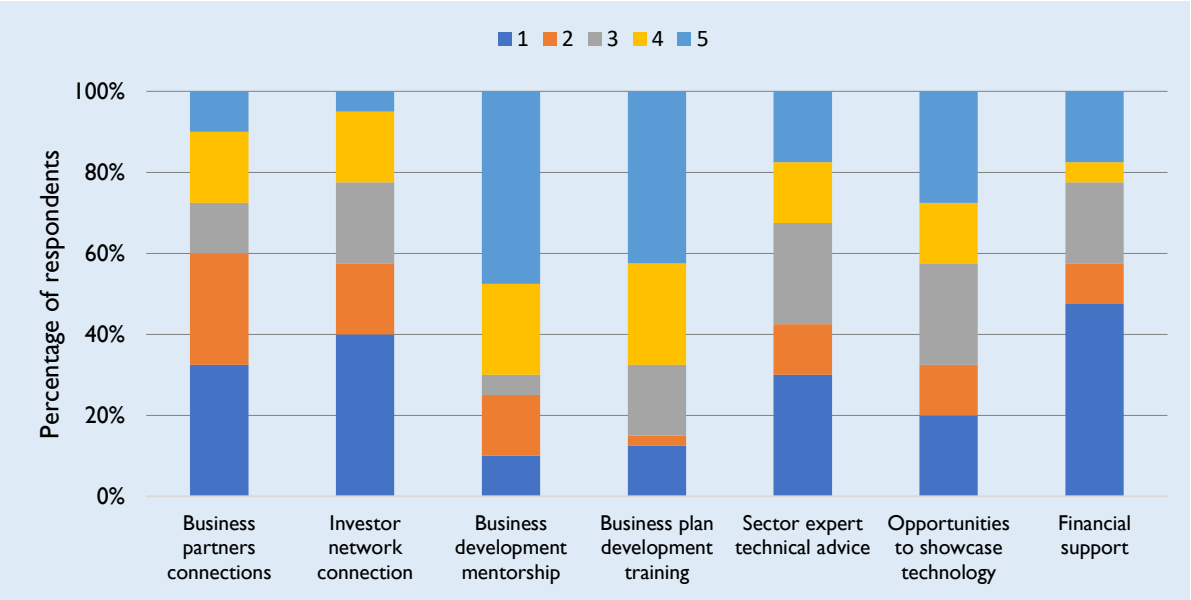


III.3. Effectiveness

Programme outputs

- **Creating awareness about GCIP and the potential of cleantech technologies:** The programme PMU engaged in scouting activities, such as visiting exhibitions, from which they identified and directly contacted innovators that fit profiles suitable for the programme. Some innovators learned about the programme from talks given by the PMU at universities.
- Around 40 percent of the surveyed programme alumni learned about the programme through the internet; 36 percent were directly contacted by TIA and asked to join the programme; 14 percent learned about the programme through TIA's outreach at universities, and 10 percent heard about the programme through word-of-mouth from friends and alumni.
- **Skills development:** Around 48 percent and 43 percent of the surveyed programme alumni gave a 5 star-rating to mentorship on business development and training for business plan development, respectively (see **Figure III.2**). Approximately 70 percent of the respondents gave a rating of 4 and above to mentorship in business development, and 68 percent gave the same rating to training for business plan development.

Figure III.2. Rating of the quality of service from 1-5, with 5 being the highest



- Around 75 percent of the surveyed alumni revised their business plans, and about 68 percent revised their business pitches. Around 63 percent and 50 percent of innovators said they revised their market and financial plans respectively. The changes to these four elements can be attributed to the skills development services offered by the programme.
- **Connections to investors and business partners:** Surveyed alumni indicated that they were able to establish useful business connections with fellow innovators met during the programme**.**
- However, very few innovators were able to establish useful business partners beyond connections with fellow innovators met during the programme; this is even more so for connections with potential investors. Only 28 percent of surveyed programme alumni rated "connection with potential business partners" 4 and above, and only 23 percent gave the same rating to "connection with an investor network" (see **Figure III.2** above). Most innovators felt that the pool of potential investors that turned up at the programme's events was small.[3]

Programme outcomes

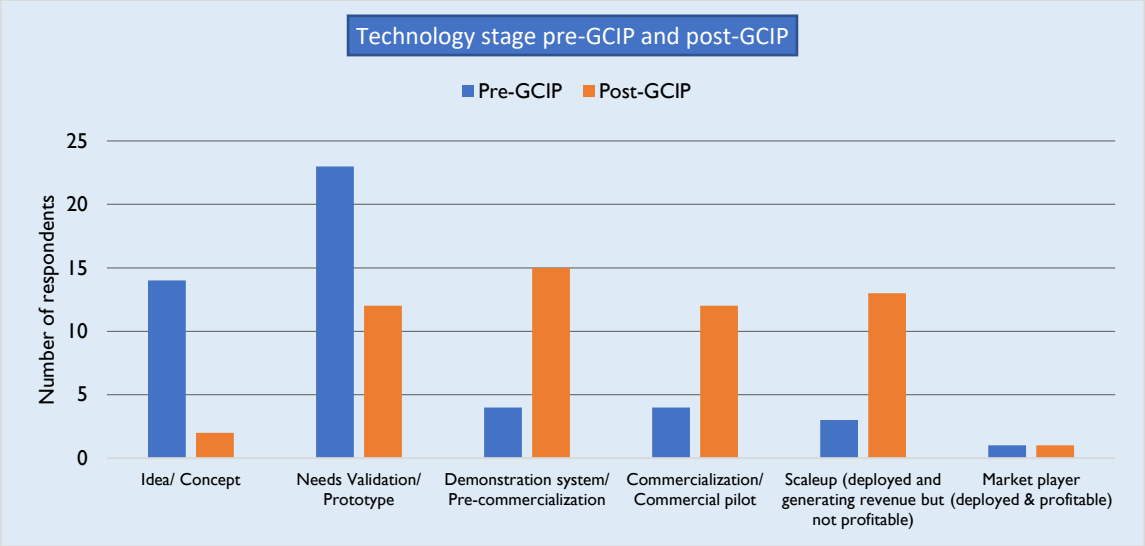
- **Scaling-up of innovative technologies and viable business models:** Many surveyed enterprises' technologies progressed from idea, technology formulation (concept), needs validation, and prototype to intermediate stages of demonstration system, pre-commercialization,

[3] As one innovator stated, *"the national investor connect events were well-organised, the problem is these events did not attract enough investors in South Africa that are willing to invest in young risky businesses."*

commercialization, commercial pilot, and scale-up (actively deployed and generating revenue but not profitable). 37 (around 75%) alumni surveyed online indicated that their technologies were between idea and prototype before joining the GCIP (see **Figure III.3**). But a few years after graduating from the programme, only 13 (around 25%) of the alumni in the evaluation sample said their technologies were still in these stages; 13 (around 24%) enterprises are in the scale-up stage, up from 3 (6%) pre-GCIP

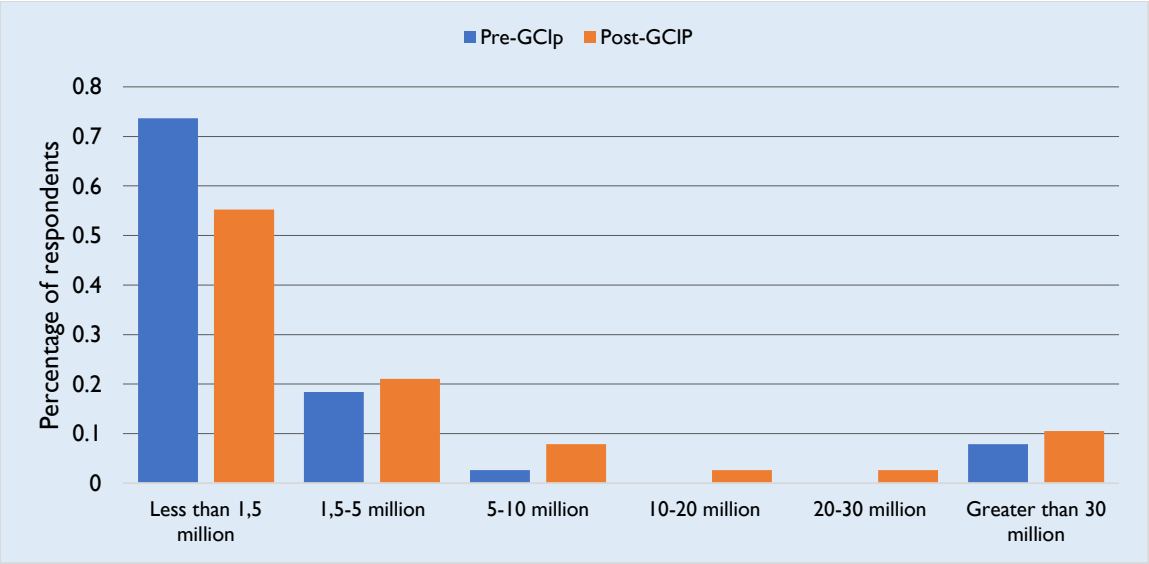
- However, many enterprises, 27 (around 50%) in the evaluation sample, are stuck somewhere between the demonstration system and commercial pilot stages. They cite struggles with access to finance as the main reason for the lack of progression to the scale-up stage.

Figure III.3. The stages of the technologies Pre- and Post-GCIP



- Around 74 percent of the respondents reported capitalisation of less than 1.5 million rands before joining the programme (see **Figure III.4**). This number was reduced to 55 percent post the programme. The proportion of respondents with enterprise capitalisation of 5 million and above increased from around 10 percent to 24 percent.
- **Investment into cleantech:** Around ZAR231million funds was attracted by surveyed enterprises; 45 percent came from the private sector, around 36 percent came from the South African Government incentives, and the rest came from self-financing. However, around 72 percent of the financing from the private sector went to one enterprise.

Figure III.4 Composition of enterprises' capitalisation pre- and post-GCIP



III.4. Impact

Job creation

- 50 percent of the surveyed enterprises recorded an increase in the number of employees. The total number of new jobs created is 100, marking an increase of 74% from 136 jobs pre-GCIP to 236 post-GCIP.
- The study cannot confidently link all these new jobs directly to the GCIP programme. Still, we can argue that the resilience exhibited by these enterprises is partly due to the skills learned, knowledge transferred, and networks created during their participation in the programme. This resilience makes start-ups survive from idea to commercialisation to scale-up and profitability.

Employment per Gender

- The number of youths and women employed in the surveyed enterprises increased by 143 percent and 74 percent, respectively, indicating the potential of the programme's alumni enterprises to absorb unemployed youth and women.

Economic impact

- There is a potential for economic impact in the form of:
  - **Tax contribution:** at least 6 enterprises paid around ZAR1million in taxes.
  - **Revenue generation:** at least 18 enterprises made sales totalling ZAR 6,580,000.
  - **Local and global economic competitiveness:** at least 4 enterprises made exports totalling ZAR276,000, and at least14 enterprises have registered around 42 patents.

- **Socio-economic impact:** Some innovations address challenges faced by vulnerable groups and communities (e.g., sanitation, energy access; fire-proof building materials for informal settlements; etc.)

Energy savings and GHG emission reduction

- The measurement indicators for GHG emissions by the enterprises are unclear. Most programme alumni enterprises are in the early development stage to have made a meaningful contribution to reducing GHG emissions. However, 46 (around 75%) enterprises in the evaluation sample are in energy and water efficiency, green building, renewable energy, and waste beneficiation. Cleantech innovations in all these sectors have the potential to directly reduce energy wastage and GHG emissions. Around 18% of the surveyed enterprises are active in the health and biotech sectors. But these enterprises are also admitted to the GCIP programme on the basis that their products are environmentally friendly.

Impact on sustainable development goals (SDGs)

- Through its intended outcomes and impact, GCIP addresses multiple sustainable development goals (SDGs), some directly and others indirectly. The SDGs that GCIP directly addresses are Goal 3 – Good health and wellbeing; Goal 5 – Gender Equality; Goal 6 – Clean Water and Sanitation; Goal 7 – Affordable and Clean Energy; Goal 8 – Decent Work and Economic Growth; Goal 9 – Industry, Innovation, and Infrastructure; Goal 11 – Sustainable Cities and Communities; and Goal 13 – Climate Action. And it indirectly addresses Goal 1 – No Poverty, Goal 4 – Quality Education, and Goal 10 – Reduced Inequality.

SDGs addressed	How GCIP addresses the SDGs
Goal 1: No Poverty	Through impact on job and wealth creation.
Goal 4: Quality Education	Through business skills development, consisting of high-quality training & mentorship.
Goal 5: Gender Equality	Through gender mainstreaming: at least 36% of the enterprises are led by women; and 37% of the enterprises' employees are women.
Goal 6: Clean Water and Sanitation	31% of the surveyed enterprises are in waste beneficiation and water efficiency.
Goal 7: Affordable and Clean Energy	39% of the surveyed enterprises are in energy efficiency and renewable energy.
Goal 8: Decent Work and Economic Growth	Through jobs created and economic impact.
Goal 9: Industry, Innovation, and Infrastructure	By identifying & supporting promising innovations; and building a cleantech ecosystem.
Goal 10: Reduced Inequality	Through job creation and economic impact. One of the main causes of inequality in South Africa is lack of employment opportunities.
Goal 11: Sustainable Cities and Communities	Around 8% of the surveyed enterprises developed innovations in green building.

Goal 13: Climate Action	79% of the surveyed enterprises are active in sectors that directly reduce GHG.

III.5. Lessons Learnt

- South Africa has many young (below 35 years of age) innovators that are able and willing to initiate innovations in the cleantech space.
- The main challenge to young innovators is access to start-up finance and potential business partners, without which innovators are doomed to fail.
- Most innovators can access online programmes in business development, but GCIP stands out in terms of the quality of business development training services, the opportunity to have direct interactions with mentors, business experts and fellow innovators, and the full range of support services it offers to innovators.
- To maximise its impact, GCIP must do a lot more to help connect innovators to investors and/or develop ways to fund innovators who are stuck in pre-commercialization and start-up stages, without access to finance, and the other services, like business skills development, that the programme offers are of minimal value.
- The effectiveness of the programme can be greatly improved by strengthening collaboration with the private sector and other government departments with related mandates.

III.6. Sustainability

- The sustainability of the programme's initiatives could be achieved by building a strong ecosystem where the programme connects innovators with other partners such as NYDA, SEFA, private sectors, and early engagement of potential users and investors rather than leaving it to the innovators. The Aspen Network of Development Entrepreneurs (ANDE) 2017 report also provides an extensive list of private sector organizations, institutions, and DFIS working within South Africa's entrepreneurial ecosystem that TIA can coordinate and work with.[4]
- A platform to engage innovators, mentors and judges would help continuous engagement with the Alumni. Knowledge management where innovators, in their own time, can access guidelines or toolkits on how to do certain things from forums of engagement where innovators can engagement each other and with experts. Potential funders, business partners, and potential investors could also access the platform to allow engagement with innovators.

[4] ANDE, 2017. Entrepreneurial Ecosystem Snapshot: South Africa. https://www.andeglobal.org/publication/entrepreneurial-ecosytem-snapshot-south-africa

IV. CONCLUSIONS AND RECOMMENDATIONS

IV.1. Conclusions

Programme design

- The programme objectives and outcomes are clearly defined. The main objectives are to promote cleantech innovations through a competition-based accelerator and develop and strengthen a cleantech ecosystem. The Project Management Unit (PMU) was appointed to set up and manage the competition-based accelerator and strengthen and develop the policy and regulatory framework for cleantech innovations.
- Although not clearly defined, the programme outcomes are derivable from the programme Theory of Change. The indicators of programme success were not defined at the national level. This makes it impossible to state more precisely whether the programme is successful, at least at the national level. Nonetheless, the evaluators identified suitable indicators for examining the extent to which the programme has achieved intended outputs and outcomes.
- The programme lacks a clear plan and system for keeping track of and engaging with the programme's alumni. This is necessary for both programme evaluation purposes and for maintaining the programme's sustainability.

Relevance

- The evaluators examined the programme's relevance to South Africa's cleantech, particularly the SMEs sector, and found that its goals and objectives align with the beneficiaries' needs.[5] South Africa has a high failure rate of young businesses attributed to a lack of access to finance and business skills required to survive through the technology start-up "valley of death."
- Business skills were imparted through a series of business model training webinars, business mentorship and advice from technical experts. The programme did not offer start-ups direct financing but a platform through which entrepreneurs forge connections with investor networks.
- Innovators found most programme components to be relevant. They highly appreciated the knowledge learned through the business skills development activities, the experience and confidence gained through business pitching and national and international travel, and the business connections and partnerships created during the retreat-style national workshops and international competitions.

[5] The strategic relevance of the programme was examined in detail by the Global Environment Facility Independent Evaluation Office's (GEF-IEO) evaluation in 2018. GEF-IEO's evaluation highlighted that GCIP is fully relevant to the national priority of environmental protection and national development goals.

Effectiveness

- The competition-based accelerator was successfully implemented and supported by the relevant actors led by TIA as the PMU.
- More work needs to be done to bring in actors from the private sector and other government institutions with related mandates. This is necessary if further progress in building the cleantech ecosystem is to be made. More work also needs to be done on the policy and regulatory front.
- More work needs to be done to increase awareness about the potential of cleantech technologies. The approach of raising awareness about the programme through talks at science and engineering departments at universities is bearing results and should be expanded to business schools and colleges. The evaluators encountered some enterprises led by entrepreneurs with business and finance educational backgrounds.
- The business skills development components of the programme (i.e., mentorship on business development, training for business plan development, technical advice through sector experts) were effectively implemented. Around 70 percent of the surveyed innovators gave a rating of 4 and above to mentorship on business development (in rating the quality of each service from 1-5, with 5 being the highest), and 68 percent gave the same rating to training for business plan development. However, some innovators whose innovations were at an advanced stage (e.g., start-up and scale-up) felt that some business training activities were not relevant to them.[6] Business skills training services should be differentiated according to the stage of the innovation journey.
- Innovators highly appreciated the opportunity to showcase their technologies and make business connections the programme offers.
- Innovators appreciated the prizes they won, mainly in the form of financial help from TIA, ranging from ZAR100,000 – to ZAR300,000. This financial support helped mostly in product development, although not enough to progress to the advanced stages of technology development.
- There was an opportunity for winners of the competition, deemed the most promising innovations, to apply for grants through TIA, but most innovators who went through this process were dissatisfied with the due diligence process, the complexity of the application process, and the long waiting time to receive funding. They felt that the committee of experts conducting due diligence did not correctly capture their technologies' social, economic and market value.
- Innovators forged lasting connections with fellow innovators met during the programme. However, most innovators felt they could not establish useful business connections outside of

[6] And to quote one innovator and implementing partner, *"You cannot train me on establishing business when I am still struggling even with my product. I need to focus first on making sure my product works. I need money for Research and Development. I need my product to be registered first before training me to establish the business". "It is important that the support being given to SMEs is differentiated on the stage, product type, and needs than having a blanket approach".*

connections with fellow innovators met during the programme; this is even more so for connections with potential investors. Most innovators felt that the pool of potential investors that turned up at the programme's events was small.

- Most surveyed alumni enterprises progressed from between idea and needs validation stages to (pre-) commercialisation and start-up. But many, around 63 percent of the 50 surveyed enterprises, are stuck at these two stages. Only 10 percent progressed from earlier to scale-up stage (i.e., deployed and generating revenue but not yet profitable).
- There is increased investment in the form of government incentives and self-funding into the cleantech sector, at least based on the funding received by innovators who responded to the online survey. Funding from the private sector was the largest, but around 72 percent of it was sourced by one enterprise that is already at the scale-up stage. The rest of the enterprises, especially those stuck at pre-commercialisation and commercial pilot, spoke of difficulties sourcing funding from the private sector. Innovators indicated that few private sector investors are willing to invest in businesses that are not at the scale-up stage.

Impact

- There is evidence of the potential for job creation by the programme's alumni enterprises. Although most surveyed enterprises are stuck in pre-commercialisation or start-up stages, the number of employees in these enterprises increased by over seventy percent, highlighting their high potential in job creation as they progress to the scale-up stage.
- There is a demonstrable impact on gender mainstreaming and inclusiveness. Around 30 percent of the enterprises were led by women, and there is a significant increase in the number of women and youth employed in these enterprises.
- There are indications of the potential economic impact of alumni enterprises in the form of tax contributions, increase in local and international market competitiveness, revenue generation, and socio-economic impact on local communities.
- The programme addresses multiple sustainable development goals (SDGs), some directly (e.g., Goal 5 – Gender Equality; Goal 6 – Clean Water and Sanitation; Goal 7 – Affordable and Clean Energy; Goal 8 – Decent Work and Economic Growth; Goal 9 – Industry, Innovation, and Infrastructure; Goal 11 – Sustainable Cities and Communities; and Goal 13 – Climate Action), and some indirectly (e.g., Goal 1 – No Poverty; Goal 4 – Quality Education; and Goal 10 – Reduced Inequality).

IV.2. Recommendations

Establishing a strong ecosystem

- The programme should increase engagement with private-sector actors and other government departments with mandates in entrepreneurship, innovation, cleantech, job creation, etc. There is a need to develop a clear partnership with relevant actors who can increase the programme's effectiveness, delivery, and ultimate impact.
- Participation from the private sector individuals and organisations is particularly necessary to improve the quality of programme components, including mentorship, technical advice, financing, and creating business partnerships. Most enterprises that made progress post-GCIP did so through forming relevant business partnerships. The Aspen Network of Development Entrepreneurs (ANDE) 2017 report provides an extensive list of private sector organizations, institutions, and DFIS working within South Africa's entrepreneurial ecosystem that TIA can coordinate and work with.
- Explore strong collaborative mechanisms with other TIA units, the Innovation Hub, Green Cape, and other national and provincial level initiatives in the greening agenda so that (financial and non-financial) support provided to innovators is well-coordinated.
- Programme outreach through talks at university science and engineering departments should be maintained and expanded to other university departments, business schools, and colleges.

Innovator support and training

- The current set up of the two components of business skills development, "mentorship on business development" and "training for business plan development", should be maintained in GCIP 2.0. Innovators found implementing these two components of the programme to be of high quality. The quality of delivery can be further improved by ensuring that innovators are matched with mentors who have experience in innovators' technology and business fields.
- The implementation of the third component of business skills development, "technical advice through sector experts", should be improved by getting more experts from the private sector, including successful programme alumni, engaged in the programme. Technical experts can help innovators through either direct involvement in mentorship or an online forum that should be created for the programme.
- Business skills development services could also be differentiated and tailored to the needs of the innovators based on the type of innovation and stage of the innovation journey the enterprise is at.
- Judges should provide clear and detailed feedback to innovators on areas of improvement in their technology and innovation journey. Some innovators felt the results of the competition were

announced without the judges providing the logic behind their decisions, which innovators believe would be useful feedback to them going forward.

- TIA's financial support to innovators in the form of prizes to the competition winners should be maintained and broadened. Although these prizes tend to be of small value, they help some innovators whose technology is in idea stage to progress with product development. There are no investors willing to support enterprises at idea to concept stages.
- On post-programme assistance to innovators, the PMU should not promise more than it can deliver, especially on issues of financial support. Otherwise, the high expectations created and eventually not fulfilled can lead to a demotivated innovator with a potentially negative effect on the willingness to progress in the innovation journey. In addition, the due diligence process for post-programme grants to innovators should be streamlined to simplify the application process, shorten waiting times, and ensure that the technologies' social, economic and market value are correctly captured.
- Create an online platform consisting of the programme's alumni, private sector experts, potential investors, business leaders, and other entrepreneurs and stakeholders interested in cleantech innovations and SMEs. Innovators could use such a platform to seek advice on technical issues regarding their business, form business partnerships, reach out to potential investors, and advise on the type of seed funding they are eligible for and how to apply for it.
- GCIP 2.0 should focus on financially supporting enterprises at the scale-up stage and those at pre-commercialisation and start-up. Most active GCIP 1.0 alumni enterprises are stuck in pre-commercialisation and start-up stages due to challenges with access to private sector finance.

Sustainability

- The plan and system for keeping track of and engaging with the programme's alumni should be developed. This is necessary for both programme evaluation purposes and for maintaining the programme's sustainability.
- A payment mechanism for mentors and experts should be built into the programme. Free mentorship may not be sustainable. The mentors, judges, and programme advisers the evaluators spoke to show a willingness to continue to support the programme. However, given time constraints and the availability of willing experts, it may be necessary to offer some incentives to encourage participation.

1. INTRODUCTION

1.1. Evaluation background and objectives

The Global Cleantech Innovation Programme (GCIP) is a global flagship programme on cleantech for small and medium-sized enterprises (SMEs). It was jointly developed by the Global Environment Facility (GEF) and United Nations Industrial Development Organization (UNIDO). SMEs constitute the backbone of developing economies, where they account for most of the employment and jobs created. GCIP supports SMEs in developing clean technologies and solutions that can deliver global environmental benefits. The programme was launched in 2013 across six countries: South Africa, Armenia, India, Pakistan, Malaysia, and Turkey. Thailand and Morocco joined in 2016, and Ukraine joined in 2017.

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This report presents a summary of the results of an independent study of GCIP-SA 1.0, commissioned by TIA and the study done by Break the Chains Development Services. The main objectives of this evaluation are:

(a) To profile GCIP-SA 1.0 alumni, capturing the address, status, progress, next steps, and challenges of the alumni enterprises.
(b) Determine the effectiveness of the programme in achieving its "intended" outputs and outcomes
(c) Examine the impact the programme has on participants, communities and the economy, highlighting the skills learned, jobs and wealth created, and reduced GHG emissions.
(d) Determine the gaps and develop recommendations that can influence the effectiveness and impact of GCIP 2.0.

1.2. Evaluation methodology

The evaluation used qualitative and quantitative methods to collect data through desktop review, online survey, key informant interviews, and site visits *(Details of the data collection tools are found in Appendices 2: Data collection tools)*.

Qualitative tools

(e) **Desktop review:** A review of the programme documents includes programme design documents, terminal review reports, promotional material and UNIDO-GCIP materials.

(f) **Alumni Profiling-** The review used the database provided by TIA of 139 Alumni, of which 89 (64 percent) were contactable. Out of the 89 contactable alumni, 61 (69 percent) were reached and responded to the survey either through online surveys or site visits.

(g) **Key informant interviews:** Semi-structured interviews with programme implementing partners were conducted. Evaluators received input from 5 individuals who worked as judges, mentors, programme advisors and programme partners; experts in business acceleration, entrepreneurship, and intellectual property rights ecosystems, some of whom have invested in the programme's enterprise.

(h) **Site visits and enterprise profiling:** Site visits or online interviews were done with 33 (54 percent) of the 61 GCIP alumni who responded, and written profiles were completed. The written profiles capture information about the enterprises' site details, stage of the technology, progress, next steps, and financial and non-financial needs.

Quantitative tools

(c) **Online SurveyMonkey:** An online survey was sent to the GCIP Alumni who went through the programme between 2014 and 2020. 89 contactable alumni were sent the survey, 3 emails bounced, and 50 (56 percent) completed the survey.

(d) **The database-** The database of the 61 (69 percent of 89 contactable) Alumni was updated with the contact and status information of those provided through survey monkey or site visits. 11 Alumni did not provide complete information on contact details, such as names, company names and addresses.

1.3. Evaluation approach

The evaluation follows the Organisation for Economic Co-operation and Development's (OECD) evaluation guidelines of programme design, relevance, effectiveness, sustainability, and impact. We did not evaluate the efficiency of the programme since this was captured in the 2018 GCIP evaluation by the Global Environment Facility Independent Evaluation Office (GEF-IEO, 2018).[7] More specifically, we triangulate data from the four sources listed in the evaluation methodology section to answer the following key evaluation questions.

[7] Global Environment Facility Independent Evaluation Office (GEF-IEO), 2020 Evaluation of the GEF-UNIDO Global Cleantech Innovation Programme. Evaluation Report No. 135.

(a) **Innovator profiling:** Who are the Alumni, where are they, what category of cleantech innovation, are they still active, status, progress to date, and next steps? What are the Alumni's financial and non-financial needs?
(b) **Programme design:** Are the programme objectives and indicators clearly defined? Are there institutional structures in place to achieve these objectives?
(c) **Programme relevance:** To what extent does the programme meet the needs of enterprises and the South African cleantech sector?
(d) **Programme effectiveness:** Was the programme design successfully implemented? How effective is the programme in achieving its "intended" outputs and outcomes?
(e) **Programme impact:** What are the individual and socio-economic impacts of the programme?
(f) **Lesson Learnt:** What worked and what did not from the inception of the programme to date?
(g) **Sustainability:** What structures are in place to ensure the programme's sustainability and impact?
(h) **Recommendations:** What recommendations can be made to influence the effectiveness and impact of GCIP 2.0

(Details of the evaluation questions are in appendices 1: Evaluation Matrix)

The evaluation addresses these questions using quantitative and qualitative analyses.

Quantitative analysis: The quantitative analysis examined the programme's relevance, effectiveness, and impact. Firstly, programme relevance is examined, identifying which, among the set of services offered by the programme, Alumni found most useful and how they benefited from them.

Secondly, the programme's effectiveness in achieving the intended outputs and outcomes were analysed. Here, the programme outputs associated with different components of the competition-based accelerator and the programme outcomes were examined. The programme outcomes associated with the competition-based accelerator are, creating awareness about the programme and the potential of cleantech technologies, skills development, connection to investor networks and potential business partners, and gender mainstreaming. In the medium-term, the programme's intended outcomes are increased investment into cleantech; scaling up innovative technologies and viable business models; and growth of entrepreneurial skills and culture. Thirdly, we examine the impact of the programme, which is job and wealth creation within the national economy, energy savings and GHG emission reduction.

The quantitative analysis evaluated the extent to which the programme is achieving its outputs, outcomes, and impact by examining the following indicators: the number of enterprises that reached

commercialisation; funds and investment raised by Alumni; patents and licences granted; growth in sales and exports; the value of taxes paid; and the number of jobs created.

Evaluators also used Pre and Post analysis to quantify the effect of the programme on the above listed indicator variables. Pre and post analysis compares the values of the indicators before and after the programme. The difference between pre-and post-programme values of the indicator variables is then the effect attributable to the programme.

Qualitative analysis: The qualitative analysis examined programme design issues, relevance, effectiveness, impact, lessons learned, and recommendations. Evaluators first examined the suitability of the programme design for South Africa, especially in relation to the programme management, clarity of roles for implementing partners, clarity of goals and targets, and the cultural and economic barriers to implementation. Evaluators then examined the programme's relevance to the target beneficiaries (i.e., Alumni and entrepreneurs), the effectiveness in achieving intended outcomes, and the overall cultural, institutional, and economic impact. This part of the qualitative analysis complements the quantitative analysis outlined above.

Through key informant interviews, we also provide feedback on lessons learned and recommendations on improving the programme from implementing partners (i.e., judges, mentors, and advisers to the programme). The qualitative analysis also presents the profiles of selected alumni enterprises, the enterprise's technology, the socio-economic issues it aims to solve, and examples of how these businesses impact youth, women, and different communities. Evaluators then documented the statuses of these enterprises, the journeys so far, the challenges they face and plans for the near future.

1.4. Evaluation sample

The Terms of Reference indicated that the programme has capacitated up to 162 candidates across all 9 provinces from 2014 to 2020. But the evaluators were provided with a database containing the telephone, cell phone numbers and email addresses of 149 alumni. After cleaning the list, 10 duplicates were found, reducing the list to 139 contactable Alumni. From the list of 139 Alumni, only 89(64 percent) were reachable. The rest, 50 innovators, were not reachable due to outdated contact details, and as a result, the status of their enterprises is unknown.

From the 89 reachable alumni, 61 (69 percent of the 89), which we hereafter refer to as the "evaluation sample", responded to either the online survey or the site visit/interview or both. Of the 61 Alumni, 50 (82 percent) responded to the online survey and 11 did not. Among the 61 Alumni, 34 (56 percent) were fully profiled (i.e., their site locations, contact details, statuses, types and stages of the

technologies, next steps, and challenges) were documented. (GICP *All Innovators surveyed 3 of July 2022 in Appendices 3).*

1.5. Risks and limitations

Because of the failure to contact some of the Alumni, the Evaluators could not verify the number of dropouts. The non-responsiveness cannot be attributed to dropping out alone. Others may have changed their contacts or moved on. Therefore, there is a substantial risk that carry-on Alumni did not participate in the study because of incorrect contacts. It is therefore important for TIA to trace these Alumni. There could be other reasons why these Alumni did not respond, but this could be due to the following reasons:

(a) Incorrect email addresses that SurveyMonkey did not accept
(b) Incorrect cellular phone numbers that could not receive Bulk SMS.
(c) Lack of interest in participating in the survey for assorted reasons.
(d) Cell phone numbers that are no longer in use.

The other limitation was the database provided did not indicate innovation details to determine pre-post statistics per province.

2. HISTORY AND OVERVIEW OF GCIP

2.1. Background and context of GCIP

Small, Medium and Micro Enterprises (SMEs) play a significant role as the engine of economic growth and employment. Across the Organisation for Economic Co-operation and Development (OECD),[8] SMEs account for 99% of all businesses and two-thirds of employment. South Africa's formal sector SMEs account for 98.5% of the number of firms in the economy but contribute only 28% of jobs (SBI, 2018),[9] indicating this sector's high potential for employment absorption. By being the most predominant form of business and job creation, SMEs play a key role in promoting inclusive growth. And due to their entrepreneurial and innovative nature, SMEs have the potential to drive long-term and sustainable economic growth through innovations in cleantech products.[10]

Despite their enormous potential to contribute to inclusive and sustainable economic growth, SMEs face several challenges related to access to resources, finances, and services, leading to high failure

[8] The OECD comprises of 36 countries from North and South America to Europe and Asia-Pacific.
[9] The majority, 56% of jobs in South Africa, come from only 1,000 larger employers, including government.
[10] Technological innovations and entrepreneurship are the main contributing factors to long-term economic growth (Mansfield, 1972; Wong et al., 2005; Maradana et al., 2017).

rates within the first five years of establishment.[11] In the cleantech sector, SMEs and entrepreneurship growth are further limited by a lack of public awareness of the potential of clean (low-carbon) technology, a shortage of entrepreneurial skills and culture; a lack of enabling policy and regulatory environment; and a lack of strategic planning coordination among key sector players.

Recognising the potential of SMEs in promoting inclusive and sustainable economic growth and the barriers that limit their potential for growth, the Global Environment Facility (GEF) and United Nations Industrial Development Organization (UNIDO) made a joint decision to develop a global flagship programme, the GCIP, on Cleantech for SMEs.[12] The GCIP is an accelerator programme aiming to address barriers cleantech start-ups and SMEs face.

GCIP traces its origin to the 2011 UN Climate Change Conference of the Parties (COP), when "Greening the COP17" was launched in South Africa with the support of GEF and UNIDO. Greening the COP17 was hosted by the National Cleaner Production Centre (NCPC-SA). Its goals were to establish a platform to promote low carbon technologies in SMEs and to increase recognition of the role of such technologies in enhancing SME competitiveness. [13] These goals were achieved through four main components: the Innovative Technology Competition for private sector SMEs, which drew 42 applications covering 3 technology categories (Energy Efficiency, Renewable Energy, Green Buildings), with 23 semi-finalists, 8 finalists, 2 runners-up, and 2 winners; communication and awareness raising; low-carbon public transport; and pilot installation of solar water heaters for health clinics to generate emission offsets. Owing to the successful implementation of "Greening the COP17",[14] GEF and UNIDO collaborated to develop a more comprehensive global initiative under the banner of the Global Cleantech Innovation Programme.

GCIP 1.0 was launched in 2013 across six countries: South Africa, Armenia, India, Pakistan, Malaysia, and Turkey. Thailand and Morocco joined in 2016, and Ukraine joined in 2017. The fields of focus are energy efficiency, green buildings, renewable energy, waste beneficiation, water efficiency, and green transport. Other categories such as environmental protection, agritech and Indigenous knowledge systems were added in 2018. The Project Management Unit (PMU) and key implementing partner of GCIP in South Africa is the Technology Innovation Agency (TIA), a national public entity whose

[11] The failure rate of new businesses in South Africa is between 80 to 90% within the first five years of establishment (OECD, 2020).
[12] The GCIP traces its origins to the "Greening the COP17" project (GED ID 4514), which was launched by GEF-UNIDO support during the 2011 UN Framework Convention on Climate Change (UNFCCC) Conference of Parties (COP) in South Africa.
[13] Greening the COP17. GEF ID 4514. Request for CEO Endorsement.
[14] Independent Terminal Evaluation of the Greening the COP17 in Durban-South Africa Project. September 2013. UNIDO.

mandate is to support the development and commercialisation of competitive technology-based services and products, leading to the creation of sustainable jobs and diversification of the economy.

TIA launched GCIP 1.0 in South Africa in 2014 to date. Owing to the satisfactory implementation of GCIP 1.0, UNIDO is rolling out GCIP 2.0 in South Africa from 2022, and TIA will continue to function as the Project Management Unit and key implementing partner. GCIP 2.0 will focus on providing post-competition services to maximise the support given to the GCIP alumni through key multi-stakeholder participation, ecosystem strengthening, and mentorship platform establishment to offer a comprehensive approach and support for a more significant impact. Since GCIP 2.0 aims to provide post-competition services to the programme's alumni, it is necessary to review, track and profile all GCIP 1.0 alumni. And to mitigate the risk of delivering quality technologies and the greater impact of GCIP 2.0, it is also necessary to evaluate and review the barriers and enablers to the implementation and the overall impact of GCIP 1.0.

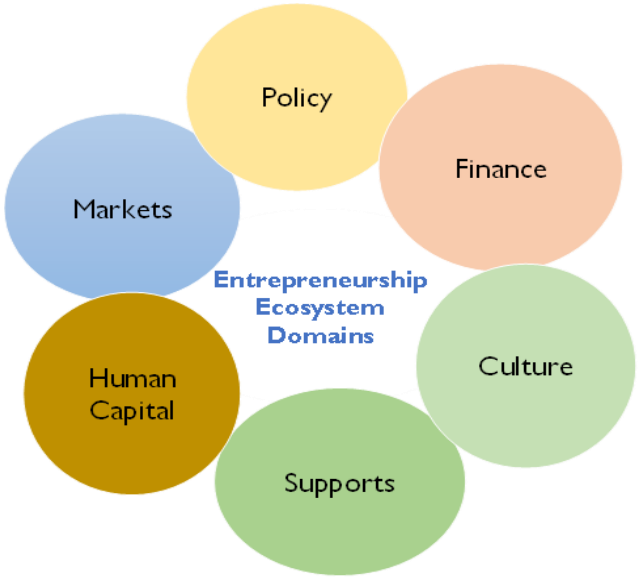
2.2. Programme components

GCIP 1.0 consists of three main components:

- **Component 1:** To promote an innovation and entrepreneurship ecosystem by identifying and naturing cleantech innovators and entrepreneurs through a national platform for an annual competition-based accelerator
- **Component 2:** To build the capacity of national institutions and partner organisations to sustain the competition-based accelerator.
- **Component 3:** To strengthen and develop the policy and regulatory framework for cleantech innovation.

GCIP aims to foster the cleantech "entrepreneurship ecosystem" through these three components. An entrepreneurship ecosystem refers to the key elements for building a conducive environment for entrepreneurship, and they include culture, enabling policies and leadership, availability of appropriate finance, quality human capital, venture-friendly markets, and institutional and infrastructural supports for start-ups (see **Figure 1**).

Figure 1. Components of the entrepreneurship ecosystem.

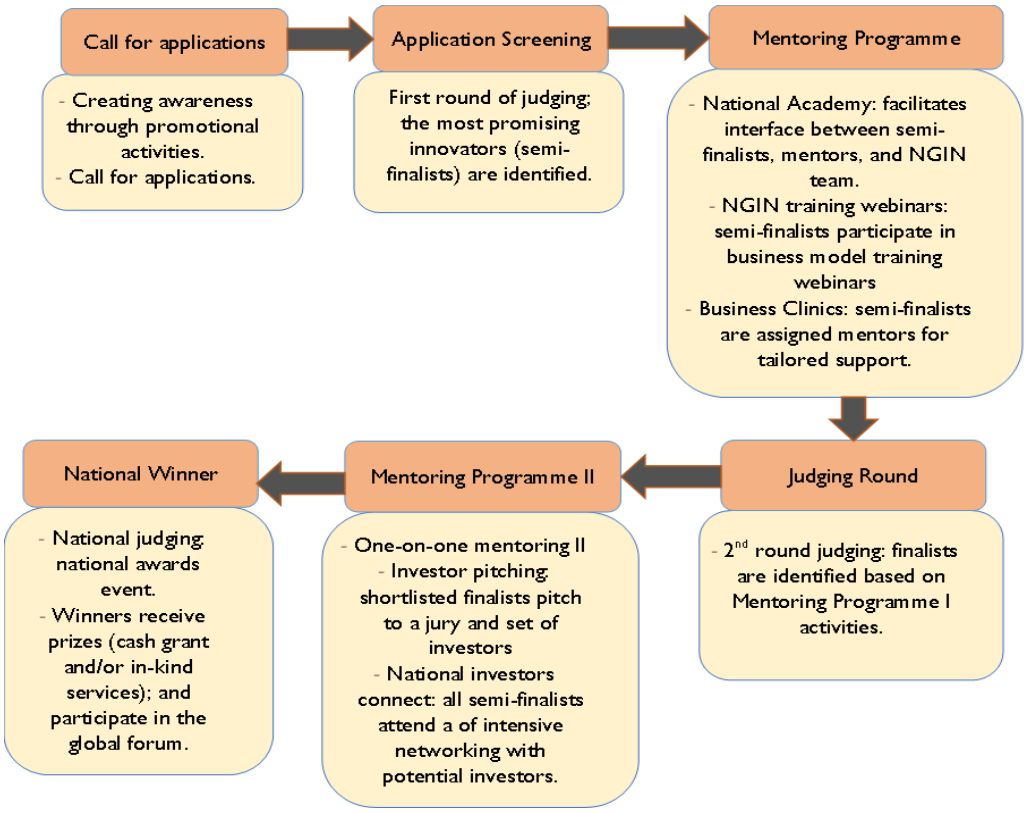


Source: *Isenberg, D. 2011. Babson Entrepreneurship Ecosystem Project.*

The competition-based accelerator consists of multiple stages (**Figure 2**) aimed at equipping entrepreneurs with business knowledge and skills to help them progress past the technology start-up "valley of death". The first stage is the identification of Cleantech Alumni, which involves promotional activities to create awareness and a call for applications to the programme. A screening stage follows this, the first round of judging, where the most promising Alumni, the "semi-finalist," typically 20-25 Alumni, are selected to enter the accelerator. The semi-finalists undergo business model training delivered by UNIDO's knowledge partner, Network for Global Innovation, which consists of a 25-session series of webinars held over many months; they also receive mentoring sessions with local private sector actors (mentors and technical experts).

The third stage of the GCIP competition-based accelerator is the second round of judging, where "finalists," typically 10-12 Alumni, are identified based on online seminar attendance and participation, mentoring sessions, worksheet submissions, investor presentations and pitching. The shortlisted finalists pitch to a jury, the national "winners" are then selected from the list of shortlisted finalists, and they get to participate in the global competition, and international investor connects to Global Forum in a country identified by UNIDO. In South Africa, entrepreneurs have an opportunity to be introduced to other TIA funding instruments and external stakeholders' funding/support opportunities. The national winners receive prizes that combine cash grants and/or in-kind services. Figure 1 below explains the GCIP Model process.

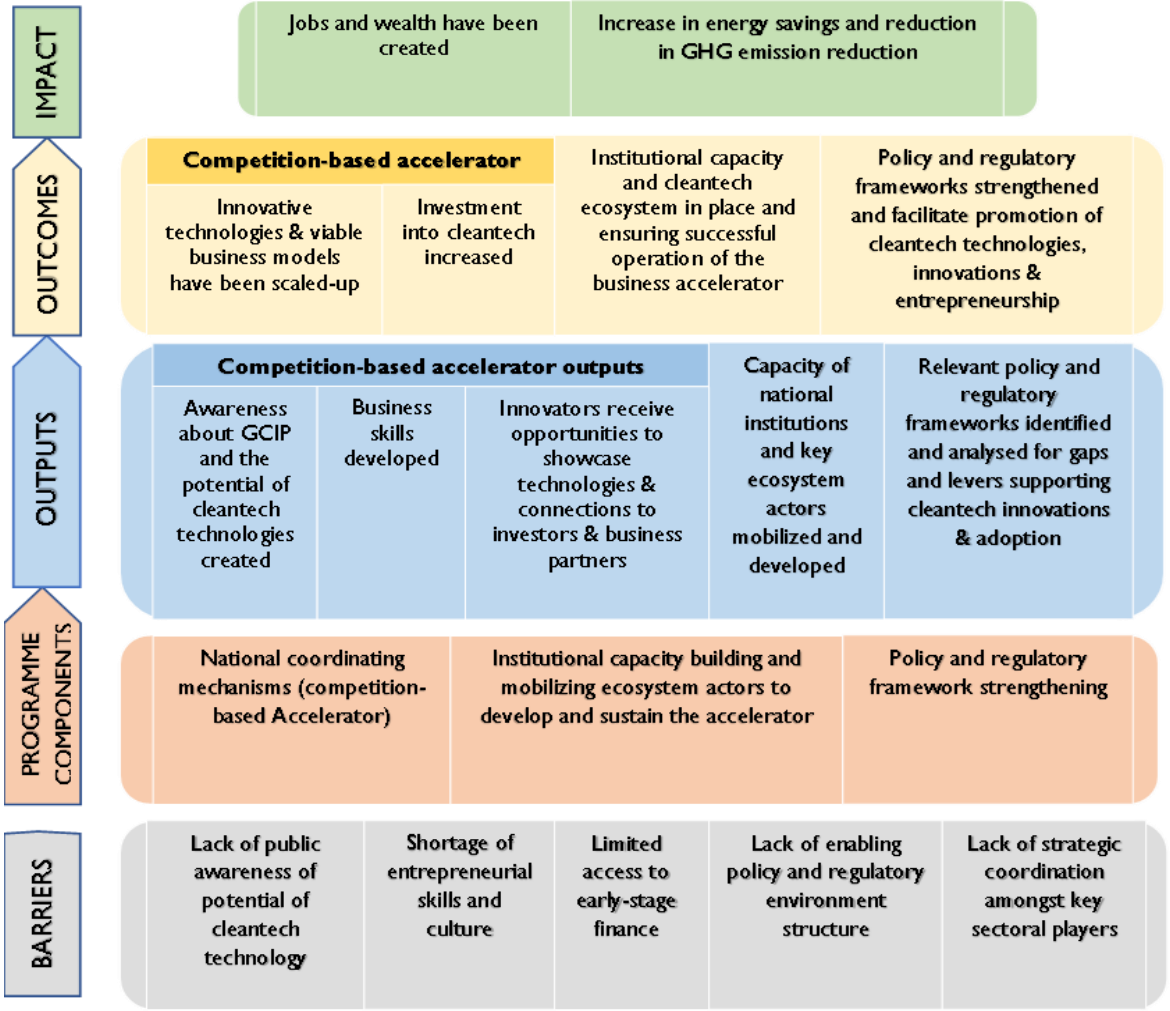
Figure 2: The GCIP Model Process and Key Milestones



2.3. GCIP's Theory of Change

Based on the literature review, the evaluation team constructed the programme's Theory of Change (see **Figure 3**). The Theory of Change also depicts the programme outputs associated with the three programme components. The main outcomes of the business accelerator are increased investment into cleantech and identification and scaling-up of innovative technologies and viable business models. The ultimate long-term impact is job and wealth creation within the national economy, energy savings and GHG emission reduction. Figure 2 below summarises the Theory of Change of the GCIP.

Figure 3: GCIP Theory of Change



As highlighted in the preceding section, GCIP aims to address the following barriers to cleantech innovations and entrepreneurship in general:

a) Lack of public awareness of the potential of cleantech technology.
b) Shortage of entrepreneurial skills and culture.
c) Limited access to early-stage finance.
d) Lack of enabling policy and regulatory environment structure.
e) Lack of strategic coordination amongst key sectoral players.

The programme aims to address these barriers through three programme components:

a) Cleantech competition-based accelerator promotes an innovation and entrepreneurship ecosystem by identifying and naturing cleantech Alumni and entrepreneurs.

b) Institutional capacity building to sustain the operation of the competition-based accelerator and monitoring. The PMU and other actors are trained on best practices in managing a cleantech platform, including communication, advocacy, and other tools to stimulate applicants and disseminate results.

c) Strengthen policy and regulatory framework that will facilitate and promote cleantech technologies, innovations, and entrepreneurship

3. EVALUATION RESULTS

Figure 4 below plots the distribution of all GCIP participants across years (from 2014 to 2020) and regions. As expected, the largest number of participants are from the three regions that are South Africa's economic hubs: Gauteng, Kwazulu Natal, and Western Cape Town. Across the years, the largest intake was in 2018, the last year of GEF-UNIDO's involvement with GCIP 1.0, and the smallest intake was in 2019, the year that TIA took over complete control of GCIP 1.0.

Figure 4: Number of GCIP participants across years and provinces

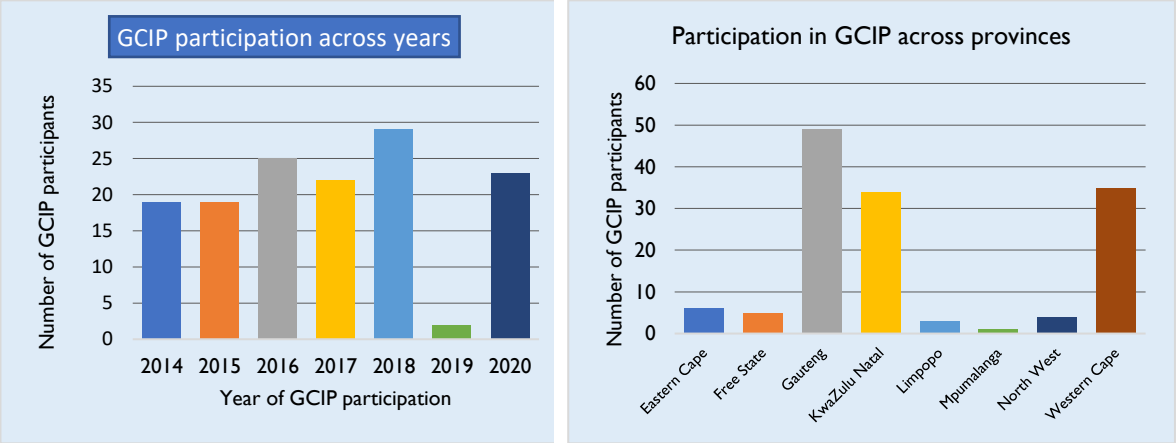
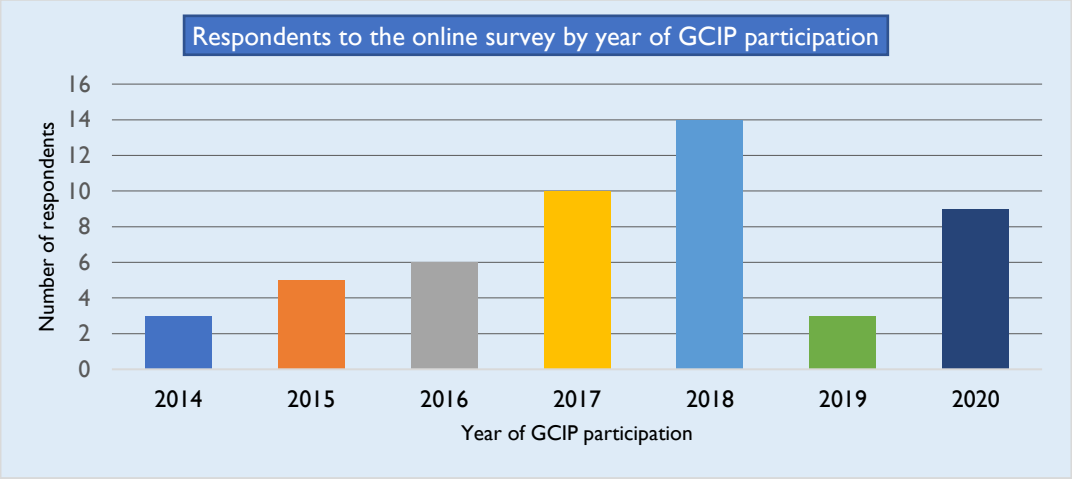


Figure 5 below plots the number of respondents to the online survey across years of participation in the programme. As expected, most respondents participated in the programme between 2017 and 2020. The largest number of respondents participated in the programme in 2018 and the smallest number participated in 2019. This observable pattern corresponds to the overall number of participants in the programme, where 2018 had the most participants, totalling around 28 innovators, and 2019 had only 3 participants.

Figure 5: Number of respondents to the online survey across years of participation in the GCIP programme



The distribution of the evaluation sample (i.e., all participants in the evaluations) across provinces (See **Figure 6)** is analogous to the distribution of all GCIP participants across provinces: most respondents, at least 63% and around 89% for the evaluation and fully profiled samples, respectively, are from Gauteng, KwaZulu Natal and Western Cape.

Figure 6: Number of respondents across provinces

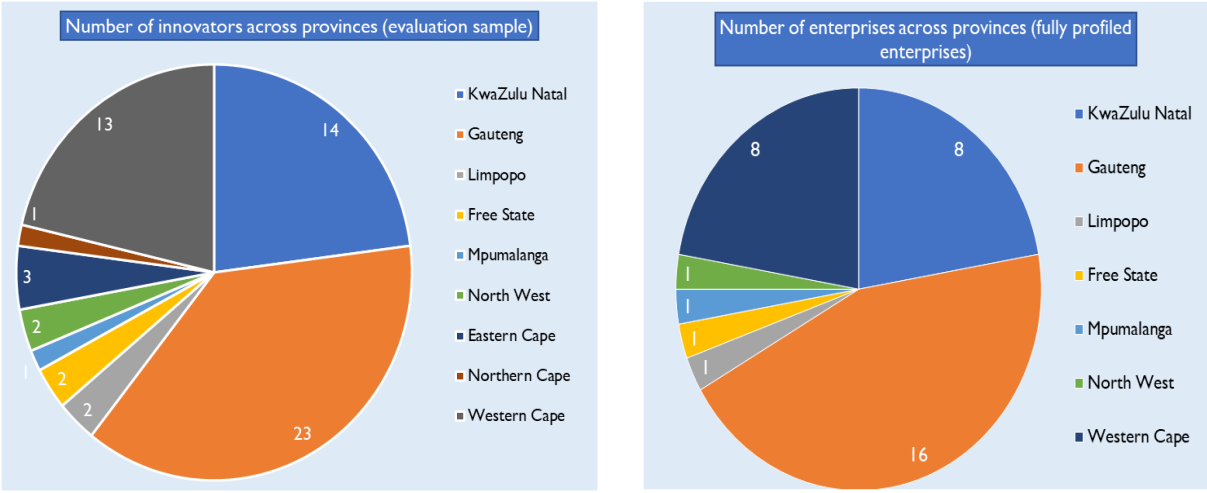
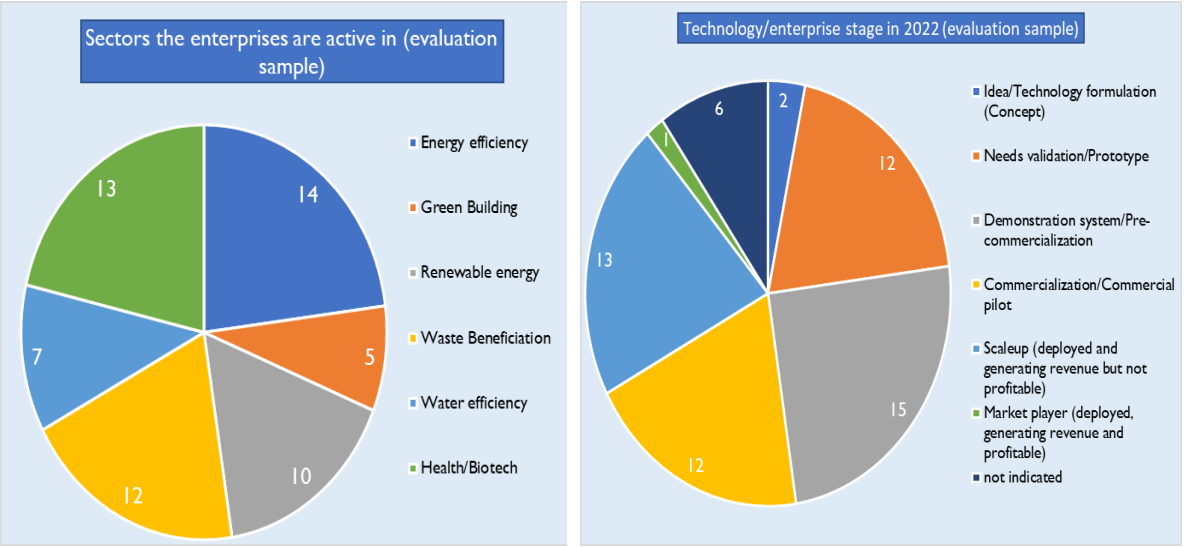


Figure 7 shows the distribution of the evaluation sample across sectors and technology stages. Most enterprises are in energy efficiency and waste beneficiation, accounting for 42 percent of the respondents, followed by renewable energy and health/biotech, accounting for 37 percent. Most of the enterprises in the evaluation sample, around 73 percent, are somewhere between Demonstration system and scaleup (actively deployed and generating revenue but not yet profitable). We discuss this issue further in the sections that follows.

Figure 7: Number of enterprises across sectors and technology stages



Most of the quantitative analysis in the following sections utilises the information from the 50 (82 percent of 61) Alumni who responded to the online survey.

3.1. Programme design

Following a review of the programme documentation and review reports[15], the evaluators found that the programme objectives of GCIP.1.0 were clearly defined. The first objective was to work with the Project Management Unit (PMU), appointed in each participating country, to set up a competition-based accelerator. The goal of the business accelerator is to promote the innovation and entrepreneurship ecosystem by identifying and naturing cleantech Alumni and entrepreneurs. The second objective was for the PMU, through its management and coordination activities, to engage in building the capacity of national institutions and partner organisations to sustain the competition-based accelerator and strengthen and develop the policy and regulatory framework for cleantech innovation.

The Technology Innovation Agency (TIA) was successfully appointed as the PMU and key implementing partner of the programme in 2014. TIA successfully set up the competition-based accelerator in 2014 and took responsibility for the management and coordination activities. The competition-based accelerator was designed to create awareness about the programme and the potential of cleantech

[15] More specifically, the programme design documentation that includes the programme's Business Case Review; Agreement and Acknowledgement Letters; Programme Brochures and the Commemorative Booklet and Stories of GCIP-SA 2014-2017; and the 2018 GCIP evaluation report by the Global Environment Facility Independent Evaluation Office.

technologies, skills development, and connecting Alumni to investor networks and potential business partners. Within these three components, clearly defined activities were to be implemented.

To create awareness about the programme and the potential of cleantech technologies, TIA engages in outreach activities that promote the programme through social media channels and "seminar" presentations at universities to target university graduates.

TIA offered business development mentorship, business plan development training, and technical advice to promote business and entrepreneurial skills development through sector experts. And to connect Alumni to potential business partners and investor networks, TIA set up retreat-style workshops bringing together Alumni, mentors, judges, and technical experts. The programme also consisted of two award ceremonies, one national and the other international, where Alumni had the opportunities to interact and connect to potential investors.

The intended programme outputs are clearly defined, and the programme outcomes are derivable from the programme theory of change discussed in Section 1 above. However, the target indicators to be used as measures of the success of the programme are not defined. The success indicators for the programme's intended impact were determined at the global level (i.e., for all 9 countries where the programme was implemented) but not nationally. The programme impact indicators at the global level are:

a) Greenhouse gas emission reduction of GHG Emissions savings 4.8 Mtons of Co2.
b) 1 219 new jobs in cleantech.
c) Growth of Cleantech industry- generated revenue of USD 263 Million.

Since programme indicators are not sufficiently defined, it is impossible for this or other evaluations to state whether the programme is a success at the national level. Nonetheless, we define indicator variables in the following sections to assess the programme's effectiveness in achieving its intended outputs and outcomes and its impact on the Alumni, their enterprises, the communities around them, and the national economy.

In addition to a lack of clarity on the indicators, there was no clearly defined plan and system to keep track of and engage with the alumni of the programme. This is necessary for both programme evaluation purposes and for maintaining the programme's sustainability. As we discuss in the following sections, most alumni felt they benefited from the programme in terms of knowledge transfer. Still, they also thought that they could have benefited from post-programme help in the form of making business partnerships, connecting with investors and other market related help. As one alumnus put

it, *"Although the programme was helpful in opening avenues, my expectation was not met because afterwards I felt lost and had to rely on myself to continue. My hope was for GCIP to assist us in connecting with potential investors and grants schemes and opening market avenues."*

Therefore, it is necessary for the programme to clearly define a strategy and system to keep an updated record of the programme alumni and design a platform that the alumni can use for continued engagement with the programme.

3.2. Relevance

From a strategic point of view, GCIP is consistent with South Africa's 2010 New Growth Plan (NGP) framework, whose objectives are to enhance growth, employment creation and equity. "Green economy" is among the five priority areas identified in the NGP with the potential to create jobs through partnerships between the state and the private sector. Programmes like GCIP are also particularly needed in South Africa, where 77% of energy is from coal, making it the world's 13th highest emitter of greenhouse gases (GHG) cumulatively.[16]

Beyond strategic relevance, GCIP addresses the lack of the necessary elements of a functioning entrepreneurial ecosystem in South Africa. Through the implementation of the competition-based accelerator and the coordination activities of the Project Management Unit, TIA, GCIP aims to establish a robust cleantech ecosystem. A functioning ecosystem would then mitigate the barriers faced by start-up entrepreneurs in cleantech (see Section 2 for the list of barriers faced by cleantech entrepreneurs and SMEs in South Africa). The programme addresses barriers to cleantech innovation and entrepreneurship through various steps outlined in **Table 1**.

[16] World Resource Institute. https://www.wri.org/insights/interactive-chart-shows-changes-worlds-top-10-emitters

Table 1: How GCIP addresses barriers to innovation and entrepreneurship in South Africa.

Barriers to entrepreneurship (in cleantech) in SA	How GCIP addresses barriers to entrepreneurship
Lack of public awareness of the potential of cleantech technology	The Project Management Unit (PMU) will create awareness through communication, advocacy, and outreach
Shortage of entrepreneurial skills and culture	The programme's competition-based accelerator will impart business skills through mentorship on business development, training for business plan development, and technical advice through sector experts. Opportunity to showcase innovations
Limited access to early-stage finance	The programme offers opportunities to connect with an investor network and potential business partners. And TIA, the PMU, offers financial support in the form of prizes for the competition winners and to special categories of innovators and innovations
Lack of enabling policy and regulatory environment structure	The PMU will engage in strengthening and developing the policy and regulatory framework for cleantech innovation.
Lack of strategic coordination amongst key sectoral players	The PMU will engage in building the capacity of national institutions and partner organisations to sustain the competition-based accelerator and develop the cleantech ecosystem

As highlighted in **Table 1**, to address the lack of business skills, GCIP offered the following services through the competition-based accelerator: mentorship on business development, training for business plan development, and technical advice through sector experts to develop entrepreneurial and business skills.

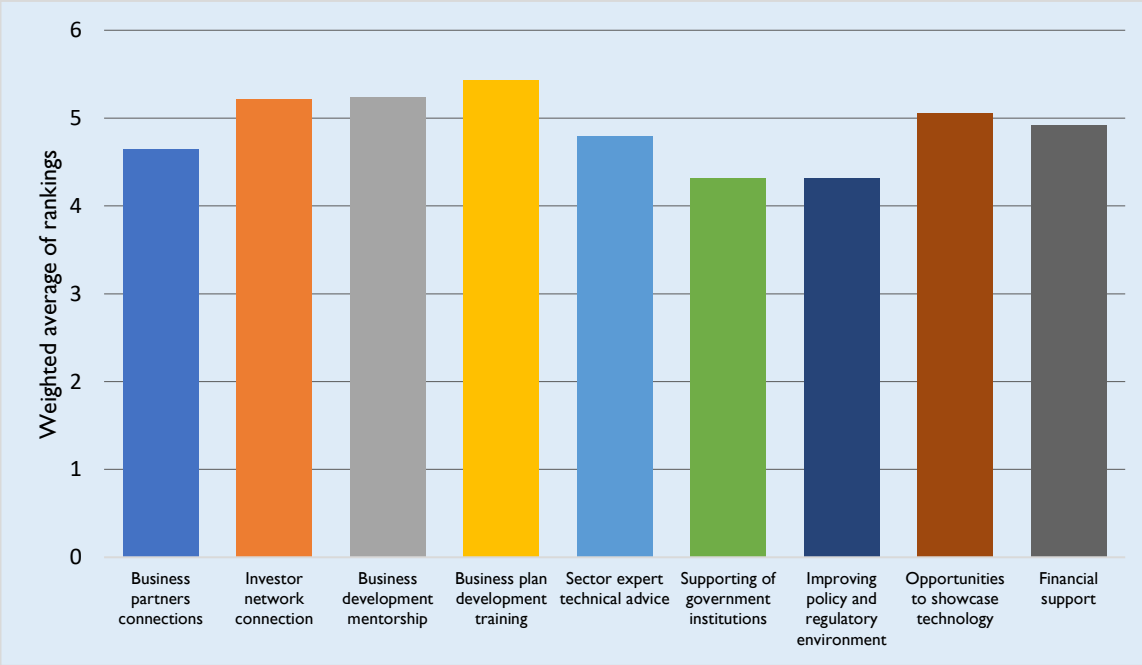
The programme did not offer start-ups direct financing but a platform through which entrepreneurs forge connections with investor networks. Through the competition-based accelerator training forums and award ceremonies, entrepreneurs get an opportunity to display their technologies to investors and potential business partners with whom they can form lasting beneficial business relations.

Evaluators asked Alumni to rank the components of the competition-based accelerator from the most to least beneficial to their enterprise. The results, reported in **Figure 8**, are weighted average rankings, which rank the components according to the most preferred overall. The component with the largest

weighted average ranking is the most preferred.[17] The two components associated with the skills development component, training for business plan development and mentorship on business development, were ranked the most beneficial components by most Alumni. This is followed by a connection with an investor network and the opportunity to display technology.

However, the difference between the weighted average rankings across the programme components is insignificant. And the observed difference could also be due to the difference in the quality of implementation of these components, an issue we discuss in the next section. The slight difference in the weighted average rankings across components indicates that Alumni find most, if not all, of these components relevant in one way or another.

Figure 8: The distribution of the weighted averages of the responses to the question "Please rank the following components of GCIP from most to least beneficial to your enterprise."



[17] More specifically, given that there are 9 components of the programme, let $n_1^i, n_2^i, \ldots, n_9^i$ be the sequence of the number of respondents that ranked component i as the first, second, …, ninth choice, respectively. Then the weighted average of component i is $(9 * n_1^i + 8 * n_2^i + \cdots + 1 * n_9^i)$/Total number of respondents.

Alumni also highlighted the relevance of the programme in business development experience, building confidence, meeting like-minded individuals who face similar challenges, and the opportunity to win prizes. Overall, Alumni find most programme components to be relevant. They highly appreciated the knowledge learned through the business skills development activities, the experience and confidence gained through business pitching and national and international travel, and the business connections and partnerships created during the national retreat-style national workshops and international competitions.

"The programme excited me, and I benefited a lot because it was my first time being exposed to others, visiting other provinces, and travelling internationally. It was a good experience, and it built my confidence. I was able to talk about my product to potential users successfully."

"The R60 000 that I won assisted me a lot even though I required more, but it was better than nothing."

"The experience I gained from the exposure and the expertise provided by the mentors is great."

3.3. Effectiveness

Although the programme success indicators are not defined, the Theory of Change defined in **Section 2.3** outlines the programme outputs, outcomes, and impacts. This section examines the programme's effectiveness in achieving intended outputs and outcomes and how it is making progress in achieving the long-term impact. The evaluators focus on the outputs and outcomes directly associated with the business accelerator.

3.3.1. Competition-based accelerator outputs

The roll-out of the competition-based accelerator in South Africa started in 2014 and has graduated a cohort of 10-15 entrepreneurs (finalists) yearly. Through multiple programme services offered to innovators, the competition-based accelerator aims to create awareness about the programme and the potential of cleantech technologies, skills development, connection to investor networks and potential business partners.

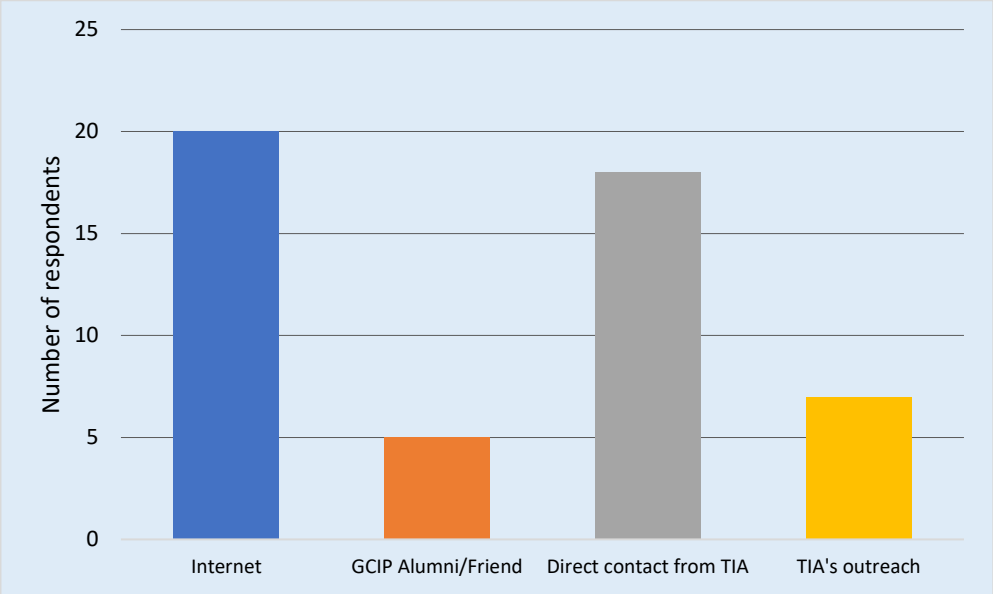
Creating awareness about GCIP and the potential of cleantech technologies

The programme created awareness through multiple channels. Of the 50 respondents to the online survey (see **Figure 9**), 40% indicated that they learned about the programme through the internet;

36% were directly contacted by TIA and asked to join the programme; 14% learned about the programme through TIA's outreach at universities, and 10% heard about the programme through word-of-mouth from friends and alumni.

TIA engaged in scouting activities, such as visiting exhibitions, from which they identified and directly contacted innovators that fit the profiles suitable for the programme.[18] Creating awareness through talks at universities started in 2018 and has recruited a sizeable number of innovators to the programme. This form of outreach is promising and should be continued. Some programme implementing partners interviewed also highlighted the need for TIA to extend outreach through talks in different business training programmes and business schools.

Figure 9: The distribution of the responses to the question "How did you hear about the GCIP program?"

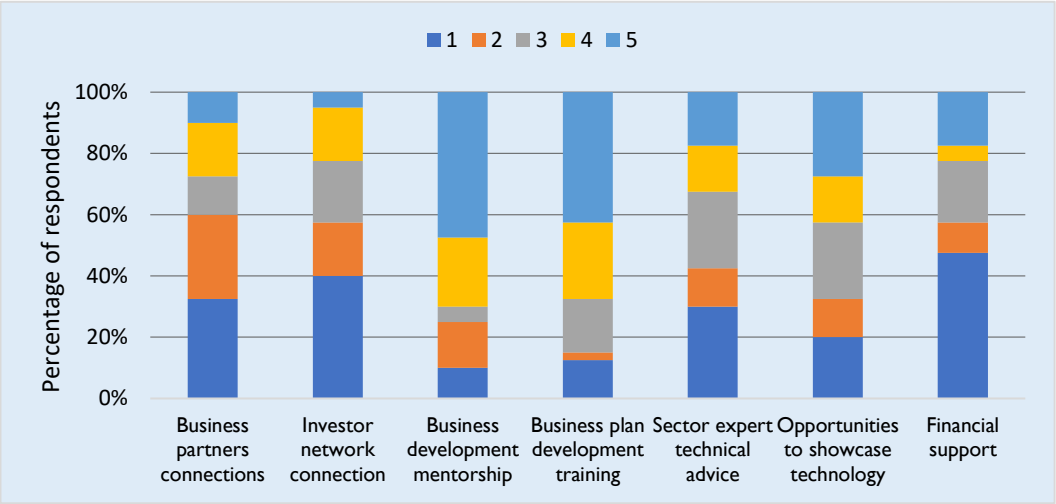


Skills development

The evaluators asked the alumni to rank, from 1-to 5, with 5 being the highest, the quality of services they received from GCIP. The results, reported in **Figure 10**, indicate that around 48% and 43% of the respondents gave a 5 star-rating to mentorship on business development and training for business plan development, respectively. Approximately 70% of the respondents gave a rating of 4 and above to mentorship in business development, and 68% gave the same rating to training for business plan development.

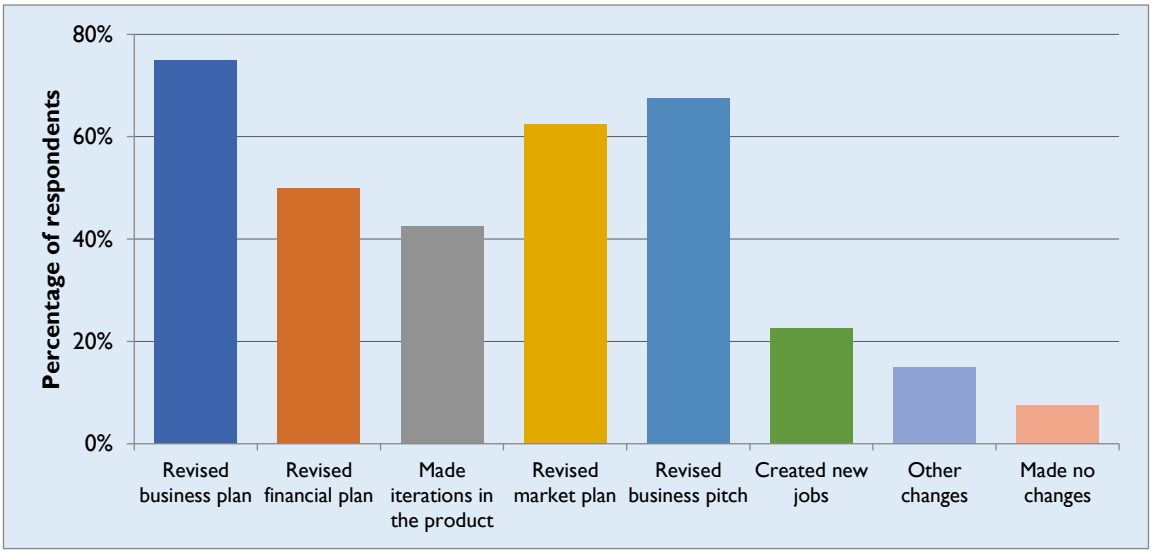
[18] One innovator indicated that "*Ellaine from TIA discovered us as we were busy exhibiting at the Durban Botanical Gardens and invited us to join the GCIP Programme.*"

Figure10: Rating of the quality of service from 1-5, with 5 being the highest



The alumni highlighted the direct benefits of the skills development services they received. We asked alumni to indicate the elements of their business they made changes to due to their participation in GCIP. The results, reported in **Figure 11**, show that around 75% of the respondents revised their business plans and around 68% revised their business pitches. In addition, around 63% and 50% of alumni said they revised their market and financial plans, respectively. The changes to these four elements can be attributed to the skills development services offered by the programme.

Figure 11: The answer to the question, "Did you made changes to any of the following elements in your business because of GCIP?"



Many programme alumni corroborate these quantitative findings during the onsite visits and online interviews. Alumni shared multiple stories of how they benefited from the business skills development services. They emphasised that the training content was excellent, simple to understand, and directly applicable to their business ideas.

> *"If it was not for TIA, I might not have been where I am now, TIA believed in my idea and assisted me in bringing it to life."*
>
> *"GCIP helped me prepare for the business pitch, and I am now using the same pitch to convince potential customers and investors to like my product. As you can see, I am already selling some of my products."*
>
> *"Yes, I managed to revise my business plan and it more professional than before GCIP."*

Opportunities to display technologies and connections to investors and business partners

Next to skills development services in ranking the quality of GCIP services is the opportunity to display the technologies. From **Figure 10** above, around 43% of Alumni gave this service a rating of 4 and above. The overall setup of the competition-based accelerator allows innovators to present their technologies to fellow participating innovators and most importantly, to potential investors and business partners.

During site visits and online interviews, a small number of Alumni shared stories of how they made connections and shared ideas and challenges with fellow innovators who participated in the programme. Some of these connections have been successfully maintained post the programme.

To paraphrase one Alumnus' sentiment shared by many, "*I am currently working with the GCIP-link third-generation of business partners*" (i.e., business partners met through business partners of business partners met at the GCIP programme).[19]

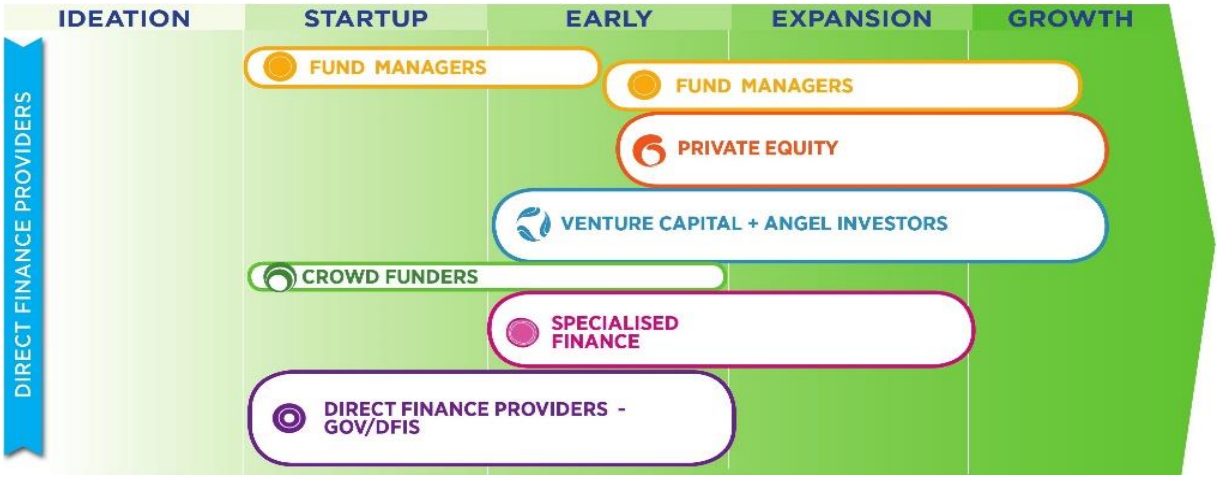
However, only 28% of respondents rated "connection with potential business partners" 4 and above, and only 23% gave the same rating to "connection with an investor network". Many Alumni felt that they could not establish useful business connections outside of connections with fellow innovators met during the programme; this is even more so for connections with potential investors. Most Alumni

[19] Another innovator remarked how connections established at GCIP programme help *"helped us connect even with potential users of our biogas project we want to implement in rural schools. We received letters of support from the schools, municipalities, and traditional authorities. I am therefore convinced that once our product is ready, we will run."*

felt that the pool of potential investors that turned up at the programme's events was small. Only To quote one of the Alumni, *"the national investor connect events were well-organised. The problem is that these events did not attract enough investors in South Africa willing to invest in young risky businesses."* [20]

The innovators' sentiment regarding the willingness of private investors to invest in start-ups is supported by the Aspen Network of Development Entrepreneurs (ANDE) 2017 report on the structure of South Africa's entrepreneurial ecosystem.[21] As depicted in **Figure 12**, most private sector financiers are willing to finance businesses that are in early-stage development and in expansion stage, but not enterprises in idea and startup stages. Since GCIP targets innovators that are in idea and startup stages, it should not be surprising that these innovators struggle to connect to networks of private sector investors.

Figure 12: Direct finance providers in the South African entrepreneurial ecosystem



Source: ANDE, *Entrepreneurial Ecosystem Snapshot: South Africa.*

Nevertheless, a considerable number of fund managers, venture capitalists, angel investors, crowd funders, and direct financial providers (DFIS) are still willing to fund start-ups. TIA should focus on identifying and working with these groups of investors. The Aspen Network of Development

[20] Another innovator remarked that, *"Although it was exciting for me to travel internationally, it was not helpful because where I went, there is no market for my products and those countries do not produce the equipment I need. It would have been more beneficial to visit China where I could have gained first-hand experience of equipment I import from China. I think future international visits should be planned and agreed together with Alumni."*

[21] ANDE, 2017. Entrepreneurial Ecosystem Snapshot: South Africa. https://www.andeglobal.org/publication/entrepreneurial-ecosytem-snapshot-south-africa

Entrepreneurs provides an extensive list of financial organizations, institutions, and DFIS working within the South African entrepreneurial ecosystem that TIA and GCIP can work with (ANDE, 2017).[22]

Financial support

Financial support from GCIP, and more specifically from TIA, was the lowest rated in terms of the quality of the service. The direct funding to Alumni from TIA during the programme was from gift grants to winners of the competition. The gift grants ranged from ZAR100,000 to ZAR300,000 for the overall winners. Alumni who received gift grants were appreciative and noted that this funding helped in product development, especially for enterprises in the idea stage. However, this funding was too small for enterprises in the advanced stage of technology development to make a difference. To quote a few Alumni: *"The R30,000 award GCIP gave me was a drop in the ocean compared to the amount I require and what I have already invested in this business,"*

There was an opportunity for winners of the competition, deemed the most promising innovations, to apply for grants through TIA, but most innovators who went through this process were dissatisfied with the due diligence process, the complexity of the application process, and the long waiting time to receive funding. They felt that the committee of experts conducting due diligence did not correctly capture their technologies' social, economic and market value. And it also appears that only enterprises in the advanced technology stage stood a chance to receive this funding.[23]

"No funding so I couldn't take the project further. The innovator did not accept TIA's due diligence as she felt it was not a true reflection of the real situation. The project was turned down, and she doesn't understand why. The information that was provided to the attorneys, but the outcome of the due diligence indicated that they didn't provide some of the information."

"I was invited to apply for IDC funding, I did, but the due diligence process took very long, and the rejection report I received showed a lack of understanding of the economic and market value of my technology."

"Even the process to apply for funding from IDC is complex and even if approval is granted, they take too long to release funding. Therefore, start-up Alumni would not even try."

[22] ANDE, 2017. Entrepreneurial Ecosystem Snapshot: South Africa. https://www.andeglobal.org/publication/entrepreneurial-ecosytem-snapshot-south-africa

[23] One innovator remarked that "*IDC visited me, and they are interested in these big innovations where they invest millions and billions whilst my innovation does not need that, if they can give me just an R1 million I will go far.*"

The low rating for the financial support component of the programme could also be due to expectations. The competitive nature of the programme and the nature of the events may have created a higher expectation of Alumni regarding financing their businesses. One of the partners interviewed pointed out, *"It was expected that Winners would receive seed funding from TIA since it is TIA's mandate. The programme would have referred the winning Alumni to TIA, but there was no support from the programme."*[24]

3.3.2. Programme outcomes

In the medium-term, it is expected that the programme will lead to scaling-up of innovative technologies and viable business models; increase investment into cleantech; build institutional capacity to foster the successful organisation of cleantech business acceleration and monitoring; and strengthen policy and regulatory framework that will facilitate and promote cleantech technologies, innovations, and entrepreneurship.

Scaling-up of innovative technologies and viable business models

The indicator variables that capture the scaling-up of businesses that went through the programme include the stage of the technology and capitalisation pre- and post-programme. The evaluators also examined other indicators, including estimated sales and exports in 2021; patents registered.

There is observable progress in the development of alumni technologies from idea/technology formulation (concept) and needs validation/prototype stages to intermediate stages of demonstration system, pre-commercialization, commercialization, commercial pilot, and scale-up (actively deployed and generating revenue but not profitable). From the evaluation sample of 61 alumni, 4 indicated that their enterprises were not active anymore.

Figures 13 and **14** present the changes in technology stages pre- and post-GCIP. The data for pre-GCIP technology stages consists of 49 alumni who responded to the online survey, and for pre-GCIP consists of 55 alumni in the evaluation sample. **Figure 14** presents percentages, providing more realistic comparison between changes in technology stages pre- and post-GCIP. The two samples otherwise have different sizes. 37 (around 76%) of the alumni that responded to the online survey indicated that their technologies were somewhere between idea and prototype stages before joining

[24] Two other programme support actors remarked that "*There was a disconnection between what Alumni would expect from such a programme, especially the winners would be expected to qualify for seed funding, but this did not happen, the amount of the award was too little to have a mark even for product research and development." "The question I will ask is that since GCIP started in 2014, how many of these Alumni are in business, very few, I know one innovator who came second internationally in the competition but did not get seed funding from TIA, she has now taken a different direction and that is completely wrong, why waste someone's time in showcasing and pitching with no intention to provide seed funding".*

the GCIP (see **Figure 13**). But a few years after graduating from the programme, only 14 (around 26% of the evaluation sample) said their technologies were still in these stages; 13 (around 24%) enterprises are in the scale-up stage, up from 3 (6%) pre-GCIP; and 27 (around 50% of the evaluation sample) are somewhere between demonstration system and commercial pilot stages, up from around 19% pre-GCIP.

Figure 13: Technology and business stages Pre- and Post-GCIP

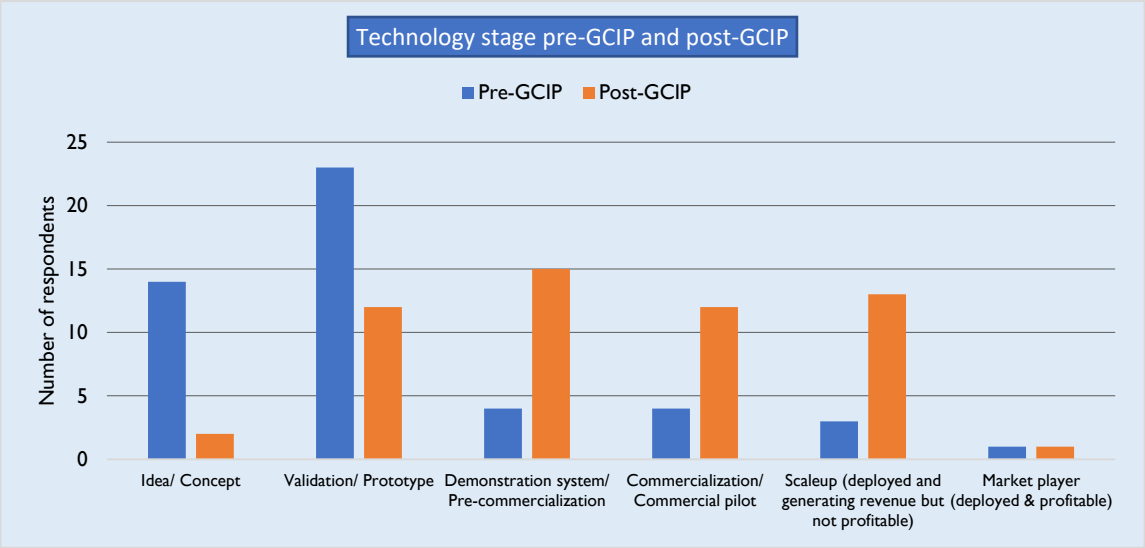
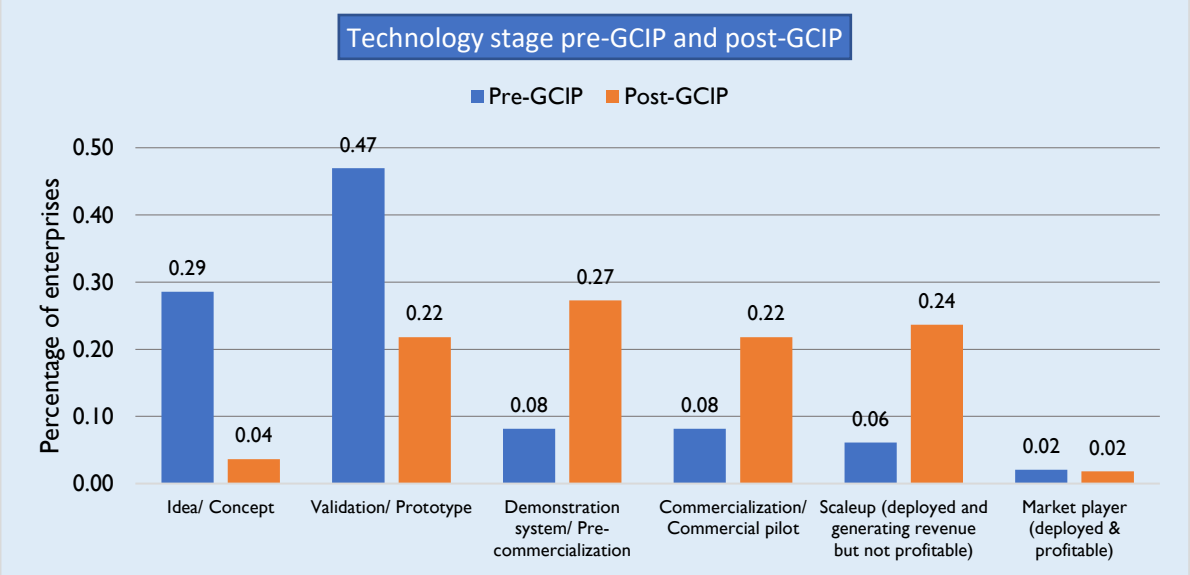
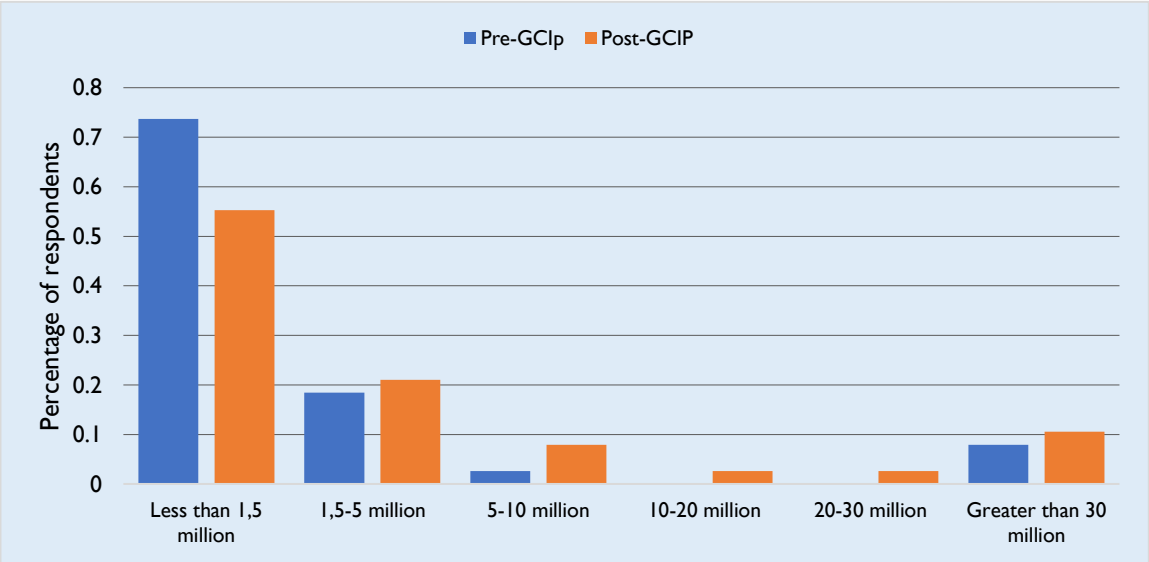


Figure 14: Technology and business stages Pre- and Post-GCIP, in percentage terms



There is also a noticeable increase in the proportion of respondents who indicated increased levels of capitalisation of their enterprises. Around 74% of the respondents reported capitalisation of less than 1.5 million rands before joining the programme (see **Figure 15**). This number was reduced to 55% post the programme. The proportion of respondents with enterprise capitalisation of 5 million and above increased from around 10% to 24%.

Figure 15: Composition of enterprises' capitalisation pre- and post-GCIP



Beyond an increase in capitalisation, about 53% of the respondents to the question regarding the value of sales made in 2021 indicated that they had made a positive sale, with total sales among respondents in this year amounting to about ZAR6,580,278. Around 39% registered at least one patent; 64% managed to attract at least one business partner, and 67% reported winning at least a competition besides GCIP (see **Table 2**).

Table 2: Other indicators of growth of GCIP enterprises.

Item	Percentage that reported positive values	Total
Number of patents registered	38%	42
Number of licenses signed	11%	6
Number of partners attracted	64%	>95
Number of competitions won	67%	>82
Estimated value of sales in 2021 (ZAR)	53%	6,580,278
Estimated value of exports in 2021 (ZAR)	14%	276,493

Investment into cleantech

An indicator of how the programme stimulates investment into the cleantech sector is the value of financing attracted by Alumni who participated in the programme. A total of 36 enterprises responded to the question regarding their enterprise source of funding. The results are reported in **Table 3**, where the total sales from these enterprises amounted to 231Million rand. Encouragingly, most of the financing, 45%, came from the private sector; around 36% came from the South African Government incentives, and self-financing accounted for the rest.

Table 3. Funding received by Alumni (the 25 respondents) from different financing schemes.

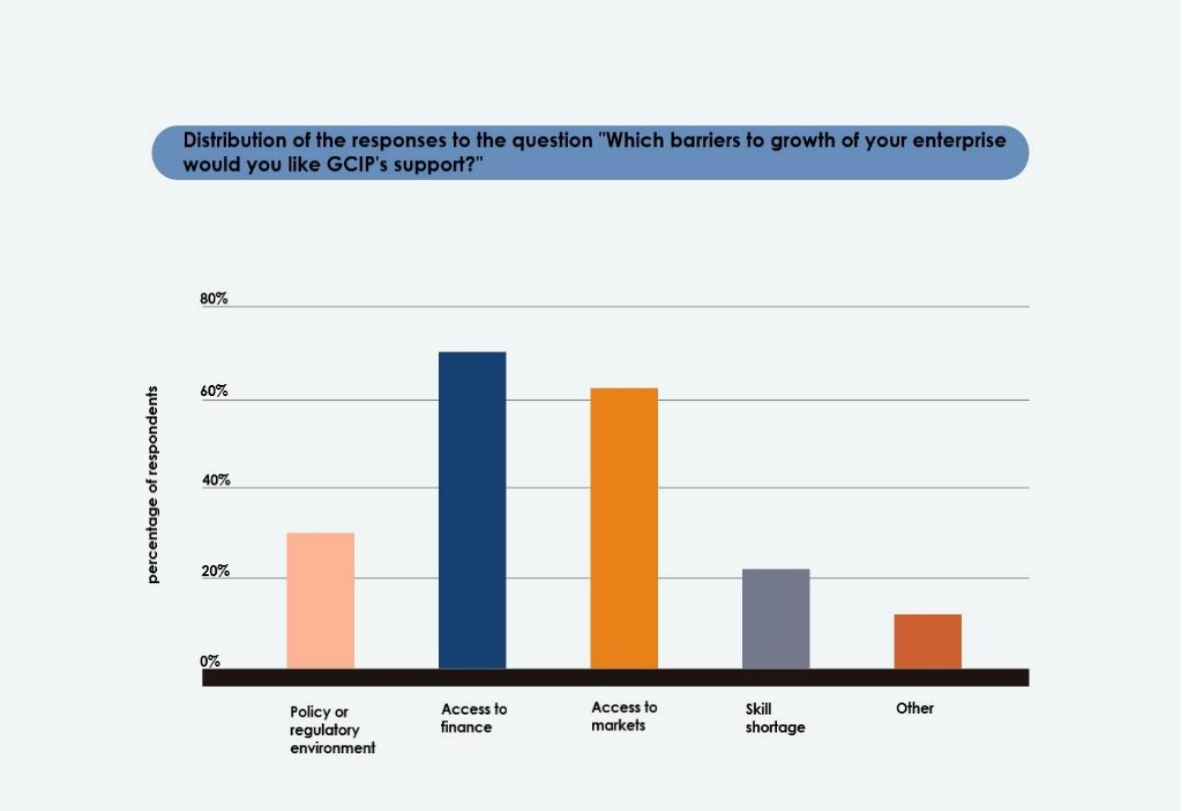
Financing schemes	Amount (ZAR)	Percentage
South African Government incentives	84,059,000	36.5%
Private sector incentives	104,330,000	45%
Self-funding	42,690,501	18.5%
Total	231,079,501	

It is important to note that around 72% of the financing from the private sector went to one enterprise. When this one enterprise is removed from the list of 36 respondents, the private sector financing accounts for only 19% of total financing and government incentives account for 54%.

On the one hand, these figures highlight the South African government's interest in promoting the growth of SMEs and start-ups overall and those in the cleantech sector. It also highlights the commitment of entrepreneurs to their innovations and businesses. And on the other, they underscore Alumni and start-up SMEs' struggles with accessing private sector financing in South Africa.

To elaborate on this issue further, we asked Alumni to list the barriers to the growth of their enterprises for which they would like support from GCIP 2.0. The results, reported in **Figure 16**, indicate that around 70% of the respondents would like support with access to finance, followed by access to markets, policy, and regulatory environment.

Figure 16: Distribution of the responses to the question "Which barriers to growth of your enterprise would you like GCIP's support?"



The challenges to accessing private sector financing seem primarily due to a lack of investors willing to invest in small, young, and risky SMEs, as highlighted in **Section 3.3.1** above. Most of the Alumni and programme partners share this sentiment.[25] Start-ups face a chicken-and-egg situation where private investors are willing to invest in operational businesses, generating revenue and requiring growth capital. But to reach this stage, start-ups require funding. The role of TIA and other government agencies with related mandates should then be to help start-ups, through various funding schemes, to overcome this chicken-and-egg situation to leapfrog from idea, concept and needs validation stages to scaleup, at which point the private sector starts to get involved.

3.4. Impact

The goal of GCIP is to support enterprises to scale up into fully fledged enterprises in the cleantech sector, with an ultimate long-term impact on job creation within the national economy, energy savings

[25] To quote one innovator: *"In the US, I can knock on many doors to get investment funding of over 5million rand, but in South Africa, I can knock on only two doors"*. And one of the programme partners remarked that *"It is frustrating to keep on mentoring someone who is not going anywhere because of financing, without financing we cannot even talk about commercialisation."*

and GHG emission reduction. The evaluators examine the potential of the programme to achieve its intended long-term impact, focusing on jobs and wealth creation.

Job creation

Around 50% of surveyed and active alumni recorded an increase in the number of employees. The number of new jobs created is 100, an increase of 74% from 136 jobs pre-GCIP to 236 jobs post-GCIP.

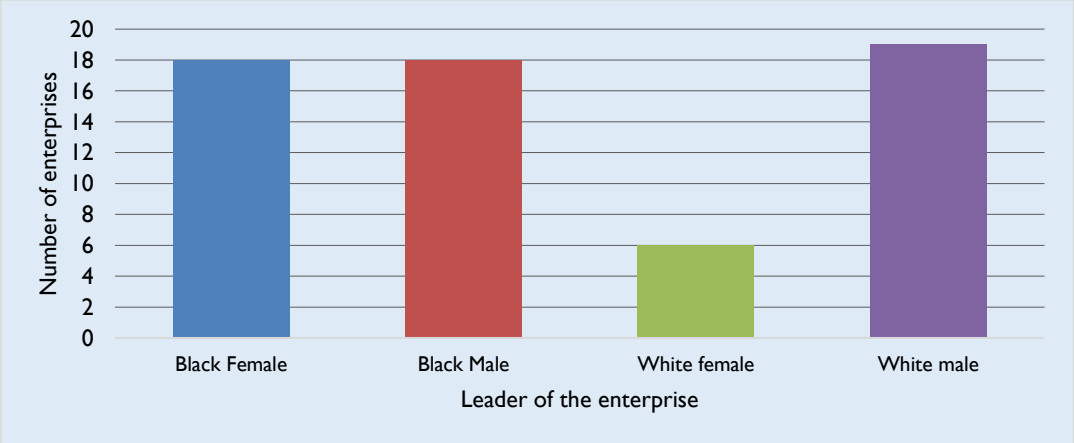
This increase in the number of employees in these enterprises is significant and highly encouraging, especially because most of these enterprises are not yet at the full commercialisation stage. As these enterprises grow, the number of created jobs can also be expected to grow. What is also encouraging is the distribution of new jobs across gender and the potential these enterprises have in absorbing unemployed youth.

The study could not confidently link all these new jobs directly to the GCIP programme. Still, it can be argued that the resilience exhibited by these enterprises is partly due to the skills learned, knowledge transferred, and networks created during their participation in the programme. This resilience makes start-ups survive from idea to commercialisation to scale-up and profitability.

Gender mainstreaming and inclusiveness

A total of 40 out of 139 (29%) enterprises that went through the programme were led by women. This is within the range (10-30%) of women's participation among other countries implementing GCIP. The number of enterprises in the evaluation sample that are currently led by women is even higher and stands at 24 (around 36%) out of 61 enterprises (**Figure 17**).

Figure 17: The gender of leaders of the enterprises in the evaluation sample.



Overall, the programme's performance in the dimension of gender mainstreaming improved from 2017 following a meeting of the PMU with the UNIDO headquarters' gender specialist to devise a strategy to attract more female entrants. TIA and the management team subsequently introduced a more tailored approach and broadened outreach to encompass more Women, Youth and Black Entrepreneurs from 2017, which included strategic outreach (university visits, affirmative action), use of special category awards, and media profiling. This led to an increase in women semi-finalists in 2017 to 32%, up from 14% in 2015 and 19% in 2016. Nevertheless, more work needs to be done to support female-led start-ups who indicated struggles with the GCIP's stringent pace, expectations, and ruthless approach to prepare for pitching to investors.

There are also potential benefits in gender mainstreaming and inclusiveness post the programme. The number of youths and women employed in the surveyed enterprises increased by 143 percent and 74 percent, respectively (see **Table 4**). What is also encouraging is the distribution of new jobs across gender and the potential these enterprises have in absorbing unemployed youth.

Table 4. Composition of employees of the surveyed enterprises

	Pre-GCIP	Post-GCIP	Percentage change
Number of women employees	33	66	74%
Number of male employees	61	114	87%
Number of youth employees (<35 years of age)	44	107	143%

Economic impact

There is a potential for economic impact by the programme's alumni enterprises. Although most of these enterprises are not yet beyond the scaleup stage, 6 (around 19%) survey respondents reported paying business taxes totalling around ZAR 1 million. The other forms of economic impact include (see **Table 5**):

- **Revenue generation:** at least 18 enterprises made sales totalling to ZAR 6,580,000.
- **Local and global economic competitiveness:** at least 4 enterprises made exports totalling ZAR276,000, and at least14 enterprises registered around 42 patents.
- **Socio-economic impact:** Some innovations address challenges faced by vulnerable groups and communities (e.g., sanitation, energy access, fire-proof building materials for informal settlements, etc.).

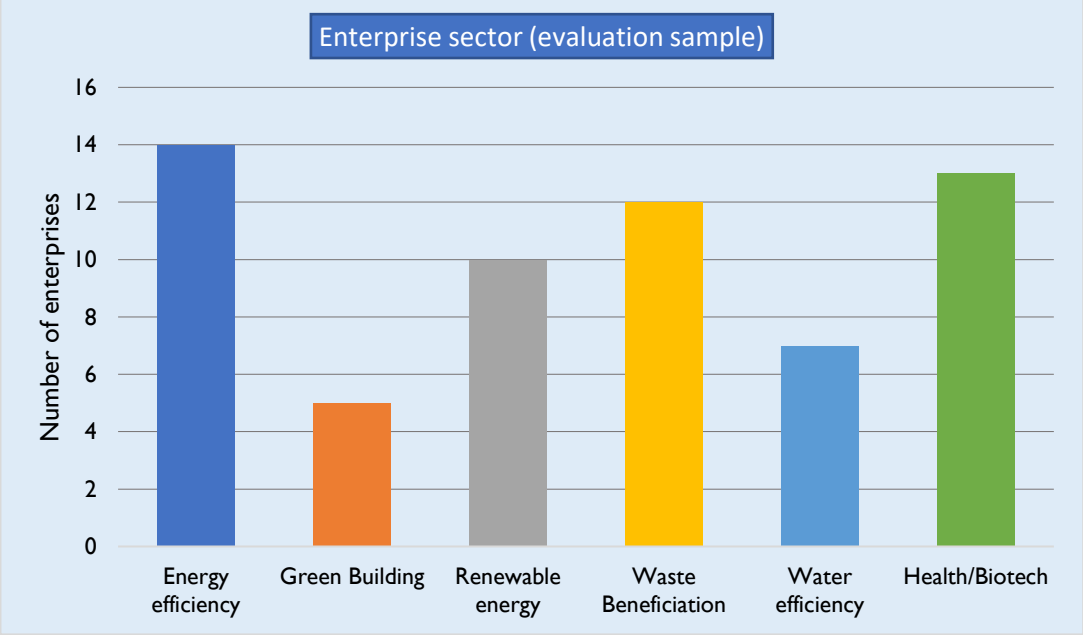
Table 5. Economic indicators of surveyed enterprises

	Number of enterprises that reported positive values	Total amount
Estimated value of taxes paid to date (ZAR)	≥ 6	1,000,000
Estimated value of sales in 2021 (ZAR)	≥ 18	6,580,278
Estimated value of exports in 2021 (ZAR)	≥ 4	276,493
Number of patents registered	≥ 14	42

Energy savings and GHG emission reduction

It was not possible to place approximate figures on the potential for energy savings and GHG emission reductions by the programme alumni enterprises. However, 48 (around 79%) enterprises in the evaluation sample are in energy and water efficiency, green building, renewable energy, and waste beneficiation (**Figure 18**). Cleantech innovations in all these sectors have the potential to directly reduce energy wastage and GHG emissions. Around 21% of the surveyed enterprises are active in the health and biotech sectors. But these enterprises are also admitted to the GCIP programme on the basis that their products are environmentally friendly.

Figure 18: The sectoral distribution of the 50 GCIP alumni enterprises that responded to the online survey



Impact on sustainable development goals (SDGs)

Through its intended outcomes and impact, GCIP addresses multiple sustainable development goals (SDGs), some directly and others indirectly. The SDGs that GCIP directly addresses are Goal 3 – Good health and wellbeing; Goal 5 – Gender Equality; Goal 6 – Clean Water and Sanitation; Goal 7 – Affordable and Clean Energy; Goal 8 – Decent Work and Economic Growth; Goal 9 – Industry, Innovation, and Infrastructure; Goal 11 – Sustainable Cities and Communities; and Goal 13 – Climate Action. And it indirectly addresses Goal 1 – No Poverty, Goal 4 – Quality Education, and Goal 10 – Reduced Inequality.

SDGs addressed	How GCIP addresses the SDGs
Goal 1: No Poverty	Through impact on job and wealth creation.
Goal 4: Quality Education	Through business skills development, consisting of high-quality training & mentorship.
Goal 5: Gender Equality	Through gender mainstreaming: at least 36% of the enterprises are led by women; and 37% of the enterprises' employees are women.
Goal 6: Clean Water and Sanitation	31% of the surveyed enterprises are in waste beneficiation and water efficiency.
Goal 7: Affordable and Clean Energy	39% of the surveyed enterprises are in energy efficiency and renewable energy.
Goal 8: Decent Work and Economic Growth	Through jobs created and economic impact.
Goal 9: Industry, Innovation, and Infrastructure	By identifying & supporting promising innovations; and building a cleantech ecosystem.
Goal 10: Reduced Inequality	Through job creation and economic impact. One of the main causes of inequality in South Africa is lack of employment opportunities.
Goal 11: Sustainable Cities and Communities	Around 8% of the surveyed enterprises developed innovations in green building.
Goal 13: Climate Action	79% of the surveyed enterprises are active in sectors that directly reduce GHG.

3.5. Lessons Learned

- South Africa has many young (below 35 years of age) innovators that are able and willing to initiate innovations in the cleantech space.
- The main challenge to young innovators is access to start-up finance and potential business partners, without which innovators are doomed to fail.
- Most innovators can access online programmes in business development, but GCIP stands out in terms of the quality of business development training services, the opportunity to have direct interactions with mentors, business experts and fellow innovators, and the full range of support services it offers to innovators.

- To maximise its impact, GCIP must do a lot more to help connect innovators to investors and/or develop ways to fund innovators who are stuck in pre-commercialization and start-up stages. Without access to finance, the other services, like business skills development, that the programme offers are of minimal value.
- The effectiveness of the programme can be greatly improved by strengthening collaboration with the private sector and other government departments with related mandates.

3.6. Sustainability

The study identified issues of sustainability that require attention, as explained below,

(a) The sustainability of the programme's initiatives could be achieved if it assists the enterprises in connecting with other partners such as NYDA, SEFA, and other private sectors rather than leaving it to the Alumni. As one of the Judges put it, *"Most of these Alumni are young and depending on their background, may not have the knowledge of accessing such services or know how to apply."*

(b) Some mentors built a strong relationship with the Alumni; it would help if there were a platform to engage enterprises for continuous engagement. This platform can be done in the form of knowledge management where Alumni, in their own time, can access guidelines or toolkits on how to do certain things from forums of engagement where Alumni can engage each other and with experts.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

Programme design

- The programme objectives and outcomes are clearly defined. The main objectives are to promote, through a competition-based accelerator, cleantech innovations and develop and strengthen a cleantech ecosystem. The Project Management Unit (PMU) was appointed to set up and manage the competition-based accelerator and strengthen and develop the policy and regulatory framework for cleantech innovations.
- Although not clearly defined, the programme outcomes are derived from the programme Theory of Change. The indicators of programme success were not defined at the national level. This makes it impossible to state more precisely whether the programme is successful, at least at the national level. Nonetheless, the evaluators identified suitable indicators for examining the extent to which the programme has achieved intended outputs and outcomes.

- The programme lacks a clear plan and system for keeping track of and engaging with the programme's alumni. This is necessary for both programme evaluation purposes and for maintaining the programme's sustainability.

Relevance

- The evaluators examined the programme's relevance to South Africa's cleantech, particularly the SMEs sector, and found that its goals and objectives align with the beneficiaries' needs.[26] South Africa has a high failure rate of young businesses attributed to a lack of access to finance and business skills required to survive through the technology start-up "valley of death."
- Business skills were imparted through a series of business model training webinars, business mentorship and advice from technical experts. The programme did not offer start-ups direct financing but a platform through which entrepreneurs forge connections with investor networks.
- Innovators found most programme components to be relevant. They highly appreciated the knowledge learned through the business skills development activities, the experience and confidence gained through business pitching and national and international travel, and the business connections and partnerships created during the retreat-style national workshops and international competitions.

Effectiveness

- The competition-based accelerator was successfully implemented and supported by the relevant actors led by TIA as the PMU.
- More work needs to be done to bring in actors from the private sector and other government institutions with related mandates. This is necessary if further progress in building the cleantech ecosystem is to be made. More work also needs to be done on the policy and regulatory front.
- More work needs to be done to increase awareness about the potential of cleantech technologies. The approach of raising awareness about the programme through talks at science and engineering departments at universities is bearing results and should be expanded to business schools and colleges. The evaluators encountered some enterprises led by entrepreneurs with business and finance educational backgrounds.
- The business skills development components of the programme (i.e., mentorship on business development, training for business plan development, technical advice through sector experts) were effectively implemented. Around 70 percent of the surveyed innovators gave a rating of 4

[26] The strategic relevance of the programme was examined in detail by the Global Environment Facility Independent Evaluation Office's (GEF-IEO) evaluation in 2018. GEF-IEO's evaluation highlighted that GCIP is fully relevant to the national priority of environmental protection and national development goals.

and above to mentorship on business development (in rating the quality of each service from 1-5, with 5 being the highest), and 68 percent gave the same rating to training for business plan development. However, some innovators whose innovations were at an advanced stage (e.g., start-up and scale-up) felt that some business training activities were not relevant to them.[27] Business skills training services should be differentiated according to the stage of the innovation journey.

- Innovators highly appreciated the opportunity to showcase their technologies and make business connections the programme offers.
- Innovators appreciated the prizes they won, in the form of financial help from TIA, ranging from ZAR100,000 – ZAR300,000. This financial support helped mostly in product development, although not enough to make progress to the advanced stages of technology development.
- There was an opportunity for winners of the competition, deemed the most promising innovations, to apply for grants through TIA, but most innovators who went through this process were dissatisfied with the due diligence process, the complexity of the application process, and the long waiting time to receive funding. They felt that the committee of experts conducting due diligence did not correctly capture their technologies' social, economic and market value.
- Innovators forged lasting connections with fellow innovators met during the programme. However, most innovators felt they could not establish useful business connections outside of connections with fellow innovators met during the programme; this is even more so for connections with potential investors. Most innovators felt that the pool of potential investors that turned up at the programme's events was small.
- Most surveyed alumni enterprises progressed from idea, concept and needs validation stages to pre-commercialisation and startup. But many, around 63 percent of the 50 surveyed enterprises, are stuck at these two stages. Only 10 percent progressed from earlier to scaleup stage (i.e., deployed and generating revenue but not yet profitable).
- There is increased investment in the form of government incentives and self-funding into the cleantech sector, at least based on the funding received by innovators who responded to the online survey. Funding from the private sector was the largest, but around 72 percent of it was sourced by one enterprise that is already at the scale-up stage. The rest of the enterprises, especially those stuck at pre-commercialisation and commercial pilot, spoke of difficulties sourcing funding from the private sector. Innovators indicated that few private sector investors are willing to invest in businesses that are not at the scale-up stage.

[27] And to quote one innovator and implementing partner, *"You cannot train me on establishing business when I am still struggling even with my product. I need to focus first on making sure my product works. I need money for Research and Development. I need my product to be registered first before training me to establish the business". "It is important that the support being given to SMEs is differentiated on the stage, product type, and needs than having a blanket approach".*

Impact

- There is evidence of the potential for job creation by the programme alumni enterprises. Although most surveyed enterprises are stuck in pre-commercialisation or start-up stages, the number of employees in these enterprises increased by over seventy percent, highlighting their high potential in job creation as they progress to the scale-up stage.
- There is a demonstrable impact on gender mainstreaming and inclusiveness. Around 30 percent of the enterprises were led by women, and there is a significant increase in the number of women and youth employed in these enterprises.
- There are indications of the potential economic impact of alumni enterprises in the form of tax contributions, increase in local and international market competitiveness, revenue generation, and socio-economic impact on local communities.
- The programme addresses multiple sustainable development goals (SDGs), some directly (e.g., Goal 5 – Gender Equality; Goal 6 – Clean Water and Sanitation; Goal 7 – Affordable and Clean Energy; Goal 8 – Decent Work and Economic Growth; Goal 9 – Industry, Innovation, and Infrastructure; Goal 11 – Sustainable Cities and Communities; and Goal 13 – Climate Action), and some indirectly (e.g., Goal 1 – No Poverty; Goal 4 – Quality Education; and Goal 10 – Reduced Inequality).

4.2. Recommendations

Establishing a strong ecosystem

- The programme should increase engagement with private-sector actors and other government departments with mandates in entrepreneurship, innovation, cleantech, job creation, etc. There is a need to develop a clear partnership with relevant actors who can increase the programme's effectiveness, delivery, and ultimate impact.
- Participation from the private sector individuals and organisations is particularly necessary to improve the quality of programme components, including mentorship, technical advice, financing, and creating business partnerships. Most enterprises that made progress post-GCIP did so through forming relevant business partnerships. The Aspen Network of Development Entrepreneurs (ANDE) 2017 report provides an extensive list of private sector organizations, institutions, and DFIS working within South Africa's entrepreneurial ecosystem that TIA can coordinate and work with.

- Explore strong collaborative mechanisms with other TIA units, the Innovation Hub, Green Cape, and other national and provincial level initiatives in the greening agenda so that (financial and non-financial) support provided to innovators is well-coordinated.
- Programme outreach through talks at university science and engineering departments should be maintained and expanded to other university departments, business schools, and colleges.

Innovator support and training

- The current set up of the two components of business skills development, "mentorship on business development" and "training for business plan development", should be maintained in GCIP 2.0. Innovators found implementing these two components of the programme to be of high quality. The quality of delivery can be further improved by ensuring that innovators are matched with mentors who have experience in innovators' technology and business fields.
- The implementation of the third component of business skills development, "technical advice through sector experts", should be improved by getting more experts from the private sector, including successful programme alumni, engaged in the programme. Technical experts can help innovators through either direct involvement in mentorship or an online forum that should be created for the programme.
- Business skills development services could also be differentiated and tailored to the needs of the innovators based on the type of innovation and stage of the innovation journey the enterprise is at.
- Judges should provide clear and detailed feedback to innovators on areas of improvement in their technology and innovation journey. Some innovators felt the results of the competition were announced without the judges providing the logic behind their decisions, which innovators believe would be useful feedback to them going forward.
- TIA's financial support to innovators in the form of prizes to the competition winners should be maintained and broadened. Although these prizes tend to be of small value, they help some innovators whose technology is in idea stage to progress with product development. There are no investors willing to support enterprises at idea to concept stages.
- On post-programme assistance to innovators, the PMU should not promise more than it can deliver, especially on issues of financial support. Otherwise, the high expectations created and eventually not fulfilled can lead to a demotivated innovator with a potentially negative effect on the willingness to progress in the innovation journey. In addition, the due diligence process for post-programme grants to innovators should be streamlined to simplify the application process,

shorten waiting times, and ensure that the technologies' social, economic and market value are correctly captured.

- Create an online platform consisting of the programme's alumni, private sector experts, potential investors, business leaders, and other entrepreneurs and stakeholders interested in cleantech innovations and SMEs. Innovators could use such a platform to seek advice on technical issues regarding their business, form business partnerships, reach out to potential investors, and advise on the type of seed funding they are eligible for and how to apply for it.
- GCIP 2.0 should focus on financially supporting enterprises at the scale-up stage and those at pre-commercialisation and start-up. Most active GCIP 1.0 alumni enterprises are stuck in pre-commercialisation and start-up stages due to challenges with access to private sector finance.

Sustainability

- The plan and system for keeping track of and engaging with the programme's alumni should be developed. This is necessary for both programme evaluation purposes and for maintaining the programme's sustainability.
- A payment mechanism for mentors and experts should be built into the programme. Free mentorship may not be sustainable. The mentors, judges, and programme advisers the evaluators spoke to show a willingness to continue to support the programme. However, given time constraints and the availability of willing experts, it may be necessary to offer some incentives to encourage participation.

5 APPENDICES

5.1 Appendices 1Evaluation matrix

Appendix 1-Evaluation matrix.

5.2 Appendices 2: Data collection instruments

Appendix 2 a Online Survey GCIP

Appendix2 b-SSI for cleantech Eco-syster

observation Appendix 2 c-Site checkli

Full Database Evidence Compilation

Final GCIP Innovators
all surveyed 3 July 20.

5.3 Appendices 3: List of key informants

GCIP-All
Contactable Innovat

Final GCIP
Innovators all survey

5.4 Appendices 4: SME Innovator Profiling reports

Sent separately

5.5 Appendices 5: List of non-Responsive Alumni

Appendix 6-All
cellphone contacts.