



Independent
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GLOBAL ENVIRONMENT FACILITY

Evaluation of the GEF-UNIDO Global Cleantech Innovation Programme

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FULL REPORT



Global Environment Facility
Independent Evaluation Office

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Cover: Cleaning solar panels at Morocco's Ain Beni Mathar Integrated Combined Cycle Thermo-Solar Power Plant, by Dana Smillie/World Bank

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Foreword

The Global Environment Facility (GEF) is increasingly recognizing the fundamental role of the private sector in tackling the most pressing environmental issues. Over time, this has resulted in a strategy directed at expanding private sector engagement across all GEF focal areas and integrated programs. The GEF Independent Evaluation Office reviews have found that, although engagement is still limited, the GEF is uniquely positioned to catalyze private sector investments for global environmental benefits.

The GEF–United Nations Industrial Development Organization (GEF-UNIDO) Global Cleantech Innovation Programme (GCIP) for small and medium enterprises seeks to encourage cleantech entrepreneurial solutions for pressing environmental and economic challenges, particularly in the area of climate change.

The purpose of this evaluation of the GCIP is to provide stakeholders with insights into the program and lessons for similar future projects and programs. The main objective of the evaluation is to assess the relevance, additionality, outcomes, and sustainability of the program. This evaluation used a mixed-methods approach, and the GEF Independent Evaluation Office collaborated with the UNIDO Evaluation Office, participating and drawing on terminal evaluations being carried out by UNIDO-contracted evaluation consultants for India, Pakistan, South Africa, and Turkey, conducted just ahead of the global review.

Although labeled as a global program, the GCIP is implemented as separate national-level projects; thus, this review is based on eight projects, which were either under implementation or completed, and a ninth project that had just started.

The final report was presented to the GEF Council in December 2018. The United Nations Framework Convention on Climate Change's 24th meeting of the Conference of Parties, which took place in Katowice, Poland, in December 2018, also provided an important platform to present highlights of the evaluation. The results will also be shared through brief summaries and discussions of findings on online forums, and in knowledge events, such as seminars with the evaluation community and expanded constituency workshops for regional and country stakeholders organized for 2019.



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Acknowledgments

Baljit Wadhwa, then Senior Evaluation Officer of the Global Environment Facility Independent Evaluation Office (GEF IEO), led this evaluation. The team consisted of Joyce Miller, Senior Evaluation Consultant; Molly Watts Sohn, Evaluation Analyst; and Sara El Choufi, Evaluation Analyst.

Quality control and substantial inputs on evaluation design, implementation, and the overall report was provided by Geeta Batra, IEO Chief Evaluation Officer. Overall oversight was provided by Juha I. Utto, Director of the IEO.

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The GEF IEO is grateful to all these individuals and institutions for their contributions. Final responsibility for this report remains firmly with the Office.

Abbreviations

COP	Conference of the Parties	PMU	project management unit
CTO	Cleantech Open	PSC	project steering committee
GCIP	Global Cleantech Innovation Programme	SMEs	small and medium enterprises
GEB	global environmental benefit	STAR	System for Transparent Allocation of Resources
GEF	Global Environment Facility	tCO ₂ e	tons of carbon dioxide equivalent
GHG	greenhouse gas	TIA	Technology Innovation Agency (South Africa)
IDEMI	Institute for Design of Electrical Measuring Instruments (India)	TÜBITAK	Scientific and Technological Research Council (Turkey)
IEO	Independent Evaluation Office	UNIDO	United Nations Industrial Development Organization
MSP	medium-size project		
MTR	midterm review		
M&E	monitoring and evaluation		

The GEF replenishment periods are as follows: pilot phase: 1991–94; GEF-1: 1995–98; GEF-2: 1999–2002; GEF-3: 2003–06; GEF-4: 2006–10; GEF-5: 2010–14; GEF-6: 2014–18; GEF-7: 2018–22.

All dollar amounts are U.S. dollars unless otherwise indicated.

Executive summary

The Global Environment Facility (GEF) has a long history of engagement with the private sector.¹ The GEF–United Nations Industrial Development Organization (GEF–UNIDO) Global Cleantech Innovation Programme (GCIP) is the major product of Modality 3 of the GEF-5 Revised Private Sector Strategy (GEF 2011c).

The GCIP is one example of GEF support to the development of small and medium enterprises (SMEs). SMEs are, by definition, modest in size and constitute the backbone of developing economies where they account for the majority of employment and jobs created. Under the GCIP, support was focused on SMEs developing clean technologies and solutions that can deliver global environmental benefits (GEBs).

As part of the GEF Independent Evaluation Office's (IEO's) evaluations of GEF engagement with the private sector, this report presents a summary of results of an independent evaluation of the GCIP. The following questions have been investigated based on implementation of GCIP projects in eight countries since 2013:

- What is the relevance of the GCIP in the participating countries?
- How effective has GCIP been in meeting its planned outputs and outcomes?
- How efficient was project delivery?
- What direct and indirect impacts did the GCIP deliver? What was the additionality of the projects?
- To what extent are the GCIP's results likely to be sustained in the long term?

This report is intended to be useful to a broad range of audiences. It will inform the GEF Council, the GEF Secretariat, participating country operational focal points, and UNIDO, the GCIP implementing agency, about the relevance, additionality, outcomes, and sustainability of this program to improve the design, performance, and impacts of similar future projects and programs.

The evaluation adopted a mixed methods approach, encompassing qualitative and quantitative data and analysis. The evaluation team began with a focused document review and then interviewed GEF Secretariat staff, UNIDO staff, government representatives, and private sector stakeholders (GCIP participants as well as other actors). The evaluation team met with GCIP 2017 national winners of the competition-based accelerator at the annual Cleantech Open Global Forum in

California.² The GEF IEO also collaborated with the UNIDO Evaluation Office to reflect the above questions in the terminal evaluations that were being carried out for GCIP projects in India, Pakistan, South Africa, and Turkey. Terminal evaluations completed over the past two years for Armenia and Malaysia were also part of the evidence base. Online surveys were administered to GCIP participants in India, Turkey, Pakistan, and South Africa as well as to all UNIDO GCIP project managers, both in country and at headquarters. The survey of GCIP participants had an overall response rate of 24 percent, and participation varied across the four countries. The project managers' survey had a 100 percent response rate.

Labeled as a global program, UNIDO implemented GCIP as nine separate national-level projects. Six of the countries had completed implementation at the time of evaluation (Armenia, Malaysia, India, Pakistan, South Africa, and Turkey). Information (project implementation reports, available midterm reviews, and interviews) from GCIP projects under way in Thailand, Morocco, and Ukraine was also considered in this evaluation. Lack of a fully shared understanding of indicators, targets, and definitions has limited the comparability and aggregation of results.

GCIP origin and overview

The GCIP traces its origins to the 2011 United Nations Framework Convention on Climate Change Conference of the Parties (COP) in South Africa where the Greening the COP17 in Durban project (GEF ID 4514) was launched with GEF–UNIDO

support. The objective of the project was to lower the ecological footprint of the COP17 and showcase targeted activities under the National Greening Programme and the South Africa–GEF Partnership. The Innovative Technology Competition for SMEs was one of four components of the medium-size project (MSP) and was intended to increase awareness of the role of clean technologies in enhancing SME competitiveness (GEF 2011b). The terminal evaluation concluded that the competition was successfully organized, delivered a comprehensive business training program, and created capacity for a future cleantech competition (UNIDO 2013).

Based on the success of the COP17 competition and as recommended in the project's terminal evaluation, the GEF and UNIDO made a joint decision to develop a global flagship program on cleantech for SMEs: the GCIP. According to interviews, UNIDO initially proposed a programmatic approach and the GEF Secretariat indicated that it would be more effective and efficient to implement the GCIP through separate country projects. Global coordination was implicitly indicated in project documents, however, without a specific budget for this management activity.

The GCIP set out to reduce and mitigate several barriers to a functioning cleantech entrepreneurial ecosystem:

- Lack of an enabling regulatory environment
- Limited access to finance (mismatch of start-up needs and offers of government/financing institutions; lack of interaction between SME innovators and potential investors)
- Lack of public awareness regarding market potential of low-carbon innovation technologies
- Lack of start-ups' strategic business planning and marketing skills

¹ The GEF has undertaken work with private sector engagement since 1996, when the first strategy for engaging the private sector was finalized based on recognition that in order to bring about transformational change to the global environment, public and private sectors must work together.

² Cleantech Open is a Silicon Valley–based accelerator. It hosts an annual Global Forum that brings together winners of national cleantech competitions, including winners from participating GCIP countries, to pitch their ideas and meet investors, other entrepreneurs, sponsoring companies, academia, and the press.

- Lack of coordination among sectoral players on market intelligence research (undermining decision making regarding market opportunities and penetration strategies)
- Lack of public awareness regarding low-carbon innovation technology's market potential

GCIP projects were designed to address incremental reasoning/additionality of GEF involvement in the projects. The rationale cited for GEF support was to address the above-mentioned barriers. Without the GEF, it was deemed unlikely that the countries could run a cleantech SME competition and support business acceleration of start-ups in the coming years. This would result in lost opportunities to nurture entrepreneurs, reduce emissions, and strengthen partnerships with the private sector.

The GCIP theory of change design relies on a structured approach focusing on three components:

- Establishing a national platform for an annual competition-based accelerator. This component would identify/nurture emerging cleantech start-ups by coordinating among existing national initiatives.
- Building the capacity of national institutions and partners to sustain the ongoing organization of the competition-based accelerator
- Strengthen and develop the policy/regulatory framework for cleantech innovation

In 2013, the GCIP was launched in Armenia, India, Malaysia, Pakistan, South Africa, and Turkey. Morocco and Thailand joined in 2016. The concept for a Ukraine GCIP with an accompanying project preparation grant was approved in August 2017. The CEO project approval came in October 2018. All are "smaller" projects, i.e., MSPs planned to run for three years with a target of two to three

annual competition-based accelerator cycles.³ GEF funding was only between \$0.5 and \$2.0 million complemented by cofinancing on the order of two to eight times the level of the GEF grant. With the restricted resources, the national projects were expected to initiate the accelerator, put in place the policies, capacities, institutional frameworks, and gather support from public and private sector cosponsors to sustain the competition-based accelerator and other project results and benefits, post completion.

Within each country, the initiative was anchored through a local host, typically a government agency focused on SME development, science, or innovation. The host was supported by a project management unit (PMU) acting as its secretariat, with guidance provided by a project steering committee composed of relevant stakeholders and cofinancing partners seen to most likely benefit from project outcomes, and who could play a role in sustaining results.

Projects were designed to have private sector contributions as a key pillar of project delivery. Entities such as Chambers of Commerce and Business Associations were involved as project steering committee members and could tap into relevant networks to support the PMU. Mentoring, technical know-how, investment, and market access were brought in primarily on a pro bono basis to contribute to enhanced climate action and job creation.

The GCIP mechanism was designed to identify and nurture the most promising cleantech innovators in a country. The competition-based accelerator functioned as an "innovation funnel." Entrants were screened and whittled down to a set

³ In 1996, when the GEF introduced the MSP modality, the initial proposal was for midsize grants ranging between \$50,000–\$750,000. This was increased to \$1 million. The MSP grant ceiling was raised to \$2 million in November 2012.

of "semifinalists." Their ideas were shaped through training delivered by UNIDO's knowledge partner, Cleantech Open, and mentoring sessions with local private sector actors (mentors, technical experts). GCIP participants then pitched to investors at national and international forums (figure ES.1). This process filtered out many of the entrepreneurs that applied to the competition. Stakeholders attested that those who completed the GCIP process were widely seen as "high quality." In principle this would increase the likelihood for their innovations to reach the market, reduce greenhouse gas (GHG) emissions, and create jobs.

Although GCIP projects were structured similarly, in response to country conditions and national priorities, there was some variation in country implementation strategies. Partly in response to local circumstances, and partly because of steering by local actors, participating start-ups differed in their stage of organizational maturity⁴ and technology development.⁵ In India, almost half of surveyed start-ups had been in existence for over 4 years. In Armenia, Pakistan, and Turkey, the majority had been established for less than 1 year. In South Africa, a higher percentage of supported start-ups had existed for one to two years. GCIP projects also achieved varying degrees of social inclusivity. Pakistan paid attention to recruiting teams led by women and youth; and in the case of South Africa, they also included black entrepreneurs. Dedicated resources to translation of training materials were not the same across countries. Turkey, Morocco, and Thailand translated materials, which enhanced access of non-English speakers.

⁴ Referring to organizational practices/processes, business skills, leadership competences, etc.

⁵ Spanning alpha testing to actively deploying technology and already being profitable.

By the end of 2017, the GCIP had supported 795 semifinalists across eight countries,⁶ spanning a variety of cleantech categories. An average of 32 start-ups per cycle per country benefited from the business acceleration activities and inputs. In 2017, the majority of start-ups were active in the field of energy efficiency (26 percent), followed by renewable energy (23 percent), waste to energy (20 percent), and water efficiency (20 percent); and through more recently introduced categories of green building (10 percent), transportation (1 percent), and advanced material (1 percent).⁷

Major findings

All six completed projects were rated in the satisfactory range for outcomes. Table ES.1 shows the performance ratings for the six GCIP projects evaluated to date. The overall assessment suggests that performance has improved over time. The first project implemented in Armenia was rated as "moderately satisfactory," and in Pakistan, where it was most recently closed, the project was rated as "highly satisfactory." In comparison, the overall "satisfactory" outcomes rating for the climate change portfolio, as reported in the GEF IEO Annual Performance Review, was 72 percent for the 2017 cohort and 77 percent for the total portfolio.⁸

Among the completed projects, there is consistency in ratings for relevance and donor

⁶ Not all national projects set targets for the number of teams/start-ups that would be supported. It is, therefore, difficult to put this number into context. Several countries set targets for number of applicants at 80–100 per year (South Africa, Turkey, Pakistan, and Thailand). Only South Africa explicitly set a target for support to "semifinalist" start-ups (initially 40–50/year and then revised down to 2025).

⁷ Percentage distribution for recently introduced categories should not be seen as a trend or standard.

⁸ Cohort of 2017 climate change projects is 71 projects; total portfolio is 376 projects (GEF IEO 2018).

FIGURE ES.1 The GCIP model's process and key milestones

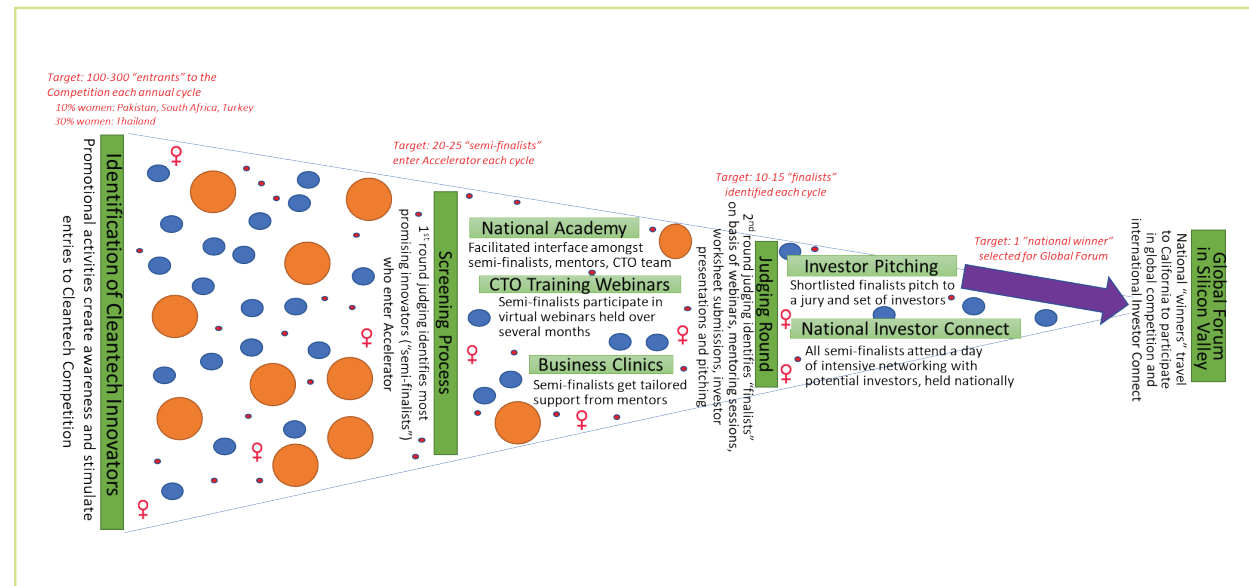


TABLE ES.1 Performance ratings from terminal evaluations of GCIP projects, by country

Evaluation criterion	Armenia	Malaysia	India	Turkey	South Africa	Pakistan
A. Impact rating	—	S	S	S	S	HS
B. Project design	MS	S	MS	S	S	HS
Overall design	MS	MS	MS	S	HS	S
Logframe	MS	MS	S	MS	MS	S
C. Project performance						
Relevance	HS	HS	HS	HS	HS	HS
Effectiveness	MS	S	S	S	S	HS
Efficiency	MS	S	HS	HS	S	S
Overall outcomes rating	MS	S	S	S	S	HS
D. Sustainability of benefits	ML	ML	ML	ML	L	HL
E. Cross-cutting performance criteria						
Gender mainstreaming	—	MS	U	S	S	HS
M&E	MU	MS	MU	S	S	S
Results-based management	—	—	HS	S	S	HS
F. Performance of partners						
UNIDO	MS	S	HS	S	HS	S
National counterparts	—	—	HS	S	HS	S
Donor	—	—	HS	HS	HS	HS
G. Overall assessment	MS	S	S	S	S	HS

SOURCE: Independent terminal evaluations of completed GCIP projects; UNIDO.

NOTE: — = not available; HS = highly satisfactory; L = likely; ML = moderately likely; MS = moderately satisfactory; MU = moderately unsatisfactory; S = satisfactory; U = unsatisfactory.

performance. There is some variation in effectiveness and efficiency, and slightly more variation is seen in ratings for sustainability, gender mainstreaming, and monitoring and evaluation (M&E). Four out of the six completed projects rated sustainability of outcomes only as “moderately likely” and pointed to limited country engagement on the part of key agencies as a contributing factor. A strategic approach to gender mainstreaming materialized more in some countries than in others. In Armenia, Malaysia, and India, there was little systematic monitoring and reporting, resulting in these terminal evaluations rating M&E as less than “satisfactory.” Pakistan has the highest ratings on almost all categories. The terminal evaluation attributes this to the high degree of engagement that national institutions displayed in collectively implementing the GCIP’s and UNIDO’s refinements in project management and monitoring approaches that better considered lessons learned from previous projects.

STRATEGIC RELEVANCE

All six of the completed GCIP projects have been rated highly satisfactory for relevance. The GCIP’s focus on a cleantech business model development distinguished it from other accelerators. In 2017, the Global Cleantech Innovation Index ranked the GCIP implementing countries in the lower half of 45 countries with functioning cleantech ecosystems.⁹ Malaysia was the highest ranked among the GCIP countries analyzed and Armenia, Morocco, and Pakistan formed the bottom three of the 45 countries reviewed. This suggests that there was a need

⁹ The Global Cleantech Innovation Index identifies countries with the greatest potential to produce start-ups that will commercialize clean technology innovations over the next 10 years. [The Global Cleantech Innovation Index 2017 Report](#) was extended to include GCIP partner countries (UNIDO, GEF, CTG, and WWF 2017).

and opportunity in these countries to develop the cleantech space.

The GCIP is consistent with national environmental and economic priorities. The GCIP supports country strategies to accelerate transformation to a low-carbon economy and is valued by governments and other stakeholders for its support to national start-up/SME agendas. The delivery of assistance to early stage start-ups filled a gap not covered by existing mechanisms. Thus far, four countries, Pakistan, South Africa, Thailand, and Turkey, have conceptualized a Phase 2 and are planning to request support under the GEF-7 cycle. Both Armenia and Malaysia expressed interest in continuing implementation of the competition-based accelerator beyond project completion. However, their submissions for a second phase were not endorsed. The reasons for these decisions are not known to the evaluation team.

The GCIP supports the GEF’s climate change focal area, private sector, and gender mainstreaming objectives as well as UNIDO’s mandate. The GCIP is aligned with the GEF “Revised Strategy for Enhancing Engagement with the Private Sector” (GEF 2011c), GEF climate change objectives to support countries in the transition to low carbon economies through market transformation, and the GEF “Policy on Gender Mainstreaming” (GEF 2012). The GCIP is also supportive of UNIDO’s mandate to promote Inclusive and Sustainable Industrial Development and furthers the agency’s Green Industrial Initiative.

RESULTS: ENVIRONMENTAL OUTCOMES

All assisted GCIP start-ups are developing innovations with climate benefits and other environmental and social cobenefits. Profiles in this report describe start-ups that are illustrative of the hundreds of the innovations with global environmental/social benefits that the GCIP has

supported, including access to environmentally friendly, affordable sanitary pads; reduction of agricultural waste; access to cleaner water; and reduced health risks, etc. Some of these benefits are also being realized through a focus on biodiversity, chemicals, and prevention of land degradation. GHG reductions are foreseen over a 10-year period (e.g., 2013–23), which is substantially beyond the duration of the national projects. Based on 14 start-ups in five countries,¹⁰ UNIDO has projected GHG reductions at 4.8 million tCO₂ by 2020. The reliability of these projected achievements is difficult to verify.

Only two terminal evaluations (South Africa and Pakistan) included projections of GHG emissions reduced and described the methodology used to make the assessments. Tracking and communicating positive environmental impacts (global climate stress reductions and improvement in environmental status) is difficult for many GEF projects as they usually take place well beyond project completion. This challenge is exacerbated by a lack of a GCIP standardized methodology for target setting and projection of impacts.

RESULTS: BENEFITS FOR SMES

The GCIP helped start-ups develop skills in business modeling, market segmentation, customer validation, and financial projections. Start-ups highly valued the use of mentors, peer-to-peer networking, and exposure to local investors.

“Business development training” was most frequently ranked as the most beneficial component of the GCIP by respondents, with 40 percent of all respondents ranking it first out of the eight components listed.¹¹ Sixty-eight percent of respondents

¹⁰ Armenia, India, Pakistan, South Africa, and Turkey.

¹¹ GCIP support elements include business development training, connection with an investor network, technical

ranked it as one of the top three. This is followed by “mentorship on business development,” which 19 percent of all respondents ranked as the first, and 56 percent ranked as one of the top three; and “opportunities to showcase technologies,” which 13 percent of respondents ranked as first, and 47 percent ranked as one of the top three most beneficial components (table ES.2). Respondents ranked “connection with an investor network/potential business partners, increased capacity of supporting government institutions, and improving the policy and regulatory environment” as the least beneficial.¹²

All respondents rated “business development training” as the very highest quality service provided by the GCIP, especially appreciated by Turkey and South Africa. This was followed by “mentorship,” and “opportunities to showcase their technology.” The results also pointed to limitations related to quality of networking activities with investors and business partners. Indian participants also rated technical advice through sector partners as lower in quality (table ES.3).

The GCIP’s uniform approach allowed for consistency in delivery of training components; however, there was opportunity for further country contextualization. There is a fine balance between maintaining standardization and customizing benefits for SMEs. In some instances, the

advice through sector experts, mentorship on business development, opportunities to showcase technology, connection with potential business partners, improving the policy and regulatory environment for business operations, and increased capacity of supporting government institutions.

¹² GCIP project managers ranked “opportunities to showcase technology, connection with potential business partners, and connection with an investor network” as the top three benefits and ranked the lowest “improving the policy and regulatory environment for business operations” (annex D).

TABLE ES.2 Top three ranking of most beneficial GICP components (% of respondents)

Component	Ranking	India (n = 24)	Pakistan (n = 45)	South Africa (n = 29)	Turkey (n = 22)	Overall (n = 120)
Training for business plan development	Ranked as most beneficial	33	44	34	45	40
	Ranked in top three	67	71	59	73	68
Mentorship on business plan development	Ranked as most beneficial	25	13	17	27	19
	Ranked in top three	54	38	66	82	56
Opportunities to showcase technologies	Ranked as most beneficial	25	13	10	0	13
	Ranked in top three	67	47	48	23	47

NOTE: Survey results based on 120 participant responses from four countries.

TABLE ES.3 Responses to survey question: How would you rate the quality of services you received?

Service	India		Pakistan		South Africa		Turkey		Overall	
	No.	Score	No.	Score	No.	Score	No.	Score	No.	Score
Training for business plan development	20	7.50	45	7.51	29	8.00	22	8.27	116	7.78
Connection with an investor network	23	4.61	45	4.76	29	4.69	21	4.86	118	4.73
Technical advice through sector experts	22	3.64	44	4.91	29	4.76	21	5.33	116	4.71
Mentorship on business development	21	5.90	45	6.04	29	6.41	21	7.33	116	6.34
Opportunities to showcase technology	24	5.92	45	5.91	29	5.66	22	5.45	120	5.77
Connection with potential business partners	23	3.76	44	4.64	29	4.28	21	4.76	117	4.40

NOTE: Survey results based on 120 participant responses from four countries. Respondents were asked to rate the quality of various inputs on a six-point scale from “very poor” to “excellent.” Weighted average score was calculated by first assigning numeric values to response choices (very poor = 0, excellent = 10), then calculating the overall average according to the number of responses to each choice. An overall score above 5.00 is positive; above 7.50 is highly positive. “N/A” and blank responses were omitted.

GCIP succeeded in providing specific assistance based on needs of SMEs. In India, where companies were at later stages of development, support was provided to gauge the technical feasibility of technologies. The slight majority of all participating start-ups entered at an early alpha phase. These start-ups reported that they too could have benefited from increased focus on the technical feasibility of their innovative idea, before advancing into the accelerator, which focused mainly on the business model and customer validation. Guidance

on country-specific regulatory environment and country-specific export market considerations would also have been helpful.

Select participating start-ups were able to access capital for their cleantech enterprises and attributed this to the GCIP. At least 12 start-ups in Armenia, India, Turkey, and South Africa had success in gaining access to venture capital, more so at the national-level in comparison to the international-level Investor Connect held as

part of the annual Cleantech Open Global Forum. These investments, ranging from \$5,000 to \$1.9 million, helped address a major hurdle in the commercialization of technology, i.e., access to capital, especially in a new domain like cleantech that does not easily qualify for traditional banking instruments.

RESULTS: SUPPORTING NATIONAL ENTREPRENEURSHIP ECOSYSTEMS

New job creation is expected as a result of GCIP support, but it is not being systematically tracked. Based on 14 start-ups in five countries,¹³ UNIDO has projected creation of 1219 new jobs by 2020. Furthermore, a recent World Bank Group report¹⁴ describes the significant potential of cleantech SMEs in developing countries to generate profits and create jobs, estimating this to be a \$1.6 trillion market opportunity. It is still too early to judge the quality of the UNIDO estimate, as many of the GCIP teams still lack the financial resources needed to test and transform their concepts into reality. Longer term monitoring is required.

The GCIP succeeded in building capacities of relevant institutions through “on-the-job” training to support subsequent organization of the competition-based accelerator. GCIP projects had positive effects in terms of enabling the local host institution to strengthen its reputation and convenor role within the national entrepreneurship system. These effects were particularly noticeable in South Africa, Turkey, and Thailand. Factors such

¹³ Armenia, India, Pakistan, South Africa, and Turkey.

¹⁴ This report illustrates the nature and likely size of the clean technology opportunity for SMEs in 145 developing countries over the next decade (World Bank 2014). In this period, expected investment across 15 clean technology sectors in developing countries is expected to exceed \$6.4 trillion. Of that total market, approximately \$1.6 trillion is expected to be accessible to SMEs.

as shifting staff, fewer competitions, and slow starts meant that in some countries (Armenia, Malaysia) there was less organizational competence built, and as of the date of this evaluation, the projects were not set to pursue a second phase.

National coordination through cross-departmental and cross-institutional partnerships was not explored to its full potential. The GCIP was expected to dynamize the national entrepreneurship ecosystem by exerting a national-level coordinating force. Respondents interviewed for this evaluation asserted that “the GCIP should be linked with other support programs and the start-ups should see these as a sequence; for example, after being supported by the GCIP, the start-up can be automatically forwarded to another program.” All projects were able to promote some collaboration across relevant entities through their involvement in the project steering committees. In general, however, the envisaged national coordination function was not uniformly clear and understood, and was insufficiently leveraged.

RESULTS: STRENGTHENING OF POLICY AND REGULATORY FRAMEWORKS

GCIP projects did not realize their intended outcome to strengthen the policy/regulatory environment to foster the growth of cleantech innovation. This is a risk factor for sustaining the projects’ results. Policy strengthening activities were limited. As MSPs there is a cap on GEF financing, but this component had relatively fewer resources and was generally embarked on at a later stage, using an ad hoc approach. In most countries (except Pakistan and South Africa), no direct structured policy work was undertaken. Project support prioritized other components because of a desire to quickly establish the competition-based accelerator and generate outputs that could be immediately seen and promoted. This often took longer than expected because of a need to identify collaborating institutions, to build

up understanding of what was meant by cleantech innovation, and to generate entrepreneurs’ interest to enter the program.

RESULTS: GENDER MAINSTREAMING AND SOCIAL INCLUSIVENESS

Twenty-five percent of teams supported by the GCIP were led by women. To date, from a total of 795 semifinalist teams, 198 semifinalists (25 percent) with women as team leaders have been supported. This is within the range for projects that set targets for female entrepreneurs (10–30 percent of entrants). In addition to targets, the GCIP approach included the creation of special category awards; selection criteria to provide preferential entry for women and specific efforts to attract female mentors, judges, and trainers. Results materialized more in some countries (Pakistan, South Africa, and Turkey) than in others. In general, projects lacked insight into how gender mainstreaming and social inclusion could enhance project impact. Pakistan’s achievements in the highest number of female entrants and semifinalists can be attributed to a gender-based priority and significant resources for communications and advocacy. In response to national priorities and context, South Africa attracted women, youth, and black entrepreneurs and had special award categories for women, youth, and innovation with social impact. Turkey’s social inclusiveness was through a Women-Led Entrepreneur and Youth-Led Entrepreneur Award in the 2015 cycle.

GCIP additionality

Project steering and country conditions influenced elements of additionality, resulting in varying benefits across countries. A summary of elements contributing to the GCIP’s additionality are depicted in table ES.4. A new and unique value add for the innovation ecosystem was the GCIP’s focus on early stage cleantech business acceleration that

encouraged environmental outcomes (particularly GHG emissions reductions). The GCIP encouraged a risk-taking mindset and provided start-ups with privileged access to local private experts. Entrepreneurs who are close to environmental and social problems were encouraged to use their indigenous insights for innovations that will help to address them. To varying degrees, the GCIP promoted collaboration among relevant entities and equipped national institutions and other ecosystem support actors with the capacities to sustain the ongoing organization of the competition-based accelerator. The GCIP was also able to leverage private sector finance to support promising cleantech solutions; however, policy and regulatory strengthening additionality was not realized.

Factors affecting GCIP function and sustainability

Likelihood of outcome sustainability at project completion is influenced by the quality of project preparation, quality of implementation and execution, country context, government support, and materialized cofinancing (GEF IEO 2018, under “Special focus: sustainability analysis”). These same factors affected GCIP function and sustainability.

UNIDO AS IMPLEMENTING AGENCY

UNIDO was well-suited to implement the GCIP. As the implementing agency, UNIDO’s performance was rated in the satisfactory range for all GCIP completed projects. Armenia received a lowest rating of “mostly satisfactory” because of poor documentation of the project’s activities and achievements. UNIDO has expertise developed over 20 years in technical cooperation for industry (especially SMEs) through technology transfer, low-carbon/resource-efficient industrial production, clean energy access for productive use, and capacity building for the implementation of multilateral

TABLE ES.4 GCIP additionality in project design and implementation

Additionality element	Project design	Results achieved
Innovation additionality		
Focus on clean technology	Yes	Yes
Early stage business assistance	Yes	Yes
Networking and eYesposure	Yes	No
Socioeconomic additionality		
Fostering entrepreneurial mindset	Yes	Yes
Encouraging of local solutions	Yes	Yes
Social inclusiveness	Yes	No
Social and economic benefits	Yes	No
Institutional/governance additionality		
Strengthening of convener role and reputation	Yes	No
Collaboration and partnerships	Yes	No
Financial additionality		
Access to venture capital	Yes	Yes
Policy/regulatory additionality		
Strengthening of the policy and regulatory environment	Yes	Partial
Environmental additionality		
Fostering cleantech ideas, solutions, and services	Yes	Yes
GHG emission reduction	Yes	No

environmental agreements. These competencies were leveraged under the GCIP framework.

UNIDO's GCIP implementation in eight countries has generated experience and lessons from each national context. Although envisioned in each country's project approval document, the absence of a formal, cross-country systematic approach, and accompanying budget to support a global coordination effort, meant it was not fully realized. UNIDO experienced some challenges in identifying the management capacity to supervise and support projects. In 2016, responsibility for GCIP countries was distributed across several project managers. Varying project management/leadership approaches and understanding of terminology were observed, which complicates extrapolation and comparison of results. In Pakistan, and South Africa where the implementing teams felt especially empowered, the PMU was able to pilot new

approaches, which have subsequently offered valuable models for replication (e.g., gender mainstreaming, national-level Investor Connect, Industry Challenge award). The GCIP has enabled UNIDO to build up its expertise business acceleration for cleantech innovation, which is a new domain for international cooperation.

PROJECT DURATION

GCIP projects were designed to have a three-year duration which was insufficient in all cases. Almost all had no-cost extensions, which prolonged their activities by up to an additional 26 months. Most extensions stemmed from delays in the initial stages related to understanding the concept, engaging the counterpart, and establishing the PMU. Nonetheless, the project duration was clearly insufficient, even in Armenia that had no extension, for pursuing the envisaged outcomes, particularly policy

strengthening. This necessitated frugal spending to remain within the original budget, covering a longer period. Projects with a longer duration would have the positive effect of deepening country ownership. It is also too short to expect to begin to gather meaningful impact data (on GHG emissions avoided, jobs created, investment leveraged).

COST-EFFECTIVENESS

All projects were in the satisfactory range for efficiency, with projects in India and Turkey rated as highly satisfactory. Seven of eight countries ran three to five cycles of the competition-based accelerator.¹⁵ Private sector contributions leveraged by the GCIP were valued at just over \$3 million. The mostly in-kind support was through sponsorship of prizes and pro bono activities of mentors, judges, trainers, advocates, and technical assistance provided by experts secured on an annual basis and matched to the extent possible, with the needs of each cohort. These activities formed a key pillar of project delivery, enlarged the available pool of resources, and contributed to strengthening the national entrepreneurial ecosystem. However, the logistics related to regularly renewing these voluntary contributions do create an administrative burden on the implementing teams.

MONITORING AND EVALUATION

There was little systematic monitoring and reporting in the projects where the GCIP was first launched (Malaysia, Armenia, India). M&E was strengthened in subsequent delivery, where it also had higher expenditures. M&E allocations ranged from 1.5 to 5.0 percent of the GEF grant. Only the Thailand GCIP project has undertaken a midterm

¹⁵ The target for countries was two to three cycles. The additional competition-accelerator cycles were facilitated due to significant extensions in project duration, albeit covered with the original financing.

review, although this was planned and budgeted for several other (Armenia, Malaysia, India, South Africa, Turkey, and Pakistan) GCIP countries.

Implementing teams focused on tracking outputs rather than outcomes. Project approval documents mentioned indicators for outputs, outcomes, specific targets, and a means of verification. However, baseline information did not exist for most envisaged outcomes. Without orientation to develop the baselines and accompanying resourcing, the projects were more focused on tracking outputs rather than outcomes (e.g., received/eligible applications, semifinalists, female-led teams, mentors, and business clinics). Outcome formulation was also hampered by differences in understanding across the countries of key terminology (entrant, accreditation, commercialization, etc.).

COUNTRY SELECTION

There was no explicit strategy or established criteria for selecting countries to take part in the GCIP. Involvement depended primarily on a country's willingness to use some of its System for Transparent Allocation of Resources (STAR) allocation for the GCIP, together with UNIDO's own institutional set up and presence of a regional office that could support the PMU. Thereafter, certain national conditions (interest of suitable local executing partner; vibrant academic scene; large SME sector; governmental interest in SME promotion; available infrastructure, i.e., access to Internet, electricity) were considered positive factors for nurturing cleantech entrepreneurs. Countries that could potentially play a role as a regional hub (Armenia, Malaysia, South Africa, and Turkey) were highlighted.

Encouraging countries to invest portions of their STAR allocation in the GCIP ensured the initiative was "demand-driven" and confirmed country buy-in and relevance. A more "top-down" approach that reviews national conditions/criteria as part of

country readiness to develop the cleantech entrepreneurial ecosystem and then “selling the GCIP” also has merit for its consideration of the potential of the initiative to be continued, scaled up, or replicated in the region after completion. A more balanced and integrated approach would serve to increase likelihood of sustainability.

HOST INSTITUTION

The selection and engagement of the “right” institution to host the GCIP, one with a convening role, was a critical factor in pursuing and sustaining project outcomes. GCIP project design documents did not mention any guiding criteria in the selection of host institution. In South Africa, the GCIP supported the Technology Innovation Agency’s strategic objectives. Turkey’s host, the Scientific and Technological Research Council (TÜBİTAK), used the GCIP to support its mandate to stimulate transformation of research into products to invigorate the role of SMEs. Both these countries have successfully continued the GCIP initiative using more of their own resources. In India, the GCIP was hosted by the Ministry of Micro, Small and Medium Enterprises. In its last year, the Ministry of Micro, Small and Medium Enterprises turned the project over to the Institute for Design of Electrical Measuring Instruments, its technology center. Given the highly technical focus of the Institute for Design of Electrical Measuring Instruments, stakeholders were concerned about its capacity to play a convening role in the entrepreneurship ecosystem. The extent to which the PMU was embedded within the physical premises of the local host was also a key positive factor in terms of providing on-the-job training opportunities for staff and cost efficiencies.

COUNTRY ENGAGEMENT

National governments that prioritized cleantech technology, understood its strategic leverage, and made tangible links between the GCIP and other

initiatives, typically had higher country engagement and ownership for the initiative. Turkey, South Africa, Pakistan, and Morocco have succeeded in making these tangible linkages more than Armenia, Malaysia, and India. The number of competition-based accelerator cycles undertaken, and the contribution of local financial/human resources during the project period and after to ensure continuity of activities, were also key factors for national ownership of the GCIP.

COFINANCING

In almost every country, no systematic mechanism was used to track the large portion of planned GCIP support that was committed by national governments and cofinancing partners. In Pakistan, the PMU did successfully track these contributions. Cofinancing commitments ranged from \$2.6 to \$6.3 million, which was two to eight times the GEF grant level in the beneficiary countries. The total GEF grant of \$11,130,426 for the nine countries matched by the planned \$38,150,169 attests to the intended catalytic effect; however, no valuation methodologies were put forward from either UNIDO or the GEF.

FINANCIAL PLANNING

Except in Armenia and India, all countries allocated the highest proportion of the available GEF MSP grant to establishing the competition-based accelerator. The institutional capacity building was next in level of resourcing. Across countries, the policy strengthening component was comparatively underresourced (4–17.5 percent of the GEF grant), which may account for the limited effects achieved.

POSTPROGRAM SUPPORT

Once an annual competition-based accelerator cycle concludes, there is no formal engagement between the GCIP and beneficiary entrepreneurs.

There has been comparatively more informal post-program interaction with start-ups in India and South Africa, where international trainers, executing partners, or mentors have kept in touch in ad hoc ways, providing occasional advice and facilitating networking with investors and other start-ups. These interactions have remained opportunistic and have not been initiated with all former participants.

Stakeholders identified the lack of formal, systematic postprogram engagement as an important shortcoming of the project’s design, potentially compromising the sustainability of results. Post-project follow-up (e.g., through knowledge exchange platforms that would be maintained by the host institution or periodic networking events bringing participants together) is also critical for measuring the viability and growth rate of supported start-ups and necessary for verification of environmental and social benefits.

KNOWLEDGE MANAGEMENT

National knowledge management and exchange was more successful than envisaged South-South cooperation and international exchange. Even with UNIDO as the implementing agency for all nine projects, the GCIP has not systematically developed and shared knowledge across national projects through a global network. This may have been linked to the GCIP’s implementation as individual-level projects as opposed to a programmatic/global project approach with resources provided for this aspect. Exchanges could have taken the form of networking events, regional Investor Connects, and relay of stories and lessons between countries.

EXIT STRATEGY

Handover has been most successful in South Africa and Turkey. An exit strategy was not explicitly described in the project documents; however,

UNIDO undertook implicit actions to ensure handover to national structures. These included:

- Identifying and working with institutions that would retain the knowledge and skills developed under the project
- Pursuing country ownership through engagement of relevant public and private sector actors
- Building local capacities (trainers, mentors, judges) to sustain the ongoing organization of the competition-based accelerator
- Assuring access to training materials and infrastructure to manage applications (whether local, international, or centrally shared)
- Providing clarity about the point at which exit would take place, based on targets and outcomes
- Engaging in a handover process and transition where UNIDO support was phased out

Conclusions and recommendations

Conclusion 1: The GCIP is highly relevant and will remain so as developing countries realize the economic and environmental opportunities to take up cleantech innovation as an engine of low-carbon growth.

GCIP projects are aligned with the mandates of the GEF and UNIDO and national priorities and strategies for helping countries transition to low carbon economies. The GCIP supported entrepreneurship ecosystems and fostered start-ups so that they may contribute to creation of “green jobs” in countries ranked lower in terms of having functioning cleantech innovation ecosystems.¹⁶ Institutional

¹⁶ Ranking was undertaken by the Global Cleantech Innovation Index, which identifies countries with the greatest potential to produce start-ups that will commercialize

partners have confirmed the value and relevance of the GCIP, although not all countries are pursuing a second phase. Beneficiary start-ups have developed and advanced their cleantech ideas through project support. Going forward, the potential for cleantech SMEs in developing countries is estimated to be a \$1.6 trillion market opportunity.

Conclusion 2: GCIP projects have meaningfully contributed to development of cleantech innovation ecosystems with improved performance over time through business acceleration, capacity-building, and institutional strengthening. Effectiveness could have been improved through a more globally coordinated delivery, sufficient time frame, and adequate resourcing.

With the relatively limited resources of an MSP, all GCIP projects succeeded in promoting clean technology innovation by conducting annual business competitions and acceleration activities. Start-ups benefited through the development of business skills and access to mentoring, new markets, and investment. The GCIP also delivered outcomes beyond the level of individual businesses. In Turkey, Pakistan, and South Africa, the projects' host institutions further established platforms with relevant organizations to ensure the continued organization of the competition-based accelerator.

Cross-country scrutiny would have been more naturally carried out on a regular basis and generated less transaction cost if it had been under an overall program or global project framework with resources for coordination between projects. The

clean technology innovations over the next 10 years. UNIDO-GEF partnered with the Global Cleantech Innovation Index for the [The Global Cleantech Innovation Index 2017 Report](#) that was undertaken several years after the selection of the nine GCIP countries to investigate, relative to gross domestic product, where cleantech companies are most likely to emerge and why (UNIDO, GEF, CTG, and WWF 2017).

GCIP did not readily realize the results aggregation, cross-country network building, and knowledge exchange foreseen in the individual project approval documents. In addition, among the completed projects, almost all had no-cost extensions, which prolonged their activities by up to an additional 26 months. This mostly stemmed from delays in the initial stages, related to understanding the concept, engaging the counterpart, and establishing a PMU.

Conclusion 3: The GCIP has demonstrated additionality but not in its planned strengthening of national policy and regulatory environments.

The GCIP demonstrated additionality through its promotion and results in innovation for clean technology, socioeconomic returns, institutional capacity, realization of financing for some start-ups, and business support to enterprises whose products and services have environmental benefits.

Policy and regulatory strengthening additionality was not realized in a meaningful way because these project activities were limited, underresourced, and generally embarked on at the later stage of implementation. Attention was diverted to the competition-based accelerator which was requested by national counterparts and generated relatively fast outputs that could be immediately seen and promoted, giving the GCIP project a national standing and branding.

Conclusion 4: The GCIP's operating model successfully enlarged the available pool of resources through catalyzing the support of private ecosystem actors, although this reliance on their voluntary contributions presents some vulnerabilities.

The reliance on annually customized private sector involvement is part of an operational model that contributes to strengthening the national ecosystem and sustaining project results and benefits, but one which requires significant local logistics.

Individuals tapped for participation are not always available for each annual run. This meant that for each competition-based accelerator cycle, the PMUs were tasked with securing and renewing participation, which imposes a burden on administrators.

Conclusion 5: Commitment by a national entity, adequate funding, and a planned exit strategy at project completion enhances prospects for sustainability.

The handover to the Technology Innovation Agency in South Africa and the Scientific and Technological Research Council in Turkey attest to the importance of ensuring that the transition to full national ownership takes place during the project period. The experience thus far attests that without this attribute, the initiative seems destined to not continue or may continue with significant delay, sacrificing important momentum (as evidenced by the case of GCIP Pakistan). All institutions involved in the implementation of GCIP projects expressed strong interest in continuation of the GCIP after project completion. However, the ability to finance the project initiatives remained mostly unsecured. Countries that ran more than two to three competition-based accelerator cycles had greater success in transitioning the project to national institutions for continued delivery. UNIDO's continued association was indicated as vital to successful continuation and project reputation.

Conclusion 6: The direct and indirect results of the GCIP are not easy to gauge due to generally weak monitoring and evaluation, including inconsistency in measurement and the lack of systematic guidance for project beneficiaries to estimate global environmental and socioeconomic benefits.

The projects' theory of change to higher-level impacts was found to be sound. However, M&E was among the GCIP's weakest areas of implementation. UNIDO has estimated impacts suggesting some tangible progress being made along this

route; however, long-term results cannot be verified at this stage. The short duration of GCIP projects requires systematic mechanisms for follow-up and verification with start-ups that go through the GCIP.

Recommendation 1: Any future "GCIP" or similar program should be structured using a more globally coordinated approach with appropriate choice of interventions based on strategic country selection.

A globally coordinated approach would allow for the establishment of a "platform" to support more effective coordination, learning, and exchange across national projects. Provided that the right metrics are in place for systemic monitoring and evaluation, this would usefully inform decision making and support the measurement of impact. Country ownership of such a platform would facilitate measurement of impact after project completion.

Countries should be selected strategically based not only on their willingness to use STAR allocation but also factors concerning their current state and readiness to support cleantech innovation, particularly the mandate and capacities of the host institution and the way in which cleantech innovation is a part of national environmental and development strategy. This could be assessed during a project preparation phase.

Recommendation 2: The GCIP should actively support national-level coordination to dynamize the cleantech entrepreneurship ecosystem.

The GCIP should focus on catalyzing the national host's mandate to coordinate, convene, and communicate with actors already working in-country to support clean technology innovation. This includes using a more explicit system to categorize the significant volume of entrants who apply, but are not selected, and channeling them to more suitable

ecosystem actors according to their stage of development (of enterprise maturity and technology phase). This would require adequate resourcing and understanding of the national coordination role.

Recommendation 3: Allow sufficient time to customize and sharpen the focus on policy strengthening and regulatory frameworks to foster cleantech innovation and its adoption.

A conducive policy environment is needed to support the growth of the cleantech SMEs. The GCIP policy strengthening component needs to be adequately scoped, sufficiently resourced, and embarked on at an early stage, with appropriate steering and according to local conditions. Allocating government cofinancing commitments to this outcome would be a suitable dedication of national resources for creating inputs to ongoing processes, even postproject completion. Entities tasked with this outcome should have policy engagement as a core to their own institutional mandate.

Recommendation 4: Expand the network of private sector partners to address GCIP participants' needs for business expertise and early stage technology validation.

The GCIP should be more strategic in its approaches to access the desired external expertise of the private sector and integrate the private sector-specific technology challenges in its competition-based accelerator for more beneficial collaborations. The GCIP should tap into broader established private sector networks, e.g., technology associations, business school alumni, business owners' clubs, SME associations, trade associations, communities of practice, women's business associations, etc. Ideally, forming collaborations with such networks would be mutually beneficial as such communities are often looking for ways to provide services and opportunities to their own members. Processes that are involved in regularly renewing private sector should be streamlined.

Recommendation 5: Measure direct and indirect impacts of the GCIP by establishing adequate monitoring and evaluation systems and ensure that they are implemented using standardized and relevant indicators.

GCIP results frameworks should systematically gather information on outcomes and higher-level impacts/results. Common methodology and terminology are required for data collection and comparison. This could potentially include a requirement that beneficiary start-ups periodically provide relevant data to the local host organization (or platform) for a period into the future, when impacts are primarily felt and can be reliably quantified and verified.

The GCIP attracts applications from start-ups that are developing technologies with environmental and social cobenefits beyond climate change. The GCIP should also capture and report on these cobenefits. Start-ups should be able to present standardized GEBs to a large and growing impact investment community that is looking specifically for the creation of GEBs as part of the return on investment. The requirements of these investors should be carefully considered in the development of GEB targets, clarifying how aspirational GEB goals will be measured at the project and global levels.

Recommendation 6: Deepen country engagement during the project period, including a plan and resourcing, to sustain activities and expand outcomes after project closure.

GCIP projects should dedicate greater effort to developing national- and regional-level initiatives. This would deepen country engagement and connect start-ups with investors and other business partners. GCIP should consider procuring trainers and materials through more open competition for service providers, with preference given to qualified vendors that are locally and regionally based.

1: Introduction

1.1 Evaluation purpose and objectives

The Global Environment Facility has a long history of engagement with the private sector.¹ The Global Environment Facility–United Nations Industrial Development Organization (GEF-UNIDO) Global Cleantech Innovation Programme (GCIP) is the major product of Modality 3 of the GEF-5 Revised Private Sector Strategy (GEF 2011c).

The GCIP is one example of GEF support to development of small and medium enterprises (SMEs). SMEs are, by definition, modest in size and constitute the backbone of developing economies where they account for the majority of employment and jobs created. Under the GCIP, support was focused on SMEs developing clean technologies and solutions that can deliver global environmental benefits (GEBs).

As part of the GEF Independent Evaluation Office's (IEO's) evaluations of GEF engagement with the private sector, this report presents a summary of results of an independent evaluation of the GCIP. Incorporating both accountability and learning

¹ The GEF has undertaken work with private sector engagement since 1996, when the first strategy for engaging the private sector was finalized based on recognition that in order to bring about transformational change to the global environment, public and private sectors must work together.

objectives, the following questions have been investigated:

- What is the relevance and additionality of the GCIP in the participating countries?
- How effective has the GCIP been in meeting its planned outputs and outcomes?
- How efficient was GCIP delivery?
- What direct and indirect impacts did the GCIP deliver? What was the additionality of the projects?
- To what extent are the GCIP's results likely to be sustained in the long term?

1.2 Evaluation scope and audience

The evaluation covers the implementation of the GCIP in eight countries² (six of which were launched in 2013). This evaluation was guided by a Concept Note prepared by the GEF IEO ([annex A](#)). This report is intended to be useful to a broad range of audiences. It will inform the GEF Council, the GEF Secretariat, participating country operational focal points, and UNIDO, as the implementing agency of the GCIP, to assist in improving the design, performance, and impacts of similar future initiatives.

² At the time of evaluation, implementation had not yet begun in the ninth country, Ukraine; however, project design documents were reviewed.

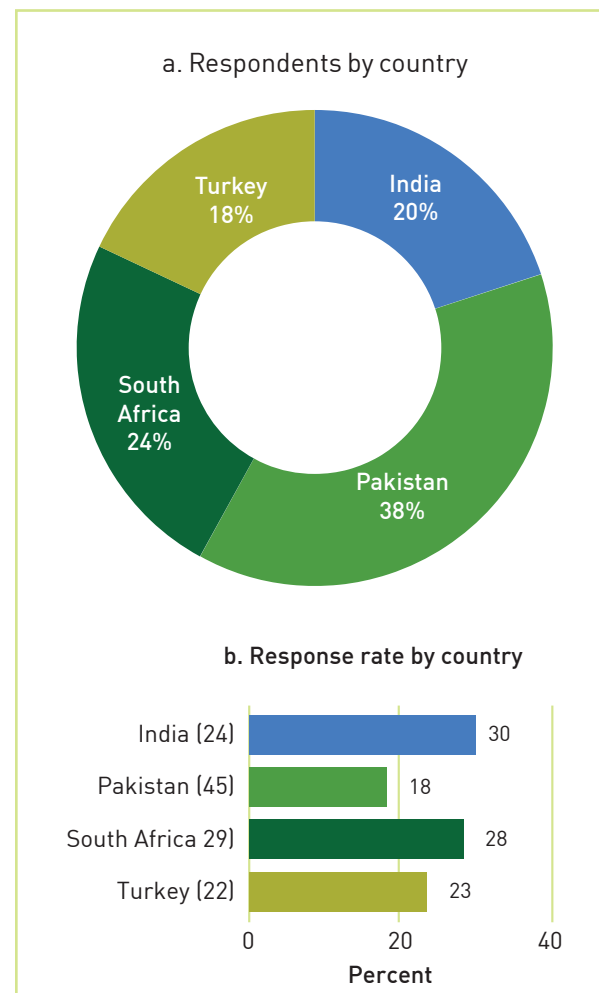
1.3 Evaluation methodology

A mixed-methods approach was applied for the evaluation encompassing quantitative and qualitative information. The evaluation draws on in-depth analysis and field verification by international consultants leading the terminal evaluations in India, Pakistan, South Africa, and Turkey conducted just ahead of this global review. As part of these terminal evaluations, in-country interviews were held with participating start-ups, mentors, judges, investors, government counterparts, UNIDO project management, and other relevant stakeholders. Evaluative evidence was also retrieved from terminal evaluations of projects in Armenia and Malaysia, which closed in the previous two years. The following tools were used to gather and analyze data.

- A desk review of documents associated with the nine country projects, including design documents, progress reports, terminal evaluations, promotional material, and UNIDO-GCIP materials (see [bibliography](#)).
- Interviews with 52 individuals in Washington, D.C., Los Angeles, Austria, and Switzerland ([annex B](#)). Findings from interviews held as part of the terminal evaluations were also triangulated with other evidence and evaluative judgments used for reporting. The following groups provided input:
 - Participating entrepreneurs
 - Mentors, judges, assistant trainers
 - Other ecosystem actors (incubators, accelerators, investors)
 - UNIDO project management
 - Cleantech Open (CTO) management and trainers
 - GEF Secretariat staff

- Experts in business acceleration and entrepreneurship ecosystems
- An online survey sent to GCIP participants in India, Pakistan, South Africa, and Turkey. In total, 493 people received the survey (figure 1.1).
- A second survey targeted UNIDO project managers at the Vienna headquarters and in-country (covering 17 respondents). This survey had a 100 percent response rate. Results from the surveys are presented in [annex C](#) and [annex D](#). Their findings are referenced throughout the main report.

FIGURE 1.1 Response rates by GCIP implementing country to online evaluation survey



Data analysis and development of findings was based on triangulation of information from multiple sources. This was undertaken collectively by the evaluation team to ensure the robustness and validity of the assessment.

1.4 Limitations

Labeled as a global program, UNIDO implemented GCIP as nine separate national-level projects. This evaluation, therefore, relies on data from these stand-alone country projects. Lack of a fully shared understanding of indicators, targets, and definitions has limited the comparability and aggregation of results.

GCIP projects were still under way in Morocco, Ukraine, and Thailand at the time of this review.

The evaluation team has relied primarily on their project information forms, project implementation reports, available midterm reviews (MTRs), and relevant interviews.

The survey of GCIP participants had an overall response rate of 24 percent. Participation levels across the four countries differed (figure 1.1).

2: History and overview

2.1 Background theory for the GCIP

Providing early stage business assistance to support and advance entrepreneurs toward commercialization first emerged in the United States in the 1980s. This was in response to perceived limitations in prevailing economic development strategies, which focused primarily on large corporate expansions and recognition that entrepreneurs who take risks to commercialize new ideas, generated by the diffusion of science and technology, are pivotal for driving economic growth.

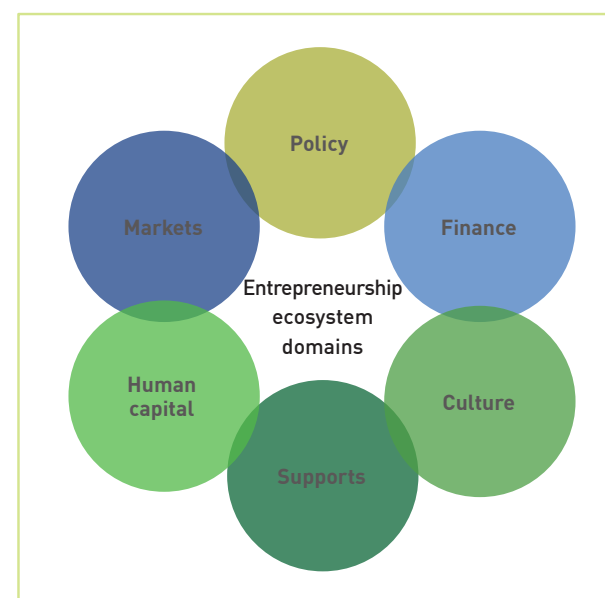
Accelerators and incubators are the most recognizable form of start-up assistance. They are both similar and different to one another. They both have positive spillover effects of facilitating firm growth/competitiveness, promoting innovation/entrepreneurship, generating employment, and reducing search costs for investors, while creating a pipeline of vetted technologies (DEEP Centre 2015).

The GCIP has closely followed the accelerator model. Accelerators typically provide time-limited support to start-ups through structured programming and mentorship services designed to accelerate high-potentials to success or failure in a high-pressure environment that distinguishes the teams that prove most resilient. In contrast, incubators are of longer tenure (one to three years), provide access to physical space, and a broad suite of services in a context where innovators can germinate and refine their ideas in the company of a

supportive network of peers with guidance from experienced mentors.

The predominant metaphor for fostering entrepreneurship as an economic development strategy is the “entrepreneurship ecosystem.” This refers to the culture, enabling policies and leadership, availability of appropriate finance, quality human capital, venture-friendly markets, and a range of institutional and infrastructural supports for start-ups as key elements for building a conducive environment (figure 2.1).

FIGURE 2.1 Domains of the entrepreneurship ecosystem



SOURCE: Isenberg 2011.

A constellation of actors need to collectively contribute and benefit from the success of the overall ecosystem. For public officials, job creation and tax revenues may be primary drivers. For banks, a larger and more profitable loan portfolio is a benefit. For universities, knowledge generation and enhanced reputation are desired effects. For entrepreneurs and investors, wealth creation is the main motivating factor. Together, these actors contribute to eventual self-sustaining of the ecosystem with limited government involvement.

Entrepreneurship, innovation, and clean technology have been identified as vital instruments to deal with climate change challenges. The term “cleantech” emerged after the 2001 “tech boom” collapse, when venture capitalists turned their attention to solar, biofuels, fuel cells, and renewable power generation (Saha and Muro 2011). In practice, a large portion of cleantech involves energy-related technologies; however, the term includes a broad range of sustainable technologies in areas such as water, agriculture, waste, and materials.

2.2 GCIP origin and overview

The GCIP traces its origins to the 2011 UN Climate Change Conference of the Parties (COP) in South Africa where the Greening the COP17 in Durban project (GEF ID 4514) was launched with GEF-UNIDO support. The objective of the project was to promote and scale up several activities under South Africa’s National Greening Programme to reduce the carbon footprint of the COP 17 event (GEF 2011b). The Innovative Technology Competition for private sector SMEs was one of four components of this medium-size project (MSP)¹ and was intended to increase awareness of

¹ The other three components were: communication and awareness raising, low-carbon public transport, and

the role of clean technologies in enhancing SME competitiveness.²

The evaluation of the South Africa project concluded that the competition for cleantech SMEs component was successfully organized, delivered a comprehensive business training program, and created capacity for a future cleantech competition (UNIDO 2013). Its limitation was the short time frame to invite entries and sponsorships. The IEO review of the terminal evaluation agreed with the overall assessment of the competition pointing out the only target not met was attracting private sector sponsorship (GEF IEO 2013).

Based on the success of the South Africa project and the recommendation of its terminal evaluation, and as part of the GEF’s private sector strategy, the GEF and UNIDO made a joint decision to develop a new global flagship program on cleantech for SMEs: the GCIP. According to interviews, UNIDO initially proposed a programmatic approach and the GEF Secretariat indicated that it would be more effective and efficient to implement the GCIP through separate country projects. With a simpler approval process, these MSPs could be approved and executed more quickly. Global coordination was implicitly indicated in the project approval documents; however, without a specific budget for this management activity. It was not clear to the evaluation team if the decision to implement the GCIP through nine individual projects, as opposed to a global program/project, was

pilot installation of solar water heaters for health clinics to generate emission offsets.

² Cleantech held the promise of addressing ecological problems with new science, emphasizing natural approaches (including biomimicry and biology) in contrast to “enviro tech,” which represented the highly regulatory-driven “end-of-pipe” technology of the past (e.g., smokestack scrubbers) with limited opportunity for attractive returns (www.cleantech.org/what-is-cleantech/).

taken to test the viability, impact, and cost advantages of this alternative method.

The GCIP focuses on the human capital, institutional support and policy domains of the entrepreneurial ecosystem. The focus considered the interlinked issues of employment, green growth, and the role of science and innovation in SME development. The projects also intended to establish linkages between the competition and the private sector at local and international levels. These interactions were limited at the time of the GCIP's introduction in the implementing countries (UNIDO, GEF, CTG, and WWF 2017).

In 2013, the GCIP was launched in Armenia, India, Malaysia, Pakistan, South Africa, and Turkey. Morocco and Thailand joined in 2016. The concept for a Ukraine GCIP with an accompanying project preparation grant was approved in August 2017. The CEO project approval came in October 2018. All are planned to run for three years with between \$0.5 and \$2.0 million in GEF funding,

complemented by national cofinancing (table 2.1). Only the most recent project in Ukraine has requested a project preparation grant.

2.3 Project components

All GCIP projects are designed using a template based on three components, underpinned by monitoring and evaluation:

- **Component 1: National Cleantech Platform (i.e., a competition-based accelerator) to promote clean technology innovations and business models in SMEs.** The platform will organize an annual competition to first identify and then nurture emerging cleantech start-ups. Selected entrepreneurs benefit from mentoring, training on business plan development, customer validation, pitching, legal and intellectual property issues, government relations, angel/venture capital investment, scaling up, and going global—with the aim of accelerating their technology and solutions toward commercialization.

TABLE 2.1 GEF grants and national cofinancing for the GCIP in nine countries

Country	GEF grant (\$)	National cofinancing (\$) ^a	Implementation start date	Extension of duration, plus any added funds	Actual end date	No. of cycles completed
Malaysia	990,000	3,000,000 (3×)	April 2013	6 months, at no cost	31 Aug. 2017	3
Armenia	547,946	2,600,000 (5×)	May 2013	No extension	30 April 2016	2
India	1,000,000	7,590,169 (8×)	May 2013	25 months, at no cost	30 June 2018	4
Pakistan	1,369,863	4,000,000 (3×)	Sept. 2013	22 months; \$100,000 from UN funds	30 June 2018	4
South Africa	1,990,000	6,310,000 (3×)	Oct. 2013	23 months, at no cost	30 Sept. 2018	4
Turkey	990,000	2,950,000 (3×)	Oct. 2013	26 months, at no cost	31 Dec. 2018	5
Thailand	1,826,500	4,200,000 (2×)	March 2016	22 months, no cost ^b	30 June 2019	3
Morocco	913,242	2,900,000 (3×)	Aug. 2016	Probably; in discussion	Sept. 2019	3
Ukraine	1,502,875	12,200,000 (8×)	Oct. 2018	n.a.	Oct. 2021	n.a.
Total GCIP	11,130,426	38,150,169 (3.4×)				

SOURCE: Project approval documents, Project Management Units, and respective terminal evaluation reports.

NOTE: n.a. = not applicable.

a. Number in parentheses = × times the level of the GEF grant.

b. Expected to launch in August 2014, a 22-month extension was requested and led to an official start of the project in March 2016, following signature of the agreement with Thailand's Ministry of Industry's Department of Industrial Promotion, following cabinet approval granted on 12 January 2016.

- **Component 2: Institutional capacity building to sustain operation of the national cleantech competition-based accelerator.** National institutions and partners are trained on best practices in managing a cleantech platform including communication, advocacy, and other tools to stimulate applicants and disseminate results.

- **Component 3: Policy and regulatory framework strengthening for scaling up cleantech competition, innovation, and acceleration activities.** This involves working with national actors to identify gaps in the policy/regulatory framework to develop and strengthen cleantech innovation and to support entrepreneurs.

Each national project's results framework followed the same logic with the same or similar outputs, outcomes, indicators, and targets. Reflecting tailoring to a country's conditions, at times various targets were modified and components were resequenced. A project implementation review framework was drawn up to guide documentation, share progress on outputs and outcomes, and track activities against annual work plans. A call for an MTR and independent terminal evaluation completed the monitoring and evaluation (M&E) architecture.

Although GCIP projects were structured similarly, in response to country conditions and national priorities, there was some variation in country implementation strategies. Partly in response to local circumstances and partly because of steering by local actors, participating start-ups differed in the stage of organizational maturity and technology development.³ GCIP projects also achieved varying

degrees of social inclusivity. Pakistan paid particular attention to recruiting teams led by women and youth, and in the case of South Africa, they also included black entrepreneurs. Dedicated resources to translation of training materials were not the same across countries. Turkey, Morocco, and Thailand translated training materials, which enhanced access of non-English speakers. Incentives also varied across countries, with Pakistan, for example, piloting an Industry Challenge award and Armenia and Turkey offering cash prizes to winners, whereas others did not.

Within each implementing country, the initiative was anchored through a local host (typically a government agency focused on SME development, science, and innovation). The host was supported by a Project Steering Committee (PSC) with relevant stakeholders and cofinancing partners. Designed with the target to hold two to three annual competition-based accelerator cycles over 36 months, national projects were expected to be fully operational following project closure, i.e., to be able to continue with the accelerator with the institutional framework, capacities, and support in place to sustain the project's results and benefits.

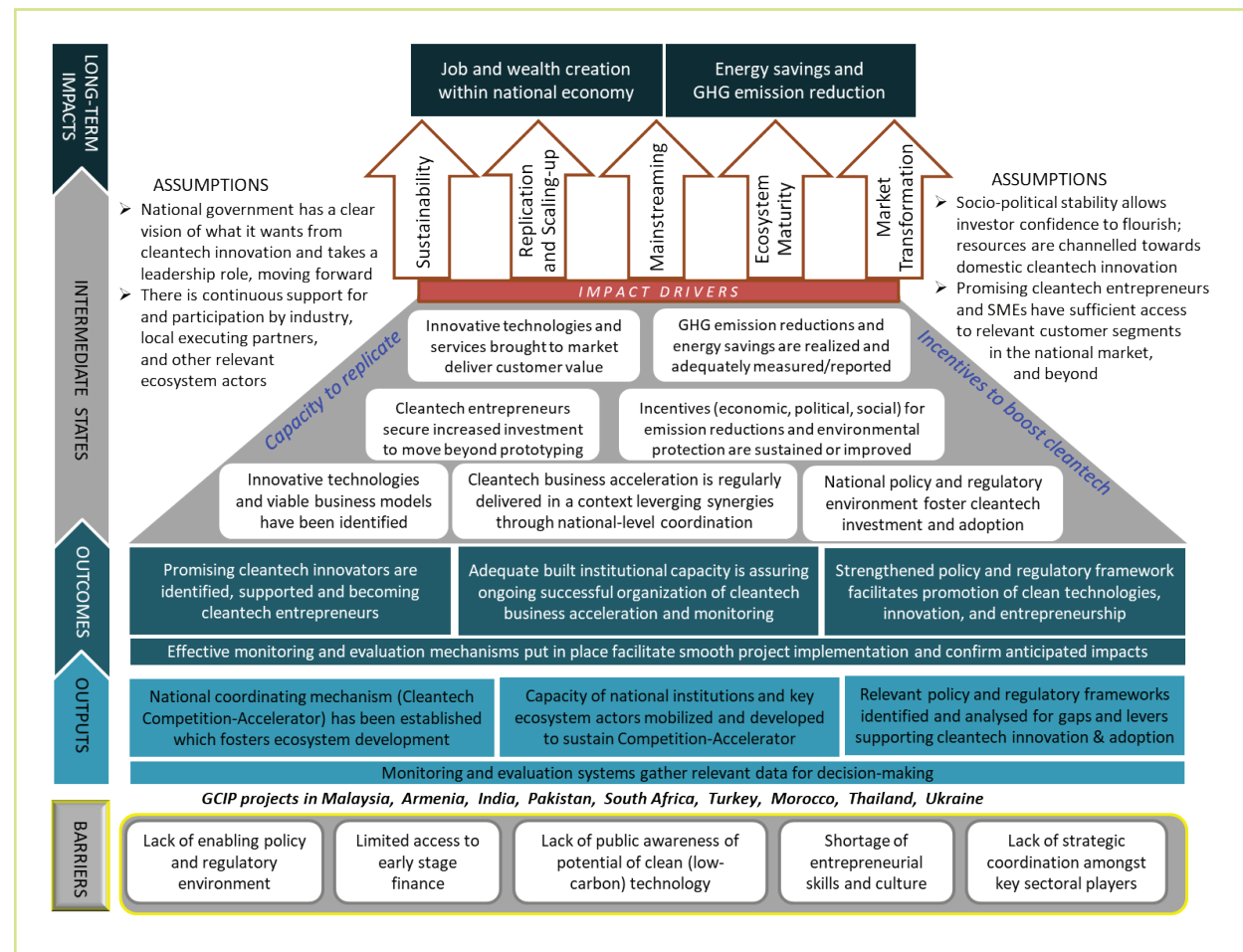
2.4 GCIP's theory of change

The evaluation team constructed a theory of change to reflect the GCIP's path to impact based on the documented design logic (figure 2.2). The theory of change depicts the following:

- Desired **high-level impacts** to which the intervention ultimately aimed to contribute for intended transformative effects.
- Expected **pathways to impact, viewed as vital to realization of broader adoption** propelled through an array of **intermediate states**, which are under the influence of project stakeholders.

³ "Organizational maturity" refers to organizational practices/processes, business skills, leadership competences, etc. "Technology development" spans alpha testing to actively deploying technology and already being profitable.

FIGURE 2.2: GCIP reconstructed theory of change



- **Assumptions**, which, if present, could positively influence the realization of intended impacts, although they are mostly beyond the control of implementing partners.
- **Program components** (the output-to-outcome sets) underpinned by monitoring.
- **Barriers** to entrepreneurship ecosystem development:
 - Lack of an enabling regulatory environment
 - Limited access to finance (mismatch of start-up needs and offers of government/financing

institutions; lack of interaction between SME innovators and potential investors)

- Lack of entrepreneurs' strategic business planning and marketing skills
- Lack of coordination among sectoral players on market intelligence research (undermining decision making regarding market opportunities and penetration strategies)
- Lack of public awareness regarding low-carbon innovation technology's market potential

2.5 Incremental reasoning/additionality

GCIP projects were designed to address incremental reasoning/additionality of GEF involvement in the projects. The rationale cited for GEF support was to remove the above-mentioned barriers. Without the GEF, it was deemed unlikely that the country could run a cleantech SME competition-based accelerator in the coming years. This would result in lost opportunities to support entrepreneurs, reduce greenhouse gas (GHG) emissions, strengthen partnerships with the private sector, and share experiences with the region.

2.6 Management arrangements

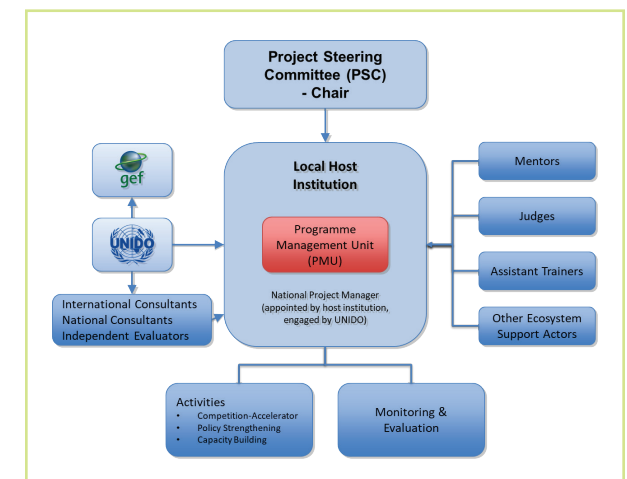
All GCIP projects established a project management unit (PMU) expected to be physically embedded in the local host organization. Headed by a national project manager engaged by UNIDO, the PMU was responsible for daily management and continuous monitoring of project implementation and performance in line with agreed work plans. The PMU established the M&E system according to the project's results framework and maintained the databases that were a prerequisite for efficient and effective project management, compiling details relating to applicants, their progress through the competition-based accelerator, and mentor and expert profiles, etc. The PMU was also responsible for undertaking outreach, awareness-raising, and coordinating all project activities carried out by contracted experts (national and international) and ecosystem actors who contributed primarily on a voluntary basis.

The PMU acted as the Secretariat of the PSC that was made up of public and private sector members. Chaired by the local host, members were those who would most likely benefit from project outcomes and who could contribute to sustaining results. The PSC's role was to provide strategic

guidance on project implementation based on national imperatives and market needs, to ensure adequate institutional support, and to review/endorse annual work plans. PSC meetings were also designed to function as a monitoring device, with the presentation of structured reporting of the project's accomplishments based on which PSC members were to provide supervision and strategic guidance.

UNIDO provided the PMUs with management support and supervision. Initially, a single project manager in Vienna was responsible for all GCIP countries. In 2016, this responsibility was dispersed over several project managers, each handling one, apart from one individual who was responsible for two countries (Pakistan, Morocco). UNIDO project managers were responsible for tracking overall project milestones and narrative reporting to the GEF (figure 2.3).

FIGURE 2.3 GCIP project implementation management structure



SOURCE: UNIDO.

2.7 Delivery mechanisms

COMPETITION-BASED ACCELERATOR MODEL

With the lure of prizes and media attention, the competition generated interest in cleantech, which was a nascent concept in many countries at the time of the GCIP's launch. A pool of innovators applied to the GCIP. Those deemed most promising would benefit from technical assistance provided through the accelerator.⁴ This notion is commonly used in the new product development process to transmit the need to start with many ideas, which are examined and whittled down, then shaped into concepts and tested until a final product is selected and launched. Integrating this notion into the GCIP process naturally filtered out many of the entrepreneurs that applied to the competition.

The GCIP's competition-based accelerator aimed to identify and nurture the most promising cleantech start-ups through an "innovation funnel." Entrants were screened and whittled down to a set of "semifinalists." Cleantech business concepts were shaped through training delivered by UNIDO's partner, CTO, and mentoring sessions with local private sector actors (mentors, technical experts). GCIP participants then pitched to investors. From these semifinalists, a second round of judging identified several national "winners," depending on the number of categories. The finalists were invited to compete against winning teams from other GCIP countries and pitch their ideas at the international Investor Connect during CTO's annual competition at the Global Forum in Silicon Valley (figure 2.4). The Investor Connect was organized to bridge the gap between start-ups with

innovations and investors who could, in theory, gain exclusive access to cleantech solutions. Stakeholders attested that those who completed the GCIP process were widely seen as "high quality."⁵ In principle, this would increase the likelihood for their innovations to reach the market, reduce GHG emissions, and create jobs. The GCIP model was described by its Turkish host, the Scientific and Technological Research Council (TÜBİTAK), as "acting like a lever to bring up the quality of the overall eco-system."

Winners, runners-up, and other finalists within the competition-based accelerator were also assisted to take part in other various national and international platforms. These events included COP side events, the Vienna Energy Forum, the Young Enterprise Development Program in France, the Grassroots Innovation Program in India, the Swiss Start-up Program, etc. They could showcase their innovations at these forums and meet potential investors/business partners to advance the commercialization of their products and services.⁶

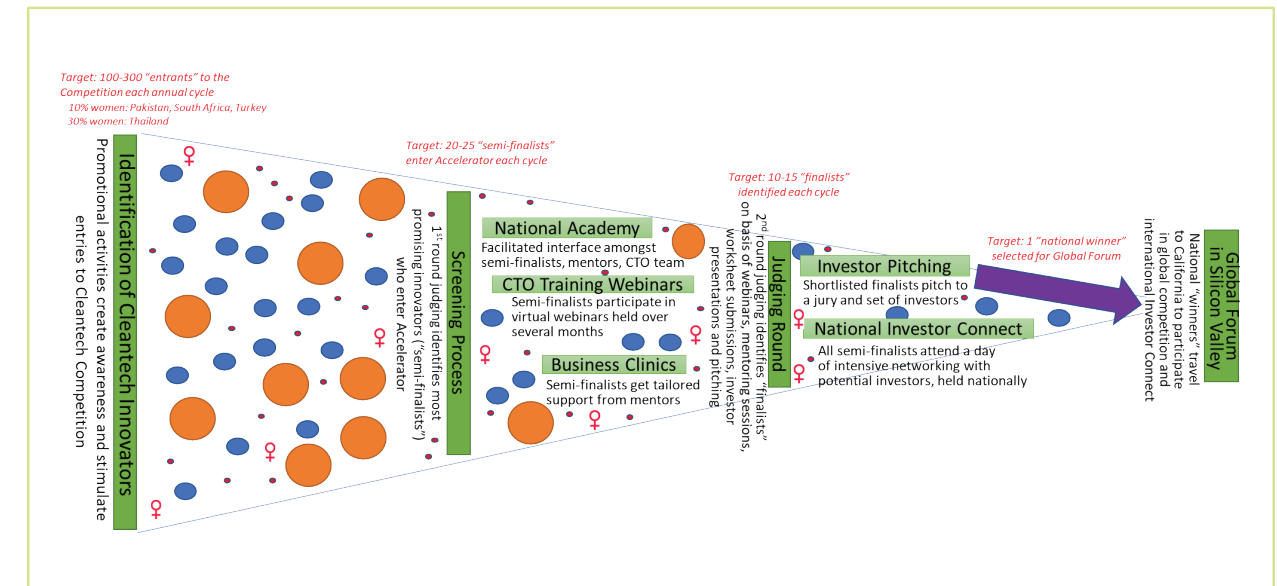
The competition-based accelerator explicitly intended to promote entrepreneurial development and job creation for women. Targets for women entrepreneurs were established in five countries: 10 percent in Pakistan, South Africa, and Turkey; 15 percent in Morocco; and 30 percent in Thailand. Selection criteria were also used to provide preferential opportunities for women and special efforts were made to attract female mentors, judges, and trainers. Special category awards were also created for women entrepreneurs. In

⁵ Interviews with the evaluation team and terminal evaluations referring to their interviews with stakeholders in the field both attested to this finding.

⁶ Such exposure enables innovation to flourish as start-ups question established techniques and approaches and develop a "pioneering spirit" (Lebert n.d.; Kenney 2000).

⁴ Technical assistance was offered for business model validation, customer identification, sales, marketing, intellectual property protection, corporate partnerships, government relations and regulations, funding, angel and venture capital, scaling up, and going global.

FIGURE 2.4 The GCIP model's process and key milestones



Pakistan, this was the Most Promising Woman-Led Business Award; in Turkey: Women-Led Entrepreneur; in South Africa: Best Female Team; and in Morocco (only in the last competition, in 2016), Woman Entrepreneur Award.

By the end of 2017, the GCIP had supported 795 semifinalists across eight countries.⁷ An average of 32 semifinalists per cycle, per country, proceeded into the accelerator, where 10–15 finalists were identified, i.e., almost 50 percent of the semifinalists who competed for a national prize including the trip to Silicon Valley.⁸ In Malaysia and Armenia where the GCIP was first launched, the annual average number of applicants was 55,

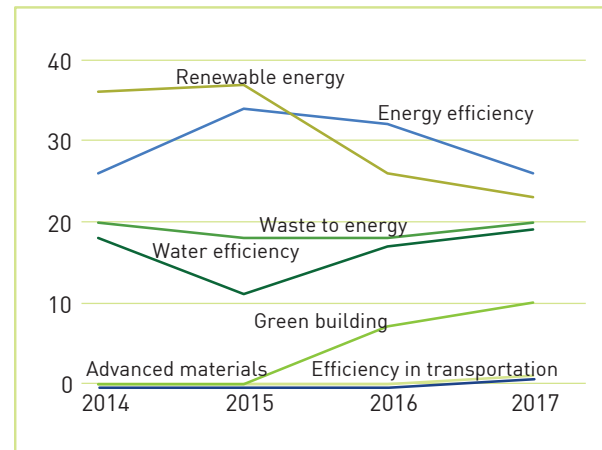
⁷ Not all national projects set targets for the number of teams/start-ups that would be supported. It is, therefore, difficult to put this number into context. South Africa, Turkey, Pakistan and Thailand set targets for number of applicants at 80–100 per year. Only South Africa set a target for support to semifinalist start-ups (initially 40–50/year and then revised down to 20–25/year).

⁸ In the response to the GEF IEO survey an average of 51 percent of semifinalists reported they moved on to become "finalists."

whereas in the five countries that subsequently implemented the initiative, the average hovered around 240. GCIP Pakistan reached the highest number of total applicants (1,635) and semifinalists (249) over four annual cycles (annex E). The GCIP was designed exclusively as climate change focal area projects. The majority of start-ups in 2017 were active in energy efficiency (26 percent) followed by renewable energy (23 percent), waste to energy (20 percent), water efficiency (19 percent), and through more recently introduced categories of green building (10 percent), transportation (1 percent), and advanced material (1 percent) (figure 2.5).⁹ Profiles spread throughout the body of this report describe start-ups that are illustrative of the hundreds of innovations with global environmental/social benefits that have been supported by the GCIP.

⁹ Percentage distribution for recently introduced categories should not be seen as a trend or standard. In South Africa, beginning in 2018, applications from two additional sectors, medical devices and bioprocessing, were included, drawing on legacy activities of the host, which shows evidence of the GCIP's potential for replication.

FIGURE 2.5 Evolution of categories of cleantech solutions generating global environmental benefits



SOURCE: UNIDO statistics based on total applications initiated during 2014 to 2017; annex E.

Participating start-ups entered the GCIP with varying levels of organizational maturity.¹⁰ There were marked differences on this dimension across the national projects, as shown in table 2.2. In India, almost half of surveyed start-ups had been in existence for over four years. In Pakistan and Turkey, the majority were less than one year old. In South Africa, a higher percentage of supported start-ups existed for one to two years.

Surveyed start-ups also entered the GCIP at varying stages of technology development. Most start-ups in South Africa and Turkey were also still in phases from early alpha to early commercial pilot. By contrast, start-ups supported in India were referred by other partners and consequently entered the GCIP at a more advanced stage of

¹⁰ Referring to organizational practices and processes put into place and the business skills and leadership competences developed over time through distinct phases (imagining, incubating, demonstrating, promoting, sustaining). Each phase involves specific tasks, organizational skills, and leadership competences. There are also challenges in transitioning between phases (Jolly 2011).

development, where they were actively deploying their technology and even working on a commercial basis, as shown in figure 2.6.

In Armenia, Morocco, and Pakistan, the GCIP targeted university students, having identified that their proximity to research results would make them good early stage GCIP candidates. In Armenia, a total of 380 students participated (with a 74 percent completion rate) in training organized under the GCIP framework for Gyumri University, Yerevan State University, and National Polytechnic University.¹¹ In Morocco, over 200 students participated in meetings about cleantech and start-up competitions, as a prelude to an envisaged Entrepreneurship Training Program designed for 100 students (with a target of 15 percent women).¹² A targeted approach to universities was also adopted in South Africa in 2017, resulting in introductory workshops with students and staff from mostly engineering departments at eight universities.

THE ROLE OF CLEANTECH OPEN

CTO was contracted by UNIDO to manage and deliver the competition-based accelerator across the GCIP implementing countries.¹³ CTO brought with it a long-standing approach to private sector cleantech innovation and business acceleration from Silicon Valley. Its network of experts included investors and serial entrepreneurs who could support GCIP start-ups during training and at the CTO

¹¹ Independent Terminal Evaluation Report of GEF UNIDO Cleantech Programme for SMEs in Armenia, April 2017.

¹² Project Progress Update Report, fiscal year 2017, for GCIP Morocco.

¹³ This Silicon Valley-based accelerator set up cleantech innovation hubs in the United States to find, fund, foster promising start-ups. Since 2005, CTO has supported 1,200 early stage start-ups through training, mentoring, and access to capital \$1.2 billion of capital, creating over 3,000 green economy jobs: <https://cleantechopen.org/>.

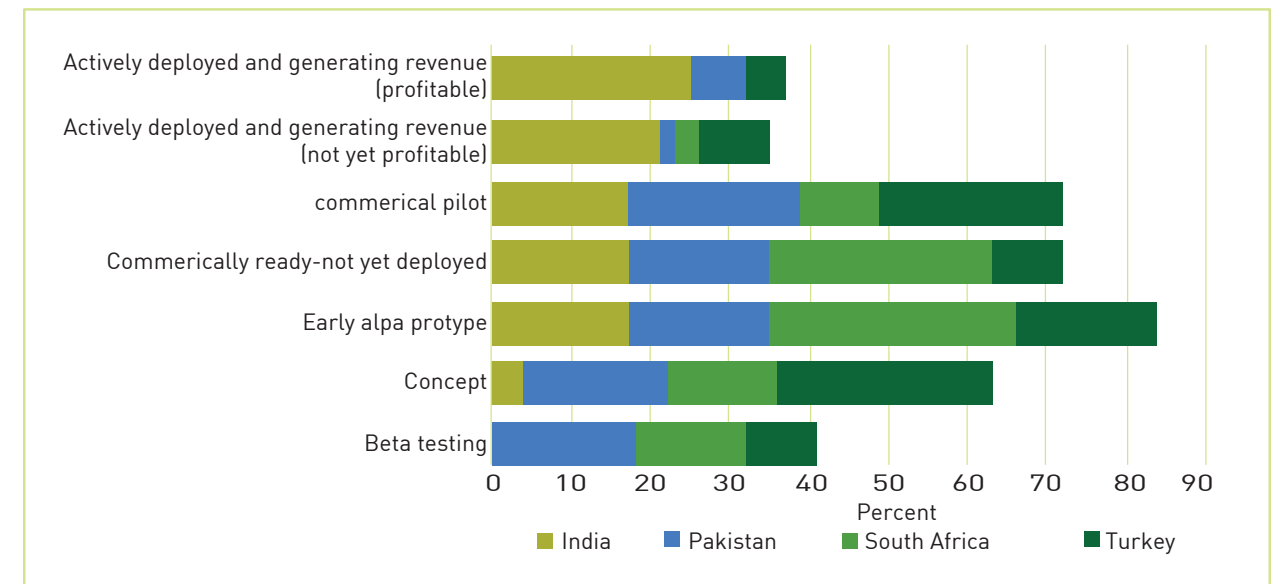
TABLE 2.2 Enterprise maturity level of GCIP-supported start-ups, by country (%)

Maturity level	India (n = 24)	Pakistan (n = 45)	South Africa (n = 29)	Turkey (n = 22)	Overall (n = 120)
Less than 1 year	0	47	14	36	28
1 year	0	22	28	14	18
2 years	21	13	34	14	20
3 years	29	2	7	14	11
4 years	4	4	3	9	5
More than 4 years	46	11	14	14	19

SOURCE: Survey results based on responses from 120 start-ups in four countries.

NOTE: Shading indicates outliers.

FIGURE 2.6 Development stage at entry of GCIP-supported start-ups, by country



SOURCE: Survey results based on responses from 120 start-ups in four countries.

Global Forum hosted annually in California, which brought together winners from participating GCIP countries to meet and pitch their ideas to investors.

CTO's training materials and standardized delivery tied together the experience of the GCIP countries. Online webinars were conducted in English with simultaneous participation across countries. Centrally produced in English, business training materials were assessed by the PMUs,

start-ups, mentors, and judges as very valuable. They were used "as is" in all countries apart from Morocco, Turkey, and Thailand where materials were translated. These materials were the basis for cascading the approach to local trainers who were to be equipped during the project period to deliver the content in subsequent phases. CTO further contributed by providing its online platform to manage applications and shared information gathered

through this process in webinars delivered to start-ups and PMUs.

PRIVATE SECTOR ENGAGEMENT

The focus of GCIP projects is private sector development and engagement in emerging economies for global environmental benefits. Projects were designed to have private sector contributions as a key pillar of project delivery. Private sector engagement consisted of pro bono activities of mentors, judges, trainers, advocates, etc., as well as the

assistance provided by technical experts (on intellectual property protection, product development) and sponsorship of prizes (each worth between \$15,000–\$20,000). These inputs contributed to strengthening the national ecosystem. Without them, there would be insufficient capacity to support the start-ups on their development journey.

3: GCIP relevance, results, and additionality

3.1 Performance ratings

All six completed projects were rated in the “satisfactory” range for outcomes. Table 3.1 shows the performance ratings for the six GCIP projects evaluated to date according to GEF-UNIDO evaluation

criteria and six-point scale. In comparison, the overall outcomes rating for the climate change portfolio, as reported in the GEF IEO Annual Performance Review, was 72 percent for the 2017 cohort (71 projects) and 77 percent for the total portfolio (376 projects) (GEF IEO 2018).

TABLE 3.1 Performance ratings from terminal evaluations of GCIP projects, by country

Evaluation criterion	Armenia	Malaysia	India	Turkey	South Africa	Pakistan
A. Impact rating	—	S	S	S	S	HS
B. Project design	MS	S	MS	S	S	HS
Overall design	MS	MS	MS	S	HS	S
Logframe	MS	MS	S	MS	MS	S
C. Project performance						
Relevance	HS	HS	HS	HS	HS	HS
Effectiveness	MS	S	S	S	S	HS
Efficiency	MS	S	HS	HS	S	S
Overall outcomes rating	MS	S	S	S	S	HS
D. Sustainability of benefits	ML	ML	ML	ML	L	HL
E. Cross-cutting performance criteria						
Gender mainstreaming	—	MS	U	S	S	HS
M&E	MU	MS	MU	S	S	S
Results-based management	—	—	HS	S	S	HS
F. Performance of partners						
UNIDO	MS	S	HS	S	HS	S
National counterparts	—	—	HS	S	HS	S
Donor	—	—	HS	HS	HS	HS
G. Overall assessment	MS	S	S	S	S	HS

SOURCE: Independent terminal evaluations of completed GCIP projects; UNIDO.

NOTE: — = not available; HS = highly satisfactory; L = likely; ML = moderately likely; MS = moderately satisfactory; MU = moderately unsatisfactory; S = satisfactory; U = unsatisfactory.

3.2 Strategic relevance

All six of the completed GCIP projects have been rated “highly satisfactory” for relevance. Four countries are currently planning a second phase under GEF-7: Pakistan, South Africa, Thailand, and Turkey. In Armenia, a second phase was part of the National Portfolio Formulation Exercise, but it was ultimately not supported in GEF-6. In Malaysia, the host, Malaysia Industry-Government Group for High Technology, also expressed interest to continue the competition-based accelerator beyond project completion; however, its submission for a second phase was also not endorsed. Malaysia has instead rebranded the initiative as Sustainable Technology for Resilient, Innovative and Knowledgeable Entrepreneurs. The reasons for deciding not to continue the competition-based accelerator are not known to the evaluation team.

In 2017, the Global Cleantech Innovation Index placed all GCIP implementing countries (eight at that time) within the lower half of its rankings.¹ This suggests that there was a need and opportunity in all GCIP countries to develop the cleantech innovation ecosystem. Malaysia was the highest ranked among the GCIP countries analyzed and Armenia, Morocco, and Pakistan formed the bottom three of the 45 countries reviewed (figure 3.1).

The state of the entrepreneurial ecosystem for innovation shows improvements in the profiles of most GCIP countries during the GCIP’s

¹ The Global Cleantech Innovation Index identifies countries with the greatest potential to produce start-ups that will commercialize clean technology innovations over the next 10 years. UNIDO-GEF partnered with the Global Cleantech Innovation Index for the [The Global Cleantech Innovation Index 2017 Report](#), which was undertaken several years after the selection of the nine GCIP countries to investigate, relative to gross domestic product where cleantech companies are most likely to emerge and why (UNIDO, GEF, CTG, and WWF 2017).

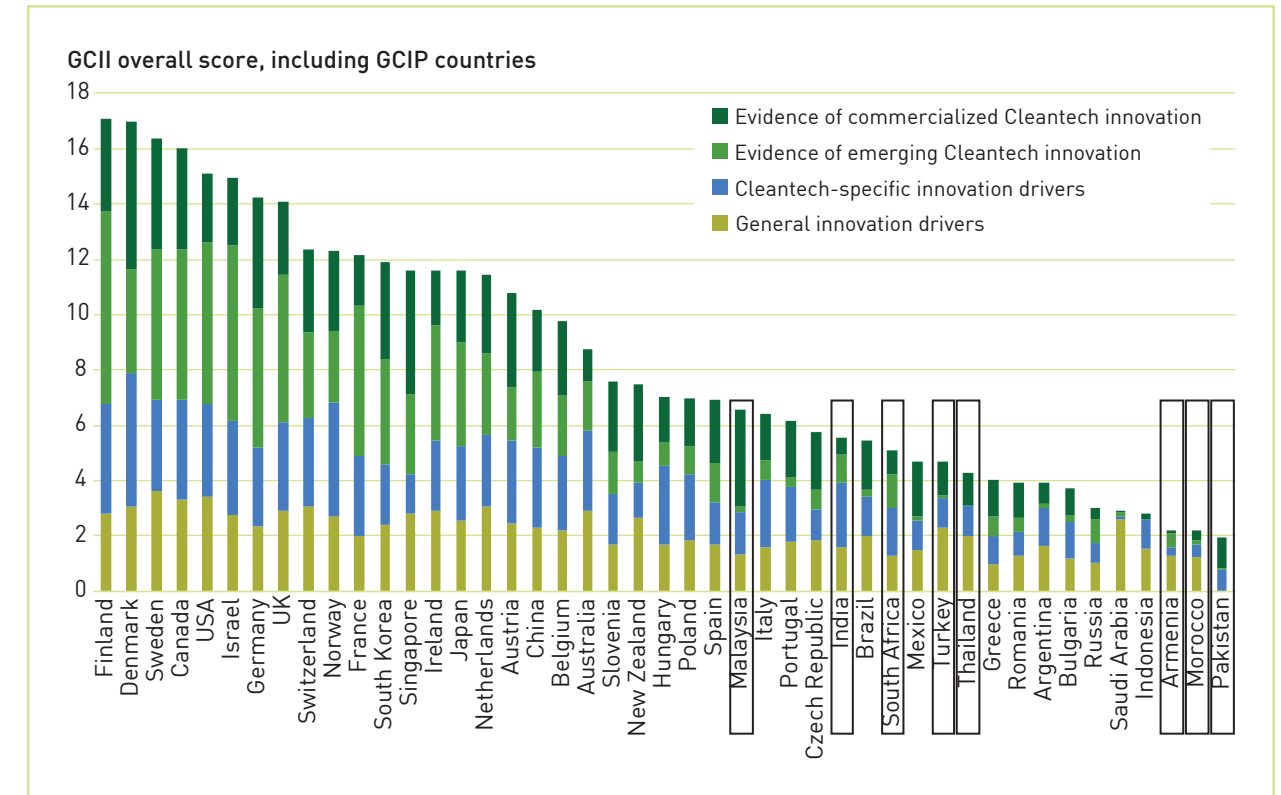
implementation (table 3.2). The GCIP cannot take the credit for this. However, the improvement is an indication of the value that can be gained from strengthening the national entrepreneurship ecosystem and supporting the development of cleantech-specific innovation drivers, which were limited in these countries at the time of the GCIP’s introduction.

The GCIP was consistent with national priorities to encourage entrepreneurial activity and development of the SME sector.² The GCIP was also fully relevant to national priorities of environmental protection. All GCIP countries have national plans/strategies that envision achieving prosperity and sustainable socioeconomic progress through use of science, technology, and innovation. However, they lack necessary elements of a functioning entrepreneurial ecosystem. The GCIP’s focus on cleantech business acceleration aligned it with national commitments to the United Nations Framework Convention on Climate Change, including the 2015 Paris Agreement and policies that recognize energy efficiency and renewable energy as keys to ensuring energy security and availability.

GCIP projects are fully aligned with the GEF’s Revised Strategy for Enhancing Engagement with the Private Sector (GEF 2011c), relevant to the GEF’s climate change focal area objectives, and the GEF Policy on Gender Mainstreaming (GEF 2012). Modality 3 of the GEF’s Revised Strategy

² SME development is the economic backbone in all GCIP countries. From the respective project documents: in Armenia, SMEs accounted for 97.7 percent of registered legal entities/sole proprietors. Pakistani SMEs contributed 40 percent to gross domestic product, 25 percent to manufacturing value-add, and provided 79 percent of nonagriculture jobs. In Thailand, SMEs account for 36 percent of gross domestic product, 84 percent of national workforce, and spent 16–25 percent of total production cost on energy. In Malaysia, SMEs were expected to generate 41 percent of gross domestic product by 2020 (Musa and Chinniahb 2016).

FIGURE 3.1 Comparison of GCIP implementing countries within the Global Cleantech Innovation Index, 2017



SOURCE: The Global Cleantech Innovation Index 2017 Report GCIP Country Innovation Profiles (UNIDO, GEF, CTG, and WWF 2017).

TABLE 3.2 Comparison of GCIP country rankings on the Global Innovation Index, 2013 and 2018

Country	2013 ranking (of 142 countries)	2018 ranking (of 126 countries)
Malaysia	32	35
Thailand	57	43
South Africa	58	58
Armenia	59	68
India	66	57
Turkey	68	50
Ukraine	71	44
Morocco	92	76
Pakistan	137	109

SOURCE: Global Cleantech Innovation Index Report, 2013 and 2018.

NOTE: The Global Innovation Index contains 80 indicators that explore a broad vision of innovation, including political environment, education, infrastructure, and business sophistication.

for Enhancing Engagement with the Private Sector is dedicated to an “SME Competition Pilot for Encouraging Entrepreneurs and Innovators through a Competition/Incubation Pilot.” The GCIP supported the “demonstration, deployment, and transfer of innovative low-carbon technologies”; “market transformation for energy efficiency in industry and the building sector”; “investment in renewable energy technologies”; and “energy efficiency, low-carbon transport and urban systems” (GEF 2011a). Reflecting recognition that gender equality enhances economic growth, household poverty reduction, and human development, the GCIP included an intention to promote women for entrepreneurs.

The GCIP was relevant to UNIDO's mandate for inclusive and sustainable industrial development and aligned with UNIDO's Green Industry Initiative and Energy Strategy (UNIDO 2015a). UNIDO leveraged its significant experience in technical cooperation for industry (especially SMEs) and introduced the Industry 4.0 concept to government officials through visible applications and concrete examples.³ UNIDO's appointment of an overall GCIP Coordinator (August 2017) and the creation of a Climate Technology and Innovations Division (June 2018) demonstrate a commitment to support member states in unlocking global environmental benefits through clean technology innovation and entrepreneurship.

The timeliness of the GCIP's implementation enhanced its relevance. Emerging economies are increasingly powering growth and innovation in clean technology. In 2012, clean technology investment rose by 19 percent in developing countries (to \$112 billion per year) compared with an overall decline of 12 percent globally (to \$244 billion per year), suggesting that clean technology investment is shifting toward developing economies in the near term (World Bank 2014b). In India, the GCIP's relevance increased since its 2013 inception, given the 2014 launch of *Make In India* and *Swachh Bharat Abhiyan*. These initiatives promote nationally developed clean technology solutions.

3.3 Results: environmental outcomes

All assisted GCIP start-ups are developing innovations with climate benefits, as well as environmental and social cobenefits. Table 3.3 describes illustrative innovations that attest to the nature of these benefits. At this stage, their results

³ Industry 4.0 refers to the fourth industrial revolution and current trend of automation and data exchange in manufacturing facilitated by the Internet of Things, cloud computing, and smart factories.

and continued operations cannot be verified. The information is drawn from GCIP implementation in South Africa. Profiles distributed throughout the report provide information on additional environmental innovations across countries.

In the absence of M&E systems operating in each GCIP implementing country beyond the project period, GHG reductions will be difficult to confirm. Emission reductions are foreseen to be achieved over a 10-year period (e.g., 2013–23), which is substantially beyond the envisaged duration of the national projects (table 3.4).⁴ There are no systems currently in place to check the realization of these projected achievements.

Only two terminal evaluations (South Africa and Pakistan) included projections of GHG emissions reduced and described the methodology used to make the assessments.⁵ The respective PMUs tried to gauge potential performance against the set target by gathering information from a small subset of start-ups and extrapolating this to the larger set. The estimates of GHG emission reductions provide insight into which types of innovations could generate which magnitude of reduction, but these calculations raise questions regarding methods used to arrive at the numbers and the targets.

■ **Pakistan.** GHG emission reduction of seven start-ups was calculated to reach an emission reduction of 196.96 tCO₂e per year. Extrapolated to 95 active projects, this suggested an annual reduction of 2,672 tCO₂e,⁶ substantially exceed-

⁴ Targets were set following the GEF Manual's calculation approach under the climate change focal area. The most recent project in Ukraine based its target (which is relatively lower) on the experiences of the preceding GCIP projects and used a different method for GHG calculation.

⁵ India's terminal evaluation states: "Reporting on GHG reductions was not required through GCIP India."

⁶ Drawn from a study which outlined the calculation methodology, presented at the International

TABLE 3.3 Illustrative GCIP-supported innovations in South Africa delivering environmental benefits

Energy efficiency	AET Africa (2016 most promising youth-led business): Its Hot Spot geyser sleeve can be used in households to conserve, reuse, and improve water heating mechanisms; following market validation. Under support from TIA and others, a manufacturing plant was to be launched in Eastern Cape's rural district in September 2018.
Renewable energy	Solar Veranda (2015 youth-led team): Uses a veranda to provide shade, solar heat, and collect rain water for low-cost houses; successfully raised funds to construct prototypes, won 2017 Ecologic gold award for best eco-innovation, in commercialization Eco-V (2015 second runner up): Its GreenTower microgrid provided affordable electricity, fresh water, hot water, and sanitation from renewable resources for self-sustainable communities. After registering a patent, was investigating industrial-scale applications.
Water efficiency	Baoberry (2016 winner and most promising woman-led team): Developed a compact mobile version of an artificial wetland providing a natural, sustainable way to improve water quality in poor communities; getting ready to offer to various markets.
Waste-to-energy	Clear Sky Energy (2014 winner): Its waste-to-energy plants utilize carbonaceous waste to produce energy, thereby diverting it from landfill; in discussion with European waste companies to license its core technology. Ekasi Energy (2015 winner): Its micro-gasifier stove efficiently burns biomass, reducing smoke and carbon monoxide fumes by over 90%; is working with the local community to use alien tree vegetation (which threatens water security) as raw bio-waste input.
Waste reduction	Gracious Nubian (2017 runner up and social impact award winner): Its reusable biodegradable sanitary pad reduces the environmental impact of modern sanitary protection (disposable pads take 500–800 years to decompose); its products are available to women and girls in rural areas.
Green buildings	Thevia (2016 runner up): Developed a 99.4% recyclable roof tile that is stronger, lighter, less prone to breakage, and quicker to install than concrete alternatives; the company is already in the market, producing 300,000 to 500,000 tiles per month.

SOURCE: GCIP 2017.

NOTE: TIA = Technology Innovation Agency.

TABLE 3.4 Country targets for GHG emissions avoided because of GCIP implementation (in tCO₂e)

Country	Target	Unit abatement cost per tCO ₂ e
Malaysia	425,000–849,000	\$1.18–\$2.36
Armenia	18,408.75–36,817.5	\$14.88–\$29.77
India	350,000–700,000	\$1.43–\$2.86
Pakistan	452,000–904,000	\$1.50–\$3.03
South Africa	815,000–1,630,000	\$1.22–\$2.44
Turkey	730,000–1,460,000	\$0.68–\$1.36
Thailand	811,500–1,623,000	\$1.23–\$2.46
Morocco	200,922.5–401,845	\$2.27–\$4.55
Ukraine	200,000 ^a	Not available

SOURCE: Request for MSP approval for the respective country projects.

a. New method introduced; based on estimation that 200 entrepreneurs participate in the project.

BOX 3.1 Pakistani start-up delivers environmental benefits and new jobs: optimizing natural gas, electricity, and water use with intelligent device

Zaheen Machines started over a conversation between two friends about developing a product to save natural gas wasted in legacy water heaters due to poor thermal insulation and a 1960s thermostat concept. Users go outside, turn on the water heater, wait 30 minutes, shower, then go again to turn it off. They created an intelligent device that can be snapped onto an existing water heater's thermostat, which users operate through an app, saving 50 percent on utility bills for gas-burning water heaters and repaying the price in less than one winter season, with continued savings for years to come. Having reached first runner up in 2015 for energy efficiency, the GCIP provided a great way to increase awareness of the company's product and acquainted the team with other entrepreneurs in Pakistan and globally. Zaheen projected GHG emission savings of 150 tCO₂e per year by 2020, the creation of 100 new jobs, and a doubling of its revenue to \$1 million.

SOURCE: GCIP South Africa PMU, 2018.

ing the targeted level in the project's results framework.

- **South Africa.** Input from nine start-ups (table 3.5) arrived at an overall long-term projection. However, estimates were requested for different time frames (2019, 2025). **A common methodology was not apparent within or across technology categories, making linear extrapolations a challenge for the wider group.** Entrepreneurs based their projections on perceived sales. They were not asked to clarify projected savings (kWh avoided or reduced,

Science-Policy Conference on Climate Change (December 18–20, 2017) published in its journal, <http://sp3c.org.pk/>.

etc.). Within this small sample, the lion's share of potential GHG savings stemmed from a single respondent in the energy efficiency category.

Select start-ups in five countries have also reported on their estimated GHG emission reductions. While showing promise, it is still too early to judge the quality of these projected impacts. Many of the teams that took part in the GCIP still lack the financial resources needed to test and transform their ideas and concepts into reality, or the enterprises were still at a nascent stage and concepts had not been sufficiently tested under the GCIP to judge their merits.

Tracking and communicating positive environmental impacts (global climate stress reductions and improvement in environmental status) is difficult for many GEF projects as they usually take place well beyond project completion. This challenge for the GCIP is exacerbated by a lack of standardized methodology for target setting and projection of impacts.

3.4 Results benefits to SMEs

BUSINESS DEVELOPMENT SERVICES

Targets were exceeded in India, Pakistan, South Africa, and Turkey for the number of **competition-based accelerator cycles.** Consequently, a higher number of businesses were put on a path to commercialization. This would, in principle, increase the likelihood for their innovations to reduce GHG emissions, reach the market, and create jobs.

Survey responses indicate that participating start-ups highly appreciated the GCIP's business development training services. Stakeholders supported the notion of a competition as an overarching entry to the GCIP accelerator. For start-ups, many typically had an engineering background and were often solely focused on technology, product

TABLE 3.5 Projected GHG emission reductions from sampling of GCIP innovations in South Africa

Company name	Technology and/or product	Potential climate change impact in tCO ₂ e	
		2019 (projected)	2025 (projected)
Ducere Holdings (Pty) Ltd.	MISER Hydraulic Hybrid Transmission	—	30,000,000
Volta	Volta Flow Battery	—	32,000
NewCarbon (Pty) Ltd.	Transforms biomass into activated biocarbon, wood vinegar, and energy	—	75,500
Ekasi Energy	Smokeless stoves	4,131	—
Pegasus Engineered Green Mobility	Pegasus multifuel technology	3,424	—
Solar Turtle	Solar Turtle	117,945	—
Eco-V	GreenTower microgrids	21,000	—
Thevia	Thevia roof tiles	35,397	—
Sustainability Professionals	Mashesha stoves	—	52,000
Total projected GHG savings		181,897	30,159,000

SOURCE: GCIP South Africa PMU, 2018.

NOTE: — = not available.

design, and proof-of-concept. The GCIP helped them recognize and address critical barriers to commercialization through the competition-based accelerator component.

“Business development training” was most frequently ranked as the most beneficial element of GCIP by respondents, with 40 percent of all respondents ranking it first out of the eight components listed.⁷ Sixty-eight percent of respondents ranked it as one of the top three. This is followed by “mentorship on business plan development,” which 19 percent of all respondents ranked as the first, and 56 percent ranked as one of the top three, and “opportunities to showcase technologies,” which 13 percent of respondents ranked as first, and

47 percent ranked as one of the top three most beneficial components (table 3.6). Respondents ranked “connection with an investor network/potential business partners,” and “increased capacity of supporting government institutions and improving the policy and regulatory environment” as the least beneficial (annex C).⁸

Training for business plan development was rated as the highest quality service provided by the GCIP. This was followed by mentorship, and opportunities to showcase their technology. The results also pointed to limitations related to quality of networking activities with investors and business partners. India participants also rated technical advice through sector partners as lower quality (table 3.7).

⁷ GCIP support elements: Training for business plan development, connection with an investor network, technical advice through sector experts, mentorship on business development, opportunities to showcase technology, connection with potential business partners, improving the policy and regulatory environment, increased capacity of government institutions.

⁸ GCIP project managers ranked opportunities to showcase technology, connection with potential business partners, and connection with an investor network as the top three benefits, and ranked improving the policy and regulatory environment for business operations the lowest (annex D).

TABLE 3.6 Top three ranking of most beneficial GICP components (% of respondents)

Component	Ranking	India	Pakistan	South Africa	Turkey	Overall
		(n = 24)	(n = 45)	(n = 29)	(n = 22)	(n = 120)
Training for business plan development	Ranked as most beneficial	33	44	34	45	40
	Ranked in top three	67	71	59	73	68
Mentorship on business plan development	Ranked as most beneficial	25	13	17	27	19
	Ranked in top three	54	38	66	82	56
Opportunities to showcase technologies	Ranked as most beneficial	25	13	10	0	13
	Ranked in top three	67	47	48	23	47

NOTE: Survey results based on 120 participant responses from four countries.

TABLE 3.7 Responses to survey question: How would you rate the quality of services you received?

Service	India		Pakistan		South Africa		Turkey		Overall	
	No.	Score	No.	Score	No.	Score	No.	Score	No.	Score
Training for business plan development	20	7.50	45	7.51	29	8.00	22	8.27	116	7.78
Connection with an investor network	23	4.61	45	4.76	29	4.69	21	4.86	118	4.73
Technical advice through sector experts	22	3.64	44	4.91	29	4.76	21	5.33	116	4.71
Mentorship on business development	21	5.90	45	6.04	29	6.41	21	7.33	116	6.34
Opportunities to showcase technology	24	5.92	45	5.91	29	5.66	22	5.45	120	5.77
Connection with potential business partners	23	3.76	44	4.64	29	4.28	21	4.76	117	4.40

NOTE: Survey results based on 120 participant responses from four countries. Respondents were asked to rate the quality of various inputs on a six-point scale from "very poor" to "excellent." Weighted average score was calculated by first assigning numeric values to response choices (very poor = 0, excellent = 10), then calculating the overall average according to the number of responses to each choice. An overall score above 5.00 is positive; above 7.50 is highly positive. "N/A" and blank responses were omitted.

Certain direct business-level outcomes can be directly attributed to the GICP. Based on responses to the survey, participating start-ups revised business plans, marketing plans, and business pitches, among other activities (table 3.8). Pakistan PMU reported that 40 percent of supported start-ups were able to successfully sell their product or idea to at least one customer during the project period. Other GICP projects did not report information at this level of granularity, which would have facilitated comparison.

Survey responses to which barriers to enterprise development were addressed by the GICP indicated access to markets and access to finance (table 3.9). This supports findings reported in a 2014 World Bank study, which cited access to finance as the most common barrier for clean technology SMEs in India.

Mentoring was an integral part of the GICP's capacity development package. The GICP's framework was stronger because of the involvement of voluntary mentors, judges, and trainers. As in the survey, interviews with start-ups consistently

TABLE 3.8 Responses to survey question: Have you made changes to the following elements in your business as a result of the GICP?

Element	India		Pakistan		South Africa		Turkey		Overall	
	No.	%	No.	%	No.	%	No.	%	No.	%
Revised financing plans	13	54	25	56	15	52	13	59	66	55
Revised business planning	16	67	32	71	19	66	14	64	81	68
Created new jobs within the enterprise	13	54	23	51	12	41	6	27	54	45
Made alterations in product	16	67	27	60	16	55	5	23	64	53
Revised marketing plan	16	67	31	69	18	62	11	50	76	63
Revised business pitch	18	75	28	62	20	69	9	41	75	63
Other changes	13	54	5	11	1	3	4	18	23	19
Have made no changes	14	58	24	53	12	41	7	32	57	48
Number of respondents	24		45		29		22		120	

SOURCE: Survey results based on 120 responses from four countries.

TABLE 3.9 Responses to survey question: Which barriers to the development of your enterprise did the GICP help address?

Barrier	India		Pakistan		South Africa		Turkey		Overall	
	No.	%	No.	%	No.	%	No.	%	No.	%
Policy or regulatory environment	5	21	14	31	6	21	10	45	35	29
Access to finance	6	25	18	40	6	21	8	36	38	32
Access to markets	7	29	16	36	10	34	11	50	44	37
Skill shortage	4	17	9	20	5	17	8	36	26	22
Not applicable	10	42	10	22	10	34	1	5	31	26
Other (please specify)	5	21	7	16	9	31	3	14	24	20

SOURCE: Survey results based on 120 responses from four countries.

stated that they gained substantial value from a mentor's input on the business, commercial, and financial aspects of entrepreneurship and insights that allowed them to leapfrog potentially critical mistakes.

The extent to which criteria were systematically applied to the selection of mentors was not clear. Volunteers for these ecosystem support roles were identified in each cycle through institutional, professional, and personal networks associated with the PMUs and PSCs. Once identified, guidance was available from CTO to support them in their roles.

Most mentors supported the start-ups with skills for business models and commercial validation rather than technical advice. While highly valued, some entrepreneurs did express concern that mentors were not familiar with an entrepreneur's technology and raised the need for more technical advisors to also serve on judging panels and as mentors.

After the launch of the GICP, Pakistan and South Africa witnessed increases in the number of entities supporting the national entrepreneurship landscape. The GICP continued to be one of the few offering early stage business assistance

to cleantech innovators. There is no evidence that these additional support services can be attributed to the GCIP. In Pakistan, the GCIP was introduced in 2015 when the national innovation ecosystem was in a nascent phase. By the end of its first annual cycle, 20 incubation initiatives were under way across the “golden triangle.”⁹ Since the GCIP’s 2015 launch in South Africa, there was a 58 percent increase in support entities in the national entrepreneurship landscape (figure 3.3).

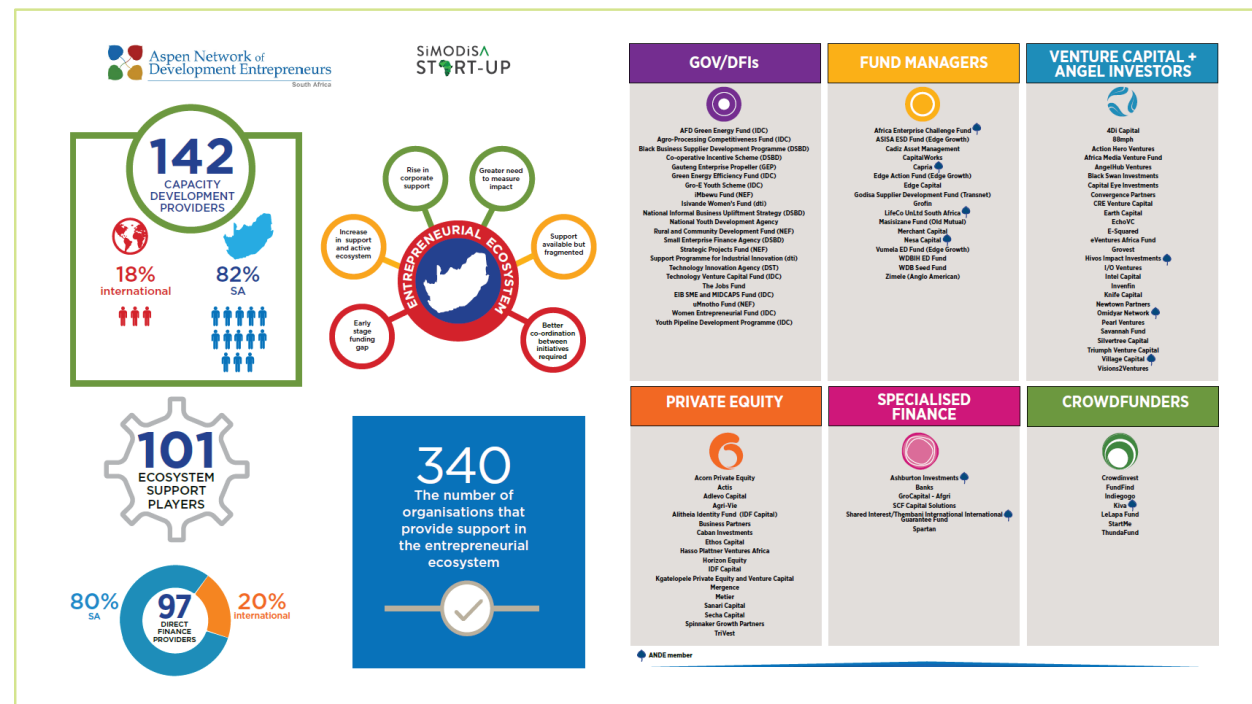
⁹ The golden triangle refers to the major urban centers of Islamabad-Karachi-Lahore; from the Comparative Statement of Different Competition/Incubation Programs being Offered in Pakistan (2015), a study undertaken by the GCIP Pakistan’s PMU.

SKILLS DEVELOPMENT

Interviewees were near unanimous in their assessment that the GCIP helped them to develop skills in business model development, market segmentation, and financial projections. As a South African start-up team member stated, the focus on business skills was the “difference that made the difference,” compared to other accelerators. A GCIP international trainer explained, “technologists understand how to produce technology, but they don’t understand aspects related to what it takes to run a successful business: how to find customers, make them happy, keep them, and use cash wisely.”

Peer-to-peer connections that emerged led to mutual learning and benefited participants. All GCIP start-ups interviewed expressed appreciation for the peer learning and connections made

FIGURE 3.3 Explosion in support available for South African entrepreneurs and start-ups (2017)



SOURCE: Aspen Network of Development Entrepreneurs South Africa Chapter, 2017, <https://www.andeglobal.org/page/SouthAfrica?>

BOX 3.2 India’s first solar ferry: running on sunshine, from commercial ferries to fishing boats

Conventional passenger boats cause air and water pollution. Noise, vibration, and diesel fumes also inconvenience passengers. NavAlt Solar and Electric Boats (2017 award winner) developed India’s first solar ferry with no fuel on board, advancing the boating industry’s technical level. Its boats are currently operating in Kerala. The start-up received its first commercial order from the State Water Transport Department of Kerala with all manufacturing to be done in India. The company has recently initiated a research project to make a solar fishing boat to suit the requirements of small fishing communities. Founder Sandith Thandashery explained, “GCIP forces you to start from the beginning, i.e., look at strategy and go through every step of a business plan. One tangible outcome of this program is we are now exploring how to do a lease model. Previously our model was to build the boat and sell it to a client. GCIP helped us explore a different business model.”

BOX 3.3 Turkish start-up helps small farmers maximize crop yields and profits

Turkey’s Eriktronik Engineering developed decision support tools (e.g., for irrigation, spraying, plant growth) and offers an app to farmers called Tarla.io (2016 finalist) to help farmers transform their fields into profit centers and support other enabling actors (agronomists, suppliers, traders, producers, creditors, insurers) to maximize yields, profits, and to save resources across the value chain. The company’s founder explained, “we are in a race to get our products to market. There are companies in the USA developing similar ideas. Through GCIP, our visibility in the Turkish ecosystem increased. We met people and develop links with other start-ups.” A hundred thousand Turkish farmers are using the company’s platform, which provides hyperlocal statistics and derives insights regarding precipitation, temperature, hail, thunderstorm distribution, and probabilities for determining operations, plant health, credit, and insurance risks, all vital to check before deciding on cultivation.

with like-minded entrepreneurs. Many reported that they intended to maintain their participation in established national networks, for example, through the use of WhatsApp groups to keep in touch and to discuss challenges. The CTO Global Forum was appreciated by the national winners for the opportunity to network with international investors/potential partners and to meet/compete against other GCIP national teams for a global prize. This exposure provided insight into what investors look for, and which (even whether) investment options were most appropriate to pursue. This assisted their long-term planning.

Start-ups expressed a desire for a platform that would allow for significantly more direct sharing and exchange across the GCIP sister countries or through UNIDO’s broader international networks.

Although such a platform was not a part of GCIP project designs, it would be consistent with a global vision for the GCIP.

The GCIP’s mostly uniform approach allowed for consistency in delivery of training components regardless of an enterprise’s state of maturity and technology stage. Those entering at the early alpha prototype phase, which represented a slight majority of all participating start-ups, reported that they could have benefited from increased focus on the technical feasibility of their innovative idea, before advancing into the accelerator, which focused mainly on the business model and customer validation. There is a fine balance between maintaining standardization and customizing benefits for SMEs.

There was opportunity for further country contextualization. For example, In India, where companies

were at later stages of development, support was provided to gauge the technical feasibility of technologies. Other Indian start-ups pointed to a need for guidance on the Indian regulatory environment, India-specific export market considerations, signposts to relevant in-country resources, and non-English promotional material because the lack of Hindi material reduced outreach.

JOB CREATION

New job creation is expected as a result of GCIP support, but it is not being systematically tracked.

Based on 14 start-ups in five countries,¹⁰ UNIDO has projected creation of 1219 new jobs by 2020. Furthermore, a recent World Bank Group report describes the significant potential of cleantech SMEs in developing countries to generate profits and create jobs, estimating this to be a \$1.6 trillion market opportunity.¹¹ Studies carried out by PMUs in two countries indicated their approach for estimating job creation:

- **South Africa.** Twelve high-potential start-ups reported job creation each in the range of five to 120 jobs, for a total of 238 new jobs in 2017. However, it was difficult to determine the extent to which job creation effects could be directly attributed to the GCIP or realized, as estimated.
- **Pakistan.** Each supported start-up was estimated to generate four to six part/full-time jobs, from which the PMU then inferred that the project had generated 500 “green jobs” by 2018.¹²

¹⁰ Armenia, India, Pakistan, South Africa, and Turkey.

¹¹ World Bank (2014) illustrates the nature and likely size of the clean technology opportunity for SMEs in 145 developing countries over the next decade. In this period, expected investment across 15 clean technology sectors in developing countries is expected to exceed \$6.4 trillion. Of that total market, roughly \$1.6 trillion is expected to be accessible to SMEs.

¹² This estimation was made by taking a sample of start-ups and checking the number of jobs created by

The evaluation survey results indicate that the average staff base of these GCIP start-ups increased (table 3.10). Although this trend is encouraging for the participating teams, it was not possible to directly attribute staffing growth to the GCIP as other factors may also have contributed to the growth in employment.

INVESTOR CONNECTS

As reported in the terminal evaluations, select participating start-ups accessed capital for their cleantech enterprises that they attributed to the GCIP. These investments helped address a major hurdle in the commercialization of technology, especially in cleantech, which does not easily qualify for traditional banking instruments.

In Turkey:

- Positive Energy (2015 alumni) raised \$320,000, with a further \$1 million in progress and \$300,000 commitment in place by December 2017. A valuation of \$8 million was anticipated.
- Biolive (2017 semifinalist) raised a TRY 500,000 investment from Turkey’s Vestel Ventures.
- Episome Biotech (2017 semifinalist) raised €1.7 million in investment through three rounds from Diffusion Capital Partners based in the Netherlands.

In India:

- Agnisumukh Energy Solutions raised \$1.2 million, with a further \$1.5 million in the pipeline.
- Others raised loans of \$50,000–\$250,000 through connections established directly through the GCIP.

them. The resulting average number of jobs created was calculated from this representative sample.

TABLE 3.10 Changes to staffing base of GCIP-supported start-ups

Staffing base	India (n = 24)	Pakistan (n = 45)	South Africa (n = 29)	Turkey (n = 22)	Overall (n = 120)
Average number of employees precompetition	16.5	18.7	3.2	2.4	11.5
Average number of employees now (early 2018)	25.4	20.0	3.9	3.0	14.1
Average change to size of staff base (%)	+54	+7	+22	+25	+23

SOURCE: Survey results based on 120 responses from four countries.

In Armenia:

- Nano Hi received \$120,000 in foreign grants (Germany, Ireland, and Spain) to advance its work.
- YSU Biofuel (2014 national winner) used a \$50,000 matching grant offered by the GCIP local executing partner to purchase equipment and initiate production.
- Several other start-ups received \$5,000–\$10,000 from GCIP Armenia to support customer validation.

In South Africa:

- EcoV received R 300,000 from The Innovation Hub and Gauteng Department of Infrastructure Development to pilot its Green Tower Microgrid to provide renewable energy and hot water to a community health center, and subsequently obtained a further R 1 million (with the involvement of the Development Bank of Southern Africa).
- Lightspense raised 25 percent of its resources through private funding, complementing 2.9 million rand funding provided by the South African government through its Department of Trade and Industry.

The CTOs annual Global Forum in Silicon Valley was not effective in securing investment. In countries where the political climate was perceived as unstable (e.g., Pakistan, South Africa, Turkey), investors were wary. As a Pakistani team member

reported, “We started talking to investors and when they learned we were from Pakistan, they said they were not interested to talk to us at all. We didn’t make any connections that lasted.” Nevertheless, the forum was described as a “nice to have” and a “valuable eye-opener.” GCIP-supported start-ups are often not at the level of commercialization (i.e., customer pipeline, protectable intellectual property), with substantive cashflow projected beyond timelines that fit within the interest of these international investors.

National-level Investor Connects designed to bring the semifinalists undergoing the accelerator in contact with potential industry partners and investors were more successful. Run twice since 2017 in Pakistan, the national Investor Connect generated additional private sector resources. Two Pakistani firms each offered \$10,000 equivalent in support, paving the way for award winners to carry out customer validation (a common obstacle faced by all entrepreneurs) in the respective sponsor’s own premises. This Industry Challenge also oriented start-ups toward developing ideas that could solve real company problems. According to its terminal evaluation, the Pakistani national Investor Connect resulted in 60 follow-up meetings with 80 percent of investors reporting their intention to follow-up on business opportunities after the session.

3.5 Results: building country capacity for cleantech and supporting national entrepreneurship ecosystems

NATIONAL COORDINATION

The national coordination role was not uniformly understood, and was insufficiently leveraged and resourced. GCIP projects did not systematically track the path of alumni as well as those who did not substantially progress down the innovation funnel. No specific guidance was provided to host organizations on how to play the expected national-level coordinating role for cleantech entrepreneurship, although project approval documents indicate this role was expected. In some instances (Turkey, South Africa), it was even mentioned that the GCIP would supply existing in-country funding schemes with applicants, thereby improving their pipelines and disbursement rate. These expectations were not referenced in the results framework, and no project activities provided the scope for creating and leveraging such linkages.

Demand has consistently outpaced supply because of the innovation funnel concept implicit in the competition-based accelerator. GCIP/CTO processes did not appear well-suited to dealing with those whose applications were not accepted. A small subset, an average of 32 semifinalists per cycle per country from the total number of applicants (240 was the average annual cohort per country), benefited from direct project support each year. Even with the support of “application mentors” (South Africa) and “infotainers” (Pakistan), there is significant attrition; 43 percent attrition in India; 51 percent in South Africa ([annex E](#)). Based on interviews in the field, this filtering approach to the selection of semifinalists had a demoralizing effect for some start-ups that were excluded from moving further along the process, i.e., the “fallen heroes.” The CTO platform also seemed

maladapted to a developing country context. As a South African applicant explained, “CTO’s platform took us to a US website. People couldn’t understand the questions. In Northern Cape, many people don’t have access to a computer. There were many issues with the sign-up process. It took hours to fill out the application. Many people simply gave up.”

The GCIP missed an opportunity to coordinate and channel promising start-ups to other parts of the ecosystem. This could have provided support to continue their journey toward maturity and commercialization. In South Africa, for example, there are 242 ecosystem support actors, which include the GCIP, but there is no coordination mechanism among them and start-ups have no idea of who to turn to for what. Interview respondents pointed to a need for significantly more channeling to achieve the desired catalytic effect.

Some general concerns emerged regarding the collaboration with CTO:

- CTO controlled the application process and GCIP platform, including storage, use, and access to information. CTO’s program is proprietary. The evaluation team did not have access to it so no assessment of the quality of materials was made other than GCIP participants’ perceptions (table 3.1). While CTO has a commercial interest to keep this information proprietary, for the development of a cleantech innovation ecosystem, it is important to have applicant information, methodologies, and experiences available in open source.
- CTO has been the main service provider across all countries; yet, the global innovation landscape is growing rapidly.

During this evaluation, CTO informed UNIDO that it had made a strategic decision to focus on the United States. CTO would therefore no longer deliver its services to the GCIP, although individuals

who had provided training services under the CTO umbrella could continue to do so on a freelance basis.

INSTITUTIONAL STRENGTHENING

The GCIP succeeded in building capacities of relevant institutions through on-the-job training to support subsequent organization of the competition-based accelerator. The GCIP projects have made good efforts to engage host institution staff. Other actors who could perform the important roles of mentors, judges, and local trainers were also appropriately engaged. Based on findings reported in terminal evaluations and MTRs, the following results were documented:

- **Thailand.** The NSTDA (National Science and Technology Development Agency) has been able to align its role in the GCIP with its Industrial Technology Assistance Program and support its mandate to help SMEs meet the challenges of introducing technology-based products and processes.
- **South Africa.** The Technology Innovation Agency (TIA) was able to significantly strengthen its remit to organize, coordinate, and develop the national ecosystem; extend its outreach; and boost its own services and system of innovation; furthermore, cleantech complemented its existing verticals, which were supported by its Technology Stations in agriculture, energy, advanced manufacturing, information and communication technology, and natural resources, which could be leveraged to support an expanding pool of entrepreneurs in the cleantech domain.
- **Turkey.** TÜBİTAK was able to help other entities make the connection between cleantech and their objectives and fields of expertise, thereby reinvigorating governmental interest in the potential of cleantech. Other stakeholders

viewed its leadership role as highly appropriate and effective, and the institution succeeded in drawing support from over 40 entities to ensure the operation of a fifth annual cycle, launched in the spring 2018, primarily funded from national sources.

- **Armenia.** The EIF (Enterprise Incubator Foundation) integrated the clean technology category into its regular business incubator support services.
- **Malaysia.** In 2016, as a spill-over from the GCIP, the MIGHT (Malaysia Industry-Government Group for High Technology) rebranded the GCIP as STRIKE (Sustainable Technology for Resilient Innovative and Knowledgeable Entrepreneur). The new model will focus on strategic support to national entrepreneurs in thematic areas such as smart cities, electric vehicles, and the biodegradable industry.

The GCIP also supported further developments beyond the host institutions. These are illustrative of its effects in institutional strengthening, as follows:

- **Turkey.** TÜBİTAK-TEYDEB (Innovation Support Program) launched a Clean Future Fund in 2017 (directly attributable to the GCIP) to foster convergence of national public funds and private sector investment to scale-up clean technology.
- **Pakistan.** Two major public sector funds (IGNITE, Technology Development Fund) now also cover cleantech. The Technology Development Fund signed a 2018 letter of intent with GCIP Pakistan for its Social Integration Outreach whose current theme is climate change, environment, and pollution. The Technology Development Fund indicated that it prioritizes GCIP awardees. These are indicators of the GCIP’s strengthening of the national innovation ecosystem.

3.6 Results: strengthening policy and regulatory frameworks

GCIP projects did not realize their intended outcome to strengthen the policy/regulatory environment to foster the growth of cleantech innovation. This is a risk factor for sustaining the projects' results. In most countries, no direct structured policy work was undertaken. Insufficient steering and limited resources meant that this component's activities were limited. Design documents do not go beyond stating that activities would be undertaken to identify and strengthen necessary policies and regulations required for cleantech competitions and ecosystem development. Outcomes that could be achieved over the duration of each national project were not properly considered, even after implementation of the first few projects. Activities were generally embarked on at the later stage, using an ad hoc approach.

A few countries did take steps toward policy strengthening. In Armenia, a policy recommendation paper was prepared at the time of project closure, but the terminal evaluation deemed it to be too late with too few specifics regarding legal frameworks, policies, and governance structures and processes. In Turkey, the PMU was able to connect a few start-ups with relevant policy-making authorities to examine blockages to realizing their innovations. South Africa and Pakistan reported undertaking a gap analysis. With the highest budget allocation for this component, GCIP Pakistan went slightly further to propose policy recommendations to the Pakistan Council for Science and Technology's Science, Technology and Innovation Action Plan (the results of which remain unknown).

The policy component was given less priority than activities associated with establishment and continuation of the competition-based accelerator because of a desire to quickly establish it and generate outputs that could be immediately seen

and promoted. As most projects did not undertake project preparation activities, there was limited information prior to implementation concerning which policies/regulations needed to be strengthened or developed. Budget allocations ranged from between 4.0 and 17.5 percent (table 4.2). The relatively short time frame and small budgets to influence national policy made this important part of ecosystem development an unachievable component of the GCIP, albeit a necessary one for assuring a climate conducive to the adoption of cleantech innovation.

Cleantech policy and regulatory challenges vary substantially from country to country. Projects aiming to strengthen policy need to be structured to accommodate the time and resources needed to support these outcomes. It requires creation of awareness among the different stakeholders about the regulatory barriers for low-carbon technologies, good understanding of the variety and complexity of cleantech concepts, and sufficient capacity to implement a facilitating policy framework.

3.7 Results: gender mainstreaming/social inclusion

Twenty-five percent of teams supported by the GCIP were led by women. To date, from a total of 795 semifinalist teams, 198 semifinalist teams (25 percent) with women as team leaders have been supported. Responses from GCIP participants to the evaluation survey reveal the same trend (table 3.11). This is within the range for projects that set targets for female entrepreneurs (10–30 percent of entrants) (annex E). In addition to targets, the GCIP approach included the creation of special category awards; selection criteria to provide preferential entry for women and specific efforts to attract female mentors, judges, and trainers. In 2017, of the 216 semifinalists supported, 25.9 percent of these were women-led. Pakistan

TABLE 3.11 Responses of surveyed start-ups regarding the gender leadership of their team

Team leadership	India (n = 24)		Pakistan (n = 45)		South Africa (n = 29)		Turkey (n = 22)		Overall (n = 120)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Female-led	2	8	10	22	6	21	6	27	24	20
Male-led	22	92	35	78	23	79	16	73	96	80

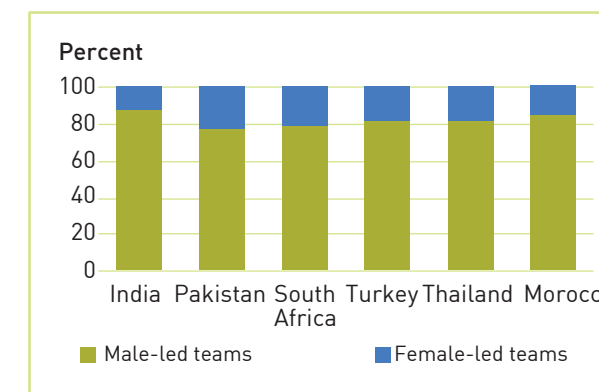
SOURCE: Survey results based on 120 responses from four countries.

had the highest proportion (30.4 percent; 26 of 84 semifinalists) (figure 3.4).

A strategic approach to gender mainstreaming/social inclusion materialized more in some countries than in others (see performance ratings in table 3.1).

- **Pakistan.** The project's achievements exceeded those in other countries. During 2014 to 2017, women figured in 25–40 percent of alumni team leader positions (annex E) that was attributable to adequate resourcing, engaged supervision (the GCIP project manager was also UNIDO's Gender Mainstreaming Focal Point), competent advocacy and outreach, and encouraging start-ups to include women.
- **Turkey.** The 10 percent target set for recruiting female trainers, mentors, and judges and promoting women entrepreneurs was substantially

FIGURE 3.4 GCIP success in attracting woman-led teams



SOURCE: UNIDO presentation on the GCIP, 2014–17.

exceeded. During 2014 to 2017, women held 18–32 percent of team leader positions. Social inclusiveness was bolstered through the delivery of a Women-Led Entrepreneur Award and a Young-Led Entrepreneur Award in the 2015 cycle.

- **South Africa.** In 2017, introduced a more tailored approach and broadened outreach to encompass more women, youth, and black entrepreneurs (supporting national imperatives). Strategic outreach (university visits, affirmative action), use of special category awards (throughout the project period, 2014–17), and media profiling tangibly and rapidly enhanced the inclusion of under-represented groups and markedly improved the project's performance. Nevertheless, an important minority of female-led start-ups reported that the GCIP's stringent pace, expectations, and ruthless approach to prepare for pitching to investors was unwittingly serving to maintain the disparity of disadvantaged groups.
- **India.** The gender dimensions of cleantech entrepreneurship were not substantively addressed. The project did not apply a gender-sensitive approach, partly because of an absence of gender analysis in the original design. The program document contained brief references to gender mainstreaming but did indicate that gender-specific targets would be established and pursued. No systematic monitoring was undertaken. The evaluation team concurs with the project's terminal evaluation conclusion that the lack of gender sensitivity

BOX 3.4 South African team delivers energy efficiency and social benefits with solar-powered hot water

This 2015 youth-led team winner devised a photovoltaic system, ideal for low-cost houses/rural homes, which provides people with hot water when they have little or no electricity. Attached above a doorway supported by two large diameter pillars, which act as hot water storage tanks, this “solar veranda” shades inhabitants from sun/rain and provides 70 liters of 60°C water per sun-day. Due to GCIP participation, the team was subsequently able to raise funds to construct a prototype and won a prestigious national award for best “eco innovation.” Solar Veranda is now commercially available in South Africa.

across program design and implementation has almost certainly reduced its outreach and potential and may also have reduced GCIP India’s overall effectiveness.

3.8 GCIP additionality

Project steering and country conditions influenced elements of additionality, resulting in varying benefits across countries. A review of GCIP projects identified several elements that contribute to additionality. These are summarized in table 3.12 and elaborated in detail below.

INNOVATION

Focus on clean technology

The GCIP’s focus on cleantech business acceleration was new, unique, and a value-add for the innovation ecosystem. The transversal concept of cleantech enabled many types of entrepreneurs to identify and situate their innovations within this category, and thereby seek and find support. While there was recognition that the cleantech

concept could stimulate economic growth, few such schemes existed, or those that did tended to operate in silos. The GCIP could therefore be characterized as joining a handful of forerunner schemes in the cleantech acceleration space.

Early stage business assistance

GCIP business assistance services primarily to early stage entrepreneurs filled a gap on the national landscape not covered by other existing mechanisms. These were often government schemes that offered technology validation to later stage entrepreneurs.

Mentorship

The 1:1 nature of interactions with mentors under the GCIP was a distinguishing element from other offerings. This approach allowed for tailored advice and was more conducive to the development of closer, longer-term relationships between mentors and teams. An Indian start-up observed that “in comparable business incubators, entrepreneurs often had to share mentors with several other businesses during joint sessions.” The strategy of approaching alumni (entrepreneurs who had graduated from previous GCIP rounds) to play roles as mentors, judges, and local trainers was a novel idea. Many who subsequently took up these roles were motivated to “give something back” to other early stage entrepreneurs.

Networking and exposure

The GCIP provided start-ups with privileged access to local private experts through their participation in project screening committees and juries and as mentors and judges. These interactions often cascaded into links for the start-ups with the professional networks in which the experts were more broadly embedded. Those who voluntarily contributed their time and expertise readily acknowledged their participation was mutually

TABLE 3.12 Summary of GCIP additionality in project design and implementation

Additionality element	Project design	Results achieved
Innovation additionality		
Focus on clean technology	Yes	Yes
Early stage business assistance	Yes	Yes
Networking and eYesposure	Yes	No
Socioeconomic additionality		
Fostering entrepreneurial mindset	Yes	Yes
Encouraging of local solutions	Yes	Yes
Social inclusiveness	Yes	No
Social and economic benefits	Yes	No
Institutional/governance additionality		
Strengthening of convener role and reputation	Yes	No
Collaboration and partnerships	Yes	No
Financial additionality		
Access to venture capital	Yes	Yes
Policy/regulatory additionality		
Strengthening of the policy and regulatory environment	Yes	Partial
Environmental additionality		
Fostering cleantech ideas, solutions, and services	Yes	Yes
GHG emission reduction	Yes	No

beneficial: entrepreneurs gained from expert input, and the involved experts were exposed to business and investment opportunities that they would not otherwise have identified. For example, as reported in the India terminal evaluation, some business relationships arose solely and directly through a mentor or judge meeting an entrepreneur during the GCIP.

SOCIOECONOMIC

Fostering entrepreneurial mindset

The GCIP stressed the importance of a risk-taking mindset.¹³ In South Africa, the GCIP supported an

important cultural shift where the population was being empowered to take economic destiny into their own hands. In Turkey, the terminal evaluation reported that the GCIP offered a space to experiment with how to foster innovation.

Encouraging local solutions

Entrepreneurs who are close to the problems were encouraged to use their insights for innovations that will help address them. This helped to dispel the perception that technology in one part of the (usually developed) world must be transferred to another part of the world (developing). The GCIP

¹³ Colin (2015) asserts three ingredients are key: *Capital*: new business can only be launched with money and relevant infrastructure; *know-how*: engineers, developers, designers, salespeople collectively have skills necessary

for launching/growing innovative businesses; *rebellion*: entrepreneurs always challenge the status quo. If they wanted to play by the book, they would innovate within big, established companies, where they would be better paid and would have access to more resources.

also promoted indigenous technology development because of reduced costs of equipment for SMEs and easier adoption for urgent development priorities, such as access to clean and affordable energy, clean water, and climate resilient agriculture. This leaning toward developing “homegrown solutions” and technology convergence meant that even countries with weak research and development could participate in the generation of global solutions.

Social inclusiveness

GCIP Pakistan mobilized additional stakeholders to support its gender mainstreaming agenda. This is seen as an indication of the catalytic potential of the GCIP. The Islamabad Chamber of Commerce took up a significantly larger role than was initially envisaged, by establishing a Women Business Growth Center in 2016 under its own auspices, which included an incubation facility for women-led start-ups within its own premises. This initiative leveraged support offered by USAID to promote business start-ups and improve economic empowerment of women.

In South Africa, the GCIP team broadened its social inclusiveness efforts to also encompass youth and black entrepreneurs. Special category awards (Most Promising Youth Team, Innovation

BOX 3.5 Pakistani solution for a low-cost house that can be assembled in three hours

Karachi-based ModulusTech designed mobile, low-cost, earthquake and cyclone-resistant, energy-efficient housing that can be assembled within a few hours, with plumbing and electricity included. Having set its sight on solving housing problems for displaced people, the team originally thought about targeting international charities and the refugee community. To its surprise, the company found its first customer in the mining industry, where its innovation is being used to fulfill a need for temporary accommodation.

for Social Impact Award) had a beneficial impact on communities outside the country’s main industrial areas.¹⁴

Social and economic benefits

Under the GCIP framework, entrepreneurs have developed and commercialized ideas with meaningful social and economic impact. For example:

- Innovations in sanitary pads (developed by Gracious Nubian in South Africa and Saathi Eco Innovations in India) have provided affordable solutions for women and girls (especially in rural areas) who were previously prevented from working and attending school during menstruation.
- A Malaysian entrepreneur (Free the Seed) is buying rice straw and waste husks left over after harvest and using it to produce biodegradable packaging. In addition to providing local farmers with additional income, this avoids the burning of rice straw, reducing smoky haze pollution that results in respiratory problems for humans and interferes with regional aviation.

INSTITUTIONAL/GOVERNANCE

Strengthening of convener role and reputation

To varying degrees, the GCIP has equipped national institutions and other ecosystem support actors with the capacities to sustain the ongoing organization of the competition-based accelerator. Beyond this building of local organizational, training, and mentoring competence, GCIP projects

¹⁴ Based in Mpumalanga province (330 km east of Johannesburg and 110 km west of the Mozambique border), Mashsha’s energy efficient stoves won the 2016 Social Impact Award; based in Free State province (400 km south of Johannesburg), Nubian Gracious Nubian’s reusable, recyclable sanitary pads won the 2017 Social Impact Award.

BOX 3.6 Women-led team commercializes affordable solution that reduces waste and supports women: world’s first biodegradable compostable sanitary pad made from banana fiber

Saathi Eco Innovations (2017 global winner) reported that the GCIP gave them insight and collaboration opportunities. “It was a roller coaster ride for us from the enthusiasm of reaching California to the anxiety of preparing the pitch to the exhilaration of receiving the Global Award.” Leveraging the highly absorbent properties of fiber locally sourced from banana tree stems (discarded after harvest), the company manufactures a sanitary pad that degrades within six months (1200 times faster than conventional pads, which are 90 percent plastic with correspondingly high disposal issues). Produced using no water, the annual projected reduction in CO₂ emissions is 1,011 metric tons and 1,323 metric tons of plastic waste.

had positive effects in terms of enabling the host institution to strengthen its role and reputation. The focus and time needed to engage with partners for participation in the competition-based accelerator, however, led to national institutions losing sight of their role with respect to the envisaged national coordinating function.

Collaboration and partnerships

GCIP projects were able to promote a degree of collaboration across relevant entities. This effect was observed, even though the projects were relatively small and involved only one to two ministries as executing partners, thereby limiting the scope to pursue broad, cross-departmental partnerships. Partnerships have developed not just across government departments but across other institutions, such as universities, chambers of commerce and other business associations. Although a “sensitivity to stepping on others’ mandates” emerged in the South African context, this issue could still be

BOX 3.7 Malaysian team’s GCIP participation was a game-changer for local farmers

Free the Seed (2014 national winner) used its patented biotechnology process to convert previously burned rice straw and husks (bought from 1318 local farmers who each earned an additional \$300 per year for selling their waste) into nontoxic, biodegradable packaging that replaces polystyrene and plastic containers. Participating in the GCIP was a game-changer for the company, which, by 2016, had struck a 10-year supply agreement with farmers harvesting 32,000 hectares (over 10% of rice paddy production on the Malaysian Peninsula) worth €1.5 million for biomass supply delivering 600,000 kg of CO₂ reduction (2015–20).

tackled, and collaborations could be cultivated. In Turkey, the PMU recently reported to the evaluation team that the Directorate for Renewable Energy’s interest in and commitment to the project and the local executing partner, the TÜBİTAK, had measurably increased based on a recognition that new technology-based start-ups, supported by the GCIP, also furthered the objectives of the Directorate for Renewable Energy.

FINANCIAL ADDITIONALITY: ACCESS TO VENTURE CAPITAL

The GCIP was able to leverage private sector finance to support promising cleantech solutions. The start-ups had more success in gaining access to venture capital through the national-level Investor Connects in comparison to the international-level Investor Connect held as part of the CTO Global Forum.

POLICY/REGULATORY: STRENGTHENING OF THE POLICY AND REGULATORY ENVIRONMENT

The policy and regulatory strengthening component was not fully realized. This has potentially negative implications on sustainability of outcomes. Implementing teams tended to focus project support on other outcomes because of a desire to quickly establish the competition-based accelerator.

ENVIRONMENTAL

Fostering cleantech ideas, solutions, and services

Within the private sector cleantech agenda, the GCIP has focused on innovators working on indigenous solutions for major environmental challenges. This includes start-ups in energy efficiency, generation, distribution, and storage, air and water pollution, waste management, and new forms of transport and construction techniques.

GHG emission reduction

Targets for GHG emissions directly/indirectly avoided were set and their respective abatement cost was calculated for each national project (table 3.4). Projections cannot be verified because of the still early stage of enterprise operations and the lack of longer term systematic monitoring systems.

BOX 3.8 Indian SME innovates ceiling fan, slashing energy costs for households

A conventional 75-watt ceiling fan consumes approximately 20 percent of a typical Indian household's electricity needs. By using permanent magnets as rotors (which eliminated power and heat losses), together with its algorithms and electronics, the 28-watt efficient, high performance, noiseless, smart ceiling fan developed by Atomberg Technologies (2017 global winner energy efficiency category) can slash electricity use by 65 percent. The company already sold over 50,000 fans, raised \$1 million in venture capital, and is now looking for impact funds to support its bid to establish itself throughout India, generating 500 direct new jobs by 2020. A team member explained, "GCIP gave us access to the entire ecosystem with a network of mentors, venture capitalists and investors working in the cleantech space. We also had a lot of peer-to-peer learning."

4: Factors affecting GCIP function and sustainability

4.1 UNIDO as implementing agency

UNIDO was well suited to implement the GCIP.

UNIDO's performance was rated in the satisfactory range for all projects. The agency has relevant expertise, developed by 20 years in technical cooperation for industry (especially SMEs) through resource-efficient industrial production and clean energy access for productive use and capacity building, all of which were leveraged under the GCIP framework. The UNIDO brand brought considerable value. Start-ups indicated that its reputation led their customers to associate the GCIP with respectability, quality, and international recognition. In India, for instance, the project's terminal evaluation reported that without the visible UNIDO association, the competition's attractiveness would be reduced.

Following the initial implementations, UNIDO experienced some capacity challenges to manage, supervise, and support projects. In early 2016, responsibility for GCIP countries was distributed among multiple project managers, in line with the regional portfolio distribution approach adopted within the Department of Energy of UNIDO.

Varying approaches to project management were observed, including understanding of definitions and indicators, which makes direct comparisons across countries challenging. In countries where the first GCIP projects were launched (Armenia, Malaysia, India), there was little monitoring and

systematic reporting. All other countries launched since adopted a more rigorous approach.

All UNIDO project managers surveyed agreed that interaction, communication, and coordination between implementation partners (UNIDO headquarters, UNIDO PMU, Executing Agencies) regarding roles, responsibilities, and accountabilities was clear (annex D). In contexts where the national implementing team felt especially empowered (Pakistan, South Africa), the PMU was able to pilot approaches, which have offered valuable models for the overall initiative (e.g., gender mainstreaming; national-level Investor Connect; Industry Challenge award).

Implementation of the GCIP in eight countries has generated experience and lessons for UNIDO from each national context. However, without a formal, cross-country approach, a global coordination effort was not fully realized. UNIDO has been able to build up its expertise in cleantech business acceleration, which is a new domain for international cooperation.

4.2 Country selection

There was no explicit strategy or established criteria for selecting countries to take part in the GCIP. Involvement depended primarily on a country's willingness to use some of its System for Transparent Allocation of Resources (STAR) allocation. A list of approximately 25 candidate countries

that had not yet joined the clean technology wave was jointly developed by the GEF and UNIDO through interviews.

UNIDO played a pivotal role in promoting the GCIP to GEF operational focal points. It was often down to the persuasive ability of UNIDO project managers as to which countries took up the the GCIP opportunity. South Africa was a natural choice, having piloted the first cleantech SME competition at COP17. South Africa was also seen to potentially have a regional hub role to play in the wider South African Development Community.

Encouraging countries to invest portions of their STAR allocation in the GCIP ensured the initiative was demand-driven and confirmed country buy-in and relevance. A more top-down approach that reviews national conditions as part of country readiness to develop the cleantech entrepreneurial ecosystem and then “selling the GCIP” also has merit for its consideration of the potential of the initiative to be continued, scaled up, or replicated in the region after completion. A balanced and integrated approach would serve to increase likelihood of sustainability.

After willingness to use STAR, the selection seemed to consider a mix of factors: (1) UNIDO’s institutional presence, i.e., a regional office that could support the PMU; (2) national conditions: interest of a suitable local executing partner, a vibrant academic scene, a large SME sector, governmental interest in SME promotion, presence of relevant entities (e.g., research and development institutes, technology incubators, innovation centers), and a level of infrastructure services that could support the development of start-ups (access to Internet, electricity, etc.); and (4) countries that could potentially play a role as a regional hub (e.g., Armenia, Malaysia, Turkey, South Africa).

In 2017, the Global Cleantech Innovation Index placed the GCIP implementing countries within

the lower half of its rankings. This suggests that although countries were not so strategically selected, the GCIP addressed a need and opportunity in these countries to develop the cleantech innovation ecosystem.

4.3 Host institution

The selection and engagement of the right institution that could play a convening role and host the GCIP was a critical factor in pursuing and sustaining project outcomes. This speaks to the importance of a careful selection of the national host and associated partners who will retain a vested interest in the ecosystem and will ensure that the project’s results are sustained after closure. GCIP project design documents did not mention any guiding criteria in the selection of host institution. For the most part, project preparation phases were not carried out to scope out the most appropriate organizations. Illustrative experiences with host organizations are drawn from.

- **South Africa’s TIA.** The GCIP supported the local host’s strategic objective “to provide an enabling environment for technology innovation in collaboration with other role players.” With technology expected to “drive job creation, innovation, and skills into Africa,” the GCIP was well-suited to fostering the needed mindset and capabilities.
- **Turkey’s TÜBITAK.** With its role to advise on science, technology, and innovation policy and its access to direct funding, exemptions, and incentives, TÜBITAK used the GCIP to support its mandate to stimulate transformation of research results into products/services and to invigorate the role of SMEs in the national innovation system.
- **India’s Institute for Design of Electrical Measuring Instruments (IDEMI).** The GCIP was hosted by the Ministry of Micro, Small and

Medium Enterprises, which turned it over to its technology center, IDEMI, during the final year of implementation as part of the strategy to take national ownership. While seen as able to manage the PMU’s administrative tasks, there is a concern that IDEMI does not have a convening role in the country’s entrepreneurship system. Furthermore, given IDEMI’s highly technical focus, stakeholders expressed concerns about its capacity to identify and manage a mentor pool with a business skill base and to build networks with investors and entrepreneurs beyond India. Challenges and tensions were documented in the handover process during the GCIP’s closure period, undermining prospects for sustainability.

The extent to which the PMU was embedded directly within the physical premises of the local host also proved to be a positive factor in terms of providing on-the-job training opportunities for staff. This link also served to deepen country ownership as well as providing cost efficiencies (access to infrastructure, services).

4.4 Country engagement

Terminal evaluations for four of the six completed projects rated the sustainability of outcomes only as moderately likely (table 3.1) and pointed to reduced country engagement on part of key agencies as a contributing factor. This was a missed opportunity for the GCIP to support hosts as active partners contributing to the development and maintenance of cleantech start-ups and the sustainability of the entrepreneurship ecosystem.

The presence or absence of several elements influences the development of national ownership and laying the foundation for continued benefits:

- The extent to which the national government has prioritized cleantech technology, understood its strategic leverage, and made tangible links

between GCIP results and other initiatives and entities:

- **Morocco.** The Ministry of Environment took full ownership, housed the project in its own premises, defined what they saw as important, added cash funding, got buy-in from the private sector (i.e., Chamber of Commerce), and brought in French-speaking trainers.
- **Turkey.** TÜBITAK increased its financial support and strengthened linkages with its existing BiGG (Individual Young Enterprise) Program to allow GCIP alumni to gain access to further support, paving the way for transforming the GCIP into a national program.
- “Right choice” of local host, engagement, and energy level of its leadership, and the organization’s absorption capacity (see Host Institution)
- Extent of engagement beyond government entities:
 - **Pakistan.** There was active collaboration and contribution from three government agencies (Pakistan Council for Science and Technology, National Productivity Organization, Pakistan Institute of Management) as well as from the private sector (Islamabad Chamber of Commerce). In September 2017, the PMU formalized a National Clean Tech Platform with a multistakeholder membership (513 members, of which 9 are public sector organizations and 12 are academic institutions; the rest are private sector actors), which is poised to carry on activities, although it is understood that a second phase will only start in 2019.
 - **Armenia.** GCIP implementation partners were all from government agencies; with limited private sector consultation, it was therefore difficult to motivate their

engagement and was counter-productive, given the project's aims that undoubtedly required active involvement of business actors. While several promising innovations were identified, private sector funding was limited; it was the GCIP project itself that offered \$5,000–\$10,000 in grants in several cases to facilitate further development.

■ Availability and contribution of local financial/human resources during project implementation and after to ensure continuity of the competition-based accelerator:

- **Turkey.** TÜBITAK provided \$33,000 in cash and \$100,000 of in-kind to the project's physical/logistical support; a key anchor for local ownership. Primarily Turkish resources/funding/trainers/mentors are being used in a fifth cycle launched in 2018; costs of national activities are being covered by TÜBITAK and TBS Investment (Turkish angel partnering with GCIP Turkey). Monetary prizes are covered by TÜBITAK, TBS, and OSTIM (one of Turkey's organized industrial zones, which signed a letter of intent for further cooperation);
- **South Africa.** The initiative to build up local training capacity (five promising candidates) started relatively late (in 2017) but was intended to ensure that adequate capacities would be available following project closure. Consequently, the fifth cycle launched in 2018 under TIA's leadership is being supported primarily by a CTO trainer brought in from California.
- **Armenia.** The PMU was housed in the local host's premises, which were located outside the capital of Yerevan, where most innovation events were concentrated. Based on the terminal evaluation, overall, there was a lack of ownership and inadequate capacity transfer.

UNIDO took the lead in project execution, relying on the strength of the local national project coordinator that was supported by an experienced head of UNIDO operations in Armenia. This led to a widespread perception that GCIP was a UNIDO project, resulting in the relatively passive role played by the Enterprise Incubator Foundation, the project partner, and SME DNC (Small and Medium Entrepreneurship Development National Center), who was originally identified as the host, as well as other institutional counterparts. The lack of active involvement of project partners was not conducive for building local institutional capacity to sustain the GCIP's results and benefits.

- **Malaysia.** Local host staff resources allocated to the GCIP were reduced over time from three to four to a single individual, the National Project Coordinator, who played a crucial connecting role. While 22 mentors were registered in 2016 to support further cycles, these did not take place following project closure, and the terminal evaluation report indicated that full ownership of the project by the government had not occurred, although the Sustainable Technology for Resilient, Innovative and Knowledgeable Entrepreneurs program was initiated. The GCIP Global Cleantech Innovation Index 2017 Report found that Malaysia led the eight GCIP countries studied, with particular strength in evidence of commercialized cleantech because of public research and development expenditures and domestic investors. However, the report states there is little evidence of emerging cleantech and still a need to fill this gap.
- Number of competition-based accelerator cycles undertaken during the project period:

- **Armenia and Malaysia** ran the fewest number of cycles of all national projects (two and three respectively, compared with five in Turkey and four in the other countries). While it could be deduced that running more than three cycles provided more anchors for sustainability, arguably, this phenomenon is also linked with the comparatively longer extensions in duration that other GCIP projects requested, which provided more time to put in place elements to deepen national ownership.

4.5 Project duration

GCIP projects were designed to have a duration of three years, which was insufficient in all cases. Almost all had no-cost extensions, which prolonged their activities by up to an additional 26 months (table 2.1). Extensions were related to (1) delays in the initial stage (understanding the concept of cleantech), (2) identifying and engaging collaborating institutions (even when partner institutions were identified, sometimes they were later switched out with others deemed to be more appropriate, i.e., in Armenia; Pakistan); (3) establishing/staffing the PMUs; and (4) generating entrepreneurs' interest to enter the program. Duration was too short to embed policy strengthening initiatives or expect to begin to gather meaningful long-term impact data. Projects with a longer duration would also have the positive effect of deepening country ownership.

4.6 Cost effectiveness

Performance ratings for efficiency (table 3.1) rated all projects in the satisfactory range, with projects in India and Turkey rated as highly satisfactory. Project approval documents indicated that cost-effectiveness was considered as a priority. Stakeholders reported that implementing teams

seemed conscientious and respectful of the use of resources, expert time, etc.

Most countries ran three to four competition-based accelerator cycles. This was facilitated by the extensions in project duration for most projects (seven of eight). The originally allocated resources were stretched to cover the longer time (up to 75 percent extension), necessitating frugal spending to remain within the originally provided budget covering a longer period and more competitions. This intensified pressure on staff, for instance, for longer supervision, and they rose to the occasion, but to what extent is such a strategy sustainable?

GCIP projects leveraged significant pro bono support. This was provided by project screening committees, mentors, judges, technical partners, local trainers, and international judges.¹ Securing these contributions also served to strengthen the national entrepreneurial ecosystem. Given that projections of cofinancing from volunteer contributions of these mostly private sector, ecosystem actors (a key source of external expertise for sustaining the competition-based accelerator) were not included in the project documents, it appears that the extent of support was not clear or anticipated. Table 4.1 shows the magnitude of these, mostly in-kind, contributions as well as provision of prizes.

Reliance on volunteer participation introduced a degree of vulnerability. Individuals who had freely participated as mentors, judges, and trainers

¹In recent cycles, GCIP India paid a small honorarium to members of the Screening Committee. In Pakistan, the value of what they brought in terms of experience, networks, and know-how was estimated to be significantly more than the symbolic compensation provided to judges out of project funds. CTO estimated that these pro bono contributions were valued at \$60,730 during 2015–17 Global Forums.

TABLE 4.1 Contribution from private sector actors, by country (\$)

Country	Period	Estimated value of volunteer contributions of local mentors, judges, trainers	Estimated value of private sector contributions of prizes and technical assistance
Armenia	2014–15	44,300	—
Morocco	2016–18	18,000	—
Thailand	2016–17	50,225	—
India	2014–17	100,512	—
Turkey	2014–18	258,410	151,000
Pakistan	2014–17	636,920	—
South Africa	2014–17	2,140,048	1,860,000
Total		3,248,415	—

SOURCE: PMU estimates.

NOTE: — = not available.

were not always the right ones or available for each annual run. As the South Africa case attests, even though a training plan was well-structured by the PMU, communicated in advance, and the five designated local trainers-in-training were well-motivated, in the end they were not all able to consolidate their competences because of scheduling conflicts related to work for which they were being compensated (regular day jobs or consultancy mandates). Volunteer resources enlarged the pool of “available funds” but heightened the administrative burden related to regularly securing and renewing participation with each annual cycle. Furthermore, start-ups across the participating countries raised the need for more qualified technical advisors to serve on judging panels and as mentors, which has implications for relying on a purely volunteer system.

4.7 Cofinancing

In almost every country, no systematic mechanism was used to track the large portion of planned GCIP support that was committed by national governments and cofinancing partners. In Pakistan, the PMU did successfully track these contributions. A large portion of planned GCIP support was in the form of cofinancing commitments

from national government partners and private sector actors, which ranged from \$2.6 million to \$6.3 million; two to eight times the GEF grant level (table 2.1). Inputs from the GEF and UNIDO were quantified and reported but no systematic mechanisms were adopted to track the support that was contributed by national governments and cofinancing partners. Apart from Pakistan, where the PMU made a serious and successful effort, the overall level of cofinancing has never been truly quantified and confirmed, largely because of the absence of valuation methodologies from either UNIDO or the GEF.

4.8 Financial planning

GCIP budgeting was linked to envisaged outcomes. Except in Armenia and India, all countries allocated the highest proportion of the available GEF grant to establishing the competition-based accelerator. As table 4.2 shows, institutional capacity building was next in level of resourcing. The policy strengthening component was comparatively underresourced, ranging between 4.0 and 17.5 percent of the GEF grant, which may account for the

TABLE 4.2 Expenditure by component, by country

Outcome component	Malaysia ^a		Armenia ^b		India ^c		Pakistan ^d		South Africa ^e		Turkey ^f		Thailand		Morocco		Ukraine	
	Thousand \$	% of GEF-grant	Thousand \$	% of GEF-grant	Thousand \$	% of GEF-grant	Thousand \$	% of GEF-grant	Thousand \$	% of GEF-grant	Thousand \$	% of GEF-grant	Thousand \$	% of GEF-grant	Thousand \$	% of GEF-grant	Thousand \$	% of GEF-grant
1. Platform to organize national cleantech competition	579	67	172	33	280	28	559	42	1,309	68.4	680	69	820	45	4,40.2	48	650	43
2. Building national capacity for clean energy technology innovations	130	15	198	44	460	46	382	29	333	17.4	125	13	500.5	27	300	33	500	33
3. Policy/regulatory framework strengthening	138	16	52	10	150	15	230	17.5	76.5	4	75	7.5	270	15	50	5.4	146	10
4. M&E	12	1.4	16.6	3.7	20	2	41	3	195	10	20	2	70	4	40	4	75	5

SOURCE: Project approval documents.

a. Figures are as per the terminal evaluation for Malaysia GCIP. Proposed expenditures were 69 percent for Component 1, 13 percent for Component 2, 7.5 percent for Component 3, and 2 percent for Component 4.

b. Figures are per the terminal evaluation for Armenia GCIP. The proposed budget allocation was 28 percent to Component 1, 39 percent for Component 2, 19 percent for Component 3, and 4.5 percent for Component 4. At project end, 82 percent of the budget had been spent. As much as 17 percent allocated to achieve Component 2 and 82 percent of budget allocated to project management remained unspent, reflected in the project’s limited success in building national capacity and a “mostly unsatisfactory” rating for project management.

c. Information on actual disbursements by component is not available in the terminal evaluation for India GCIP.

d. In GCIP Pakistan, projected expenditures were budgeted as 41 percent for Component 1, 29 percent for Component 2, 18 percent for Component 3, and 3.6 percent for Component 4. Comparison of the planned allocation versus actual expenses indicates very little variation.

e. Figures are per the terminal evaluation for South Africa GCIP. As of July 2018, total expenditures recorded represented 98 percent of the planned budget. Component 4 actual expenditures include project management costs. Projected budget in the design document was 73 percent for Component 1, 10 percent on Component 2, 6 percent on Component 3, and 1.5 percent for Component 4.

f. Information on actual disbursements by component is not available in the terminal evaluation for Turkey GCIP.

limited effects achieved. Allocations for M&E ranged from 1.5 to 5.0 percent of the GEF grant.²

4.9 Monitoring and evaluation

Half of the terminal evaluations rated the projects’ M&E performance as less than satisfactory. In Armenia, Malaysia, and India there was little

systematic monitoring and reporting, which had correspondent effects in terms of provision of relevant information into decision-making processes. M&E was strengthened in subsequent delivery. The other half was satisfactory and had higher expenditures on M&E. The relatively weak orientation for M&E reflects 2017 observations made by the United Nation’s Joint Inspection Unit and is a concern that has been repeatedly highlighted in internal evaluation reports and external reviews of UNIDO (United Nations 2017).

² According to KPMG’s 2014 survey of “Monitoring and Evaluation in the Development Sector,” programs typically allocate 1 percent of their overall budgets to this activity and fewer than 5 percent of projects allocate more than 5 percent of their budget to M&E (KPMG 2014).

Implementing teams focused on tracking outputs related to the competition-based accelerator.

Baseline information did not exist for most envisaged outcomes. No suggestions were offered for areas that could be explored to develop baselines to facilitate the assessment of change. Without resourcing and orientation from the logframe to develop these baselines, the implementing teams focused on tracking and tabulating outputs related to the competition-based accelerator; for example, received applications, eligible applications, semi-finalists, female-led teams, mentors, business clinics, etc. Table 4.3 summarizes the results data related to the national projects' M&E systems that was meant to be systematically captured and which could be then used by the PSCs and UNIDO.

The M&E data that were tracked are not directly comparable across countries.

Because of different understandings of key terminology (applicant, entrant, accreditation, commercialization), there was confusion about the ways in which the national projects gauged and communicated their success. Interpretations were not commonly shared across the implementing countries, which is illustrative of the challenge of comparing national performance. Furthermore, there was a tendency to exclusively report "good news" stories. The lack of GCIP India's analysis and reporting on the reasons behind the business failure of the country's 2016 winner were highlighted as a missed opportunity to learn and strengthen the program.

The projects did not establish a system for long-term monitoring of outcomes and impacts.

Targets were indicated for GHG emission reduction, but it was understood from the outset that actual GHG savings and other longer-term impacts would be achieved beyond the projects' life and scope.³

³ On average, it takes about three to four years to incubate a successful enterprise. To measure the impact and

UNIDO, according to its own performance review,⁴ has tried to estimate the impact in emission reduction, job creation, and economic growth, projected to exponentially increase by 2020 (figure 4.1). As indicated earlier, a lack of standardized accounting methodology for establishing targets during project design and lack of systematic reporting on projected GHG reductions at project completion creates uncertainty regarding the robustness of projections. In the absence of M&E systems operating in each GCIP implementing country beyond the project period, GHG reductions and other impacts will be difficult to confirm.

Only the Thailand project has undertaken a mid-term review.

All other national projects have missed out on the opportunity to gain insights into progress and recommendations to inform the continued roll-out. The GEF and UNIDO evaluation policy encourages MSPs to carry out an MTR, but it is not obliged. Most project documents indicated that such a review would be undertaken and budgeted for it.⁵ The utility of an MTR, whether executed internally or supported through external facilitation, and its contribution to adaptive management seem to be insufficiently understood. There seemed to be a feeling that if the project was on track, there was no need to undertake a strategic reflection midway.

growth rate of the incubated firms, one would need to wait at least another three to four years (annex A).

⁴ As these projections are based on only 14 start-ups located in five countries (out of the total of 795 semifinalists supported in eight countries under the GCIP during 2014–17), the evaluation team has concerns about the extent to which these start-ups are representative of the entire universe of teams that participated in the GCIP and the credibility of the methodology used to develop these estimates and the exponential extrapolation for 2020.

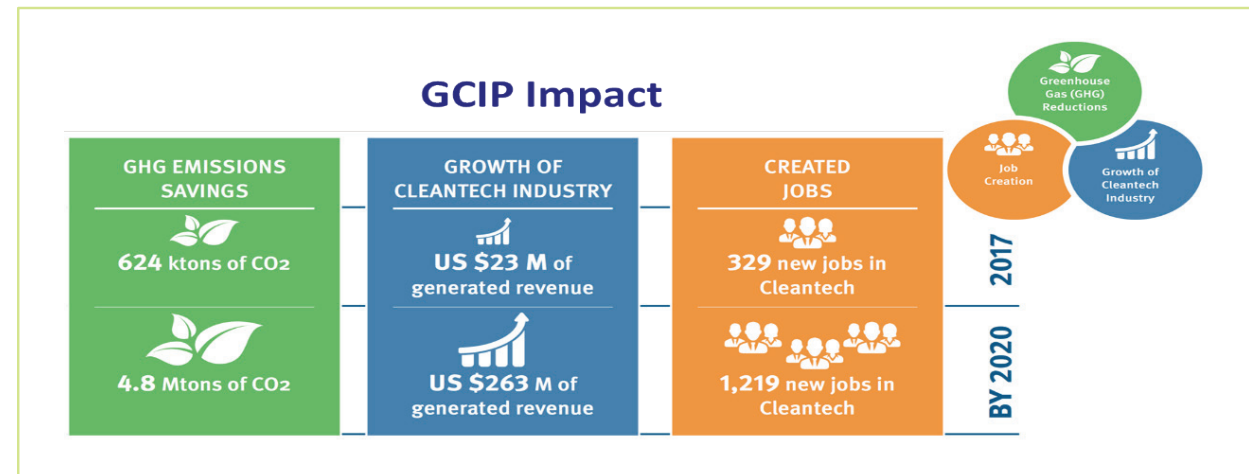
⁵ Project approval documents for GEF-6 funded projects (Morocco, Ukraine) mention "periodic reviews" and terminal evaluation. All others also specifically mention both a midterm review and terminal evaluation.

TABLE 4.3 Summary of GCIP project outputs and outcomes from project approval documents

Outcome component	Outcome-level indicators	Programmed outputs	Output-level indicators (target)
1: A coordinating mechanism/platform established at national level to promote clean technology innovations and entrepreneurship in SMEs; clean technology innovators identified, coached, supported during and beyond the cleantech competition	No. of innovative businesses created/ accredited No. of prizes for innovators with great impact on women entrepreneurial development and job creation	1.1 Three annual national cleantech competitions organized	<ul style="list-style-type: none"> No. of entries (100–300 per competition; 10% women participants) No. of semifinalists (20–25) No. of finalists (10–15)
		1.2 Three associated accelerator programs organized, including post competition support	<ul style="list-style-type: none"> No. of boot camps, training workshops, and mentoring sessions organized Improvement of disbursement rate of existing funding programs
		1.3 Participation in regional and global networking activities	<ul style="list-style-type: none"> No. of participants of regional and global networking activities (15)
2: National institutional capacity built for mentoring and training programs as part of competition-based accelerator	<ul style="list-style-type: none"> No. of human/financial resources of host institution and other counterparts with built capacity Wide platform of all stakeholders operationalized 	2.1 Capacity building of host institution strengthened and wide platform with all stakeholders of the project established	<ul style="list-style-type: none"> No. of host institution staff trained to be able to organize the competition-based accelerator program No. of partners involved in the platform No. of mentors recruited and trained
		2.2 Experience shared with other countries	<ul style="list-style-type: none"> No. of regional workshops and training courses organized
3: Strengthened policy/regulatory framework for the development of a supportive local innovation ecosystem	Extent to which these policies and regulations are amended or implemented	3.1 Necessary policies and regulations required for Cleantech competition and ecosystem identified and developed	<ul style="list-style-type: none"> No. of new policies and regulations developed to create a conducive policy environment for cleantech implementation No. of policy makers to receive training on policy development
Outcome component	Outcome-level indicators	Related targets	
Overall project	No. of SMEs to pursue innovations in clean technologies; successful cleantech programs organized after project completion	No. of clean technology start-ups/SMEs increased by 15%	
	Additional investment into clean technology innovations because of increased interest in the cleantech program	Investment in clean technology increased by 15%	
	No. of SMEs as members of the national platform	Minimum 450 SMEs participating in the cleantech program are trained and connected with funding partners and investors	
	Tons of GHG emissions directly and indirectly avoided	Indirect savings of the project are in the range of 815,000 to 1,630,000 tCO ₂ e	

SOURCE: Project approval documents.

FIGURE 4.1 Projected impacts of GCIP-supported start-ups



SOURCE: UNIDO projections based on 14 selected start-ups spanning five countries (2011–17).

4.10 Postprogram support

Once an annual competition-based accelerator cycle concludes, there is no formal engagement between the GCIP and beneficiary entrepreneurs. Evaluation survey responses (table 4.4) indicate that 38 percent of all respondents have not had postprogram contact with the PMU. Among the four countries surveyed, there has been more informal postprogram interaction with Indian and South African start-ups. These interactions have remained opportunistic and have not been initiated with all former participants.

In ad-hoc ways, executing partners and mentors are in touch with individual start-ups. They support them through occasional advice and by facilitating networking with investors and other start-ups. Similarly, on an individual basis, CTO trainers are in touch and support their journeys as personal relationships have developed, which have also been observed to link with discussions about taking up equity positions.

Stakeholders identified the lack of formal, systematic postprogram engagement as an important shortcoming of the project's design, potentially compromising the sustainability of

TABLE 4.4 Responses to the survey question: Have you had any contact with the GCIP after completion of the program?

Response	India		Pakistan		South Africa		Turkey		Overall	
	No.	%	No.	%	No.	%	No.	%	No.	%
No	5	21	27	60	5	17	9	41	46	38
Yes	19	79	18	40	24	83	13	59	74	62
Number of responses	24	100	45	100	29	100	22	100	120	100

SOURCE: Responses to evaluation survey of GCIP start-ups.

results. The lack of systematic long-term support for and contact with former participants was not part of the original project design. Based on interviews, some participants were confident that the cohort-level networks were self-sustaining, but they invariably also felt that the GCIP and the host institution could be more involved in these networks and in providing longer-term support (help to identify new opportunities and linkages) to alumni through periodic networking, periodic “check-ins,” etc. Postproject follow-up is also critical to measure the viability and growth rate of supported start-ups and necessary for verification of environmental and social contributions.

4.11 Knowledge management

National knowledge management and exchange was more successful than envisaged South-South cooperation and international exchange. Even with UNIDO as the implementing agency across the nine projects, the GCIP has not systematically developed and shared knowledge across national projects through a global network as originally envisaged in the design. GCIP projects⁶ in Malaysia, South Africa, India, and Armenia published entrepreneurs' stories, videos, brochures, and promotional materials. In 2016, the GCIP project manager for Pakistan was designated as the overall GCIP coordinator. This move provided an institutional mechanism to promote sharing of experience and lessons learned under the GCIP framework. However, the extent to which knowledge management was addressed across the country projects remains undocumented and is related to the strength of M&E and succession planning. This may be linked

⁶ These materials provided a consolidated view of the projects' achievements during implementation, including showcasing the start-ups that benefited from project support, and illustrated the innovations advanced under the GCIP, and those which contributed to global environmental benefits.

to the implementation as individual country projects as opposed to a programmatic approach with resources provided for this aspect.

Similarities across the GCIP projects under review have allowed for a degree of interaction among start-ups across the countries. This has been achieved through virtual participation in the CTO online training webinars. A smaller number of start-ups were able to meet face-to-face during CTO's Global Forum in Silicon Valley, on which considerable reliance was placed for international knowledge sharing.

4.12 Exit strategy

Handover has been most successful in South Africa and Turkey. The strategy for how UNIDO planned to withdraw externally provided program resources from GCIP projects was not explicitly described in project documents. It appears to not have been planned for. Nevertheless, from what was observed across the countries, as project support has ended, the notion of an exit strategy was implicitly pursued by GCIP projects.

UNIDO undertook the following actions that should be considered in future design of exit architecture:

- Identified and worked with institutional structures that would retain the knowledge and skills developed under the project; in this light, the selection of the host institution was critical.
- Pursued country ownership through engagement of relevant public and private sector actors.
- Built local capacities (trainers, mentors, judges) to sustain the ongoing organization of the competition-based accelerator.
- Assured access to training materials and infrastructure to manage applications (whether local, international, or centrally shared).

- Provided clarity about the point at which exit would take place, based on targets and outcomes.
- Engaged in a handover process and transition where UNIDO support was phased out (in Armenia, India, and Malaysia, this process did

not work out very well; whereas South Africa and Turkey have created longer transitions with UNIDO support being slowly withdrawn, with higher prospects that GCIP activities will be sustained).

5: Conclusions and recommendations

5.1 Conclusions

Conclusion 1: The GCIP is highly relevant and will remain so as developing countries realize the economic and environmental opportunities to take up cleantech innovation as an engine of low-carbon growth.

All completed GCIP projects rated relevance as highly satisfactory. Going forward, the potential for cleantech SMEs in developing countries is estimated to be a \$1.6 trillion market opportunity. Studies have confirmed that the countries in which the GCIP has been implemented are ranked lower in terms of countries with functioning clean innovation ecosystems, suggesting there was a need and opportunity in these countries to develop the cleantech space. The GCIP is also fully complementary of the GEF-5 Revised Private Sector Strategy. GCIP projects are aligned with the GEF's focal area strategy under climate change mitigation and the GEF's Policy on Gender Mainstreaming. GCIP projects are also supportive of UNIDO's Inclusive and Sustainable Development mandate and objectives to implement its Green Industry Initiative. GCIP projects have addressed national climate change mitigation issues, energy challenges, and green job strategies in line with key environmental and economic priorities developed in-country. Institutional partners have confirmed the value and relevance of the GCIP, although not all countries have moved forward in pursuing a second phase.

Conclusion 2: GCIP projects have meaningfully contributed to development of cleantech innovation ecosystems with improved performance over time through support for business acceleration, capacity-building, and institutional strengthening. Effectiveness could have been improved through a more globally coordinated delivery, sufficient time frame, and adequate resourcing.

With the relatively limited resources of an MSP, all GCIP projects succeeded in promoting clean technology innovation by conducting annual business competitions and acceleration activities. Start-ups benefited through the development of business skills and access to mentoring, new markets, and investment. Only a limited number of business-related impacts can be directly attributable to GCIP participation. However, there are numerous examples of the GCIP's contribution to business improvements. Results include:

- 795 teams supported
- Help to entrepreneurs in leveraging grants and other financing
- Networks of national-level cleantech entrepreneurs created
- Increased interest of innovators in cleantech
- Demonstration that cleantech ideas can become businesses

- Built capacity of executing agencies to further replicate project results
- Cleantech products and services produced with resulting impact on the economy

The GCIP also delivered outcomes beyond the level of individual businesses. Host institutions developed interest and supportive capacities in cleantech and established relations with relevant other organizations, including government departments, universities, and chambers of commerce to anchor the overall concept. Projects could have been more proactive in deepening involvement from additional stakeholders, particularly the private sector, to sustain project results and benefits.

Cross-country scrutiny would have been more naturally carried out on a regular basis and generated less transaction cost if it had been coordinated under an overall program framework or global project framework. The initiative did not readily realize the results aggregation, cross-country network building, and knowledge exchange foreseen in the individual project approval documents. In addition, among the completed projects, almost all had no-cost extensions, which prolonged their activities by up to an additional 26 months. This mostly stemmed from delays in the initial stages, related to understanding the concept, engaging the counterpart, and establishing a PMU.

Conclusion 3: The GCIP has demonstrated additionality, although not in its planned strengthening of national policy and regulatory environments.

The GCIP demonstrated additionality through its promotion and results in innovation for clean technology, socioeconomic returns, institutional capacity, realization of financing for some start-ups, and business support to enterprises whose products and services have environmental benefits.

Policy-related activities were limited, under-resourced, and generally embarked on at the later stage of implementation. The lack of focus on the policy arena is linked to the priority given to the competition-based accelerator. Requested by national counterparts, running a competition-based accelerator generated relatively fast outputs that could be immediately seen and promoted, giving the GCIP project a national standing and branding. Customized efforts in the creation of enabling policy and regulatory environment to promote SME cleantech would have contributed to increasing the likelihood of project sustainability.

Conclusion 4: The GCIP's operating model successfully enlarged the available pool of resources through catalyzing the support of private ecosystem actors, although this reliance on their voluntary contributions presents some vulnerability.

The reliance on private sector involvement is part of a strong, potentially self-sustaining operational model, which contributes to strengthening the national entrepreneurial ecosystem and sustaining project outcomes. The projects have secured extensive pro bono support from the private sector. This has come in the form of their sponsorship of prizes, technical assistance, and volunteer contributions of mentors, judges, trainers, advocates, etc. To date, these contributions are in the range of \$3 million. The same individuals were often tapped and they were not always available, particularly in view of competition with other activities for which they were being compensated. This meant that for each competition-based accelerator cycle, the PMUs were tasked with securing and renewing participation, which imposes a burden on administrators.

Conclusion 5: Commitment by a national entity, adequate funding, and a planned exit strategy

at project completion enhances prospects for sustainability.

The handovers to TIA in South Africa and TÜBİTAK in Turkey attest to the importance of ensuring that the transition to full national ownership takes place during the project period. The experience thus far attests that without this attribute, the initiative seems destined to not continue or may continue with significant delay, sacrificing important momentum (as evidenced by the case of GCIP Pakistan). All institutions involved in the implementation of GCIP projects expressed strong interest in continuation of the GCIP after project completion. However, the ability to finance the project initiatives, particularly the competition-based accelerator, remained mostly unsecured. Countries that ran more than two to three accelerator cycles had greater success in transitioning the project to national institutions for continued delivery. In all instances, UNIDO's continued association was indicated as vital to successful continuation and project reputation.

Conclusion 6: The direct and indirect impacts of the GCIP are not easy to gauge because of a generally weak monitoring and evaluation, including inconsistency in measurement and the lack of systematic guidance for beneficiaries to estimate global environmental and socioeconomic benefits.

The projects' anticipated pathway to impact, as portrayed in the GCIP's reconstructed theory of change, i.e., GHG reductions, job creation, and investment mobilized, was found to be sound. However, M&E was among the GCIP's weakest areas of implementation. The projects' results measurement systems have inconsistencies in indicators and definitions, e.g., in "commercialization" or "accredited" company. Structured reporting on the projects' accomplishments was absent from PSCs as they did not convene as frequently as intended and were characterized by high turnover, although

the key involved actors had high legitimacy. This limited the benefit of ongoing supervision and strategic guidance.

UNIDO has estimated impacts suggesting some tangible progress being made along this route; however, long-term results cannot be verified at this stage. The short duration of GCIP projects requires systematic mechanisms for follow-up and verification with start-ups that go through the GCIP.

5.2 Recommendations

Recommendation 1: Any future GCIP or similar program should be structured using a more globally coordinated approach with appropriate choice of interventions based on strategic country selection.

A globally coordinated approach would allow for the establishment of a "platform" to support coordination across national projects, global networking, synergy with other international initiatives, capacity-building, standardized metrics, and knowledge management. Provided that the right metrics are in place for systemic monitoring and evaluation, this would usefully inform decision making and support the measurement of impact. Country ownership of such a platform after project completion would facilitate measurement of impact beyond the life of national implementations.

Countries should be selected strategically based not only on their willingness to use STAR allocation but also on factors concerning their current state and readiness to support cleantech innovation, particularly the mandate and capacities of the host institution and the way in which cleantech innovation is part of national environmental and development strategy. This could be assessed during a project preparation phase. Strategic pre-implementation scoping would allow for assessing the policy/regulatory environment to

determine priorities to support national implementation; identifying the most suitable local host and other public/private sector partners; developing in-country understanding of the cleantech concept, including ability to scale up and replicate activities in other countries as a regional hub; gathering baselines for outputs and outcomes; and undertaking a social inclusiveness analysis prior to project launch.

Recommendation 2: The GCIP should actively support national-level coordination to dynamize the cleantech entrepreneurship ecosystem.

The GCIP should focus on catalyzing the national host's mandate to coordinate and convene actors already working in-country to support technology innovation. This involves using a more explicit system to categorize the significant volume of entrants who apply, but are not selected, and channeling them to proceed to other more suitable ecosystem actors who can support them according to their stage of development (of enterprise maturity and technology phase). This would require adequate resourcing and understanding of the national coordination role. Selected start-ups with readiness for the GCIP's approach to business acceleration would move toward the competition-based accelerator, and other start-ups could be channeled to different actors. The intention would be to get start-ups at their varying stages into the right setting and give them a path that leverages the support that is available. The GCIP should further support national hosts in strengthening and communicating this coordination role, which can act as further assurance of sustainability.

Recommendation 3: Customize and sharpen the focus on policy strengthening and regulatory frameworks to foster cleantech innovation and its adoption.

A policy environment that is conducive to supporting the growth of cleantech SMEs is needed. The GCIP policy strengthening component needs to be adequately scoped, sufficiently resourced, and embarked on at an early stage, with appropriate steering and according to local conditions.

Allocating government cofinancing commitments to this outcome would be a suitable dedication of national resources for creating inputs to ongoing processes, even postproject completion. Entities tasked with this outcome should have policy engagement at the core of their institutional mandate. The GCIP was successful in identifying and engaging such national institutions, but they did not seem to have any role other than to attend PSC meetings and play an executive review role. They should be encouraged to view policy outcomes as a mechanism to help them to meet their own institutional objectives.

Recommendation 4: Expand the network of private sector partners to address GCIP participants' need for business expertise and early stage technology validation.

The GCIP should be more strategic in its approaches to access the desired external expertise of the private sector and to integrate the private sector-specific technology challenges in its competition-based accelerator for more beneficial collaborations. The GCIP should tap into broader established private sector networks, e.g., business school alumni, business owners' clubs, SME associations, trade associations, communities of practice, women's business associations, etc. Processes that are involved in regularly renewing private sector support should be streamlined.

Recommendation 5: Measure direct and indirect impacts by establishing adequate monitoring and evaluation systems and ensure that they are implemented using standardized and appropriate indicators.

The GCIP results frameworks should incorporate programmatic approaches that systematically gather information on outcomes and higher-level impacts/results. A common methodology is required for data collection that allows for comparison and extrapolation and shared understanding of GCIP-associated terminology among the involved actors. This could potentially include a requirement that beneficiary start-ups periodically provide relevant data to the local host organization (or platform) for a period into the future, when impacts are primarily felt and can be reliably quantified and verified.

The GCIP attracts applications from start-ups that are developing technologies with environmental and social cobenefits beyond climate change. The GCIP should also capture and report on these cobenefits. The GCIP should be able to present standardized GEBs to a large and growing impact investment community. These investors are looking specifically for the creation of GEBs as part of their returns. The requirements of these investors should be carefully considered in the development of GEB targets, clarifying how aspirational GEB will be measured at the project- and global-level.

Recommendation 6: Deepen country ownership during the project period, including a plan and resourcing to sustain activities and expand outcomes after project closure.

GCIP projects should dedicate more effort to developing national- and regional-level initiatives. This would deepen country ownership and connect start-ups with investors and other business partners that can support their advance toward commercialization. The GCIP should consider procuring trainers and materials through more open competition for service providers, with preference given to qualified vendors based locally and regionally. The GCIP should be woven into the fabric of the national innovation ecosystem. By just being another donor-funded business accelerator, albeit distinguished by its cleantech focus, the risk is that local actors cease to be interested when GEF-UN funding stops.

Annex A: Concept note

Text has been edited for clarity and grammar.

A.1 Introduction

The GEF is the financial mechanism for several multilateral environmental conventions. It works primarily with the public sector in developing countries providing grants to national governments and aims to expand private sector engagement in developing environmental solutions across the GEF's focal areas and initiatives. Since its inception in 1991, the GEF has provided developing countries and countries with economies in transition with more than \$10.5 billion in grants. The GEF Secretariat provides support to the GEF Council and ensures that Council decisions are implemented. Projects financed by the GEF are implemented by 18 GEF Agencies. The GEF Independent Evaluation Office has a central role in ensuring the independent evaluation function within the GEF. More information about the GEF Evaluation Office can be found at Office's website: <http://www.gefieo.org/>.

A.2 Background

An effective way for countries to meet their commitments under various international environmental conventions and agreements is to promote the development and deployment of clean technologies. This is particularly the case in the United Nations Framework Convention on Climate Change. In order to promote the development and deployment of clean technologies, various support

programs and initiatives have been implemented to identify innovators and to support innovative SMEs during their start-up phase.

The concept of providing business assistance services to early stage companies first emerged in the United States in the 1980s in response to perceived limitations in the prevailing economic development strategies, which focused largely on large corporate expansions. As other countries recognized the potential economic value of investing in and supporting new businesses, communities around the world developed business incubation programs to support the growth of new ventures (DEEP Centre 2015). Accelerators and incubators are the most recognizable start-up assistance programs and there are distinctions between the two. Accelerators usually provide time-limited support to start-up teams using structured programming and mentorship services designed to accelerate high-potential firms to success or failure. Incubators cater to early stage entrepreneurs, usually providing longer tenure for participating firms and a broader suite of services in terms of access to physical space and mentorship.

The predominant metaphor for fostering entrepreneurship as an economic development strategy is the "entrepreneurship ecosystem" that describes the culture, enabling policies and leadership, availability of appropriate finance, quality human capital, venture friendly markets, and a range of institutional and infrastructural supports for SMEs. Each

entrepreneurship ecosystem is unique and the various actors have different motivations for the success of the ecosystem. For public officials, job creation and tax revenues may be the primary objectives; for banks, a larger and more profitable loan portfolio may be the benefit. For universities, knowledge generation and reputation may be the benefits; and for entrepreneurs and investors, wealth creation could be the main motivating factor. Collectively, many stakeholders must benefit so that these characteristics lead to eventual self-sustaining of the ecosystem, and tipping points arise where government involvement can and should be reduced.

A.3 Global Cleantech Innovation Programme

In 2011, UNIDO, with support from the GEF, implemented the Greening the COP17 program. One of the components was focused on the design of the first South Africa Clean Technology competition for green entrepreneurs and SMEs. This competition was in line with the GEF’s Revised Strategy for Enhancing Engagement with the Private Sector and a specific modality for encouraging innovation in small and medium enterprises through a competition and incubation pilot (GEF 2011c).

From the South Africa pilot, the need emerged for further support to policy and regulatory frameworks and for building institutional capacity for cleantech entrepreneurship. The learnings from this pilot resulted in the expansion of the program by UNIDO and the GEF into the GCIP, which expanded into other countries in 2013, namely Armenia, India, Malaysia, Pakistan, and Turkey. Thailand joined in 2014, Morocco in 2016, and Ukraine in 2017. The GCIP has now operated in nine countries (table A.1). Another dozen or more additional countries have been identified for further expansion as part of a Phase 2.

The GCIP is in line with the GEF’s Climate Change Mitigation Focal Area Strategy under the GEF-6 Programming Directions and the Private Sector Strategy, as well as UNIDO’s mandate to promote Inclusive and Sustainable Industrial Development. The program uses a similar model in each country and supports a cleantech competition from which winners are selected to be trained through a business accelerator program. Entrepreneurs are chosen across four main clean technology categories:

- Renewable energy
- Energy efficiency

- Waste to energy
- Water efficiency

Additional categories such as green building, transportation, and advanced materials and chemicals have also been included in competitions for certain countries.

The nature of the business assistance spans topics such as business model validation, product/technology validation, finance, funding, legal and intellectual property issues, sustainability, corporate partnerships, government relations and regulations, sales, marketing, crowdfunding, angel and venture capital investment, scaling up, and going global.

National winners are then invited to a global competition hosted by the US-based Cleantech Open in California every year. Platforms at the national and international levels introduce the entrepreneurs and link them with investors and business and commercial partners, with a view to commercialization of the services or products.

Through program planning, the GCIP also has an aim to promote an innovation ecosystem in the countries where it operates by coordinating existing national programs relating to the promotion of development and deployment of clean technologies. Figure A.1 presents the GCIP approach to building an entrepreneurship ecosystem. Through this cleantech ecosystem and accelerator approach, the GCIP expects to catalyze investment to support and accelerate start-up entrepreneurs toward the development and commercialization of their innovative ideas.

Strengthening the policy and regulatory framework for the development of a supportive local innovation ecosystem is another hallmark of the project. It entails reviewing the policies and regulations relating to the promotion of SMEs working on clean technologies, in order to identify those that need

FIGURE A.1 GCIP approach to an innovation and entrepreneurship ecosystem



SOURCE: UNIDO 2015b.

to be developed or improved upon. These include those governing the protection of intellectual property rights, sponsorship agreements, and rights of different stakeholders (competition organizers, entrants, judges, mentors, etc.).

A third component entails institutional capacity building for the executing organizations, namely the government ministries and research institutions associated with the competition and accelerator program. This can include communication and advocacy strategies and other tools to support the collection of contestant entries, and subsequent sustainable delivery of the program. Figure A.2 presents the IEO-reconstructed theory of change of the GCIP.

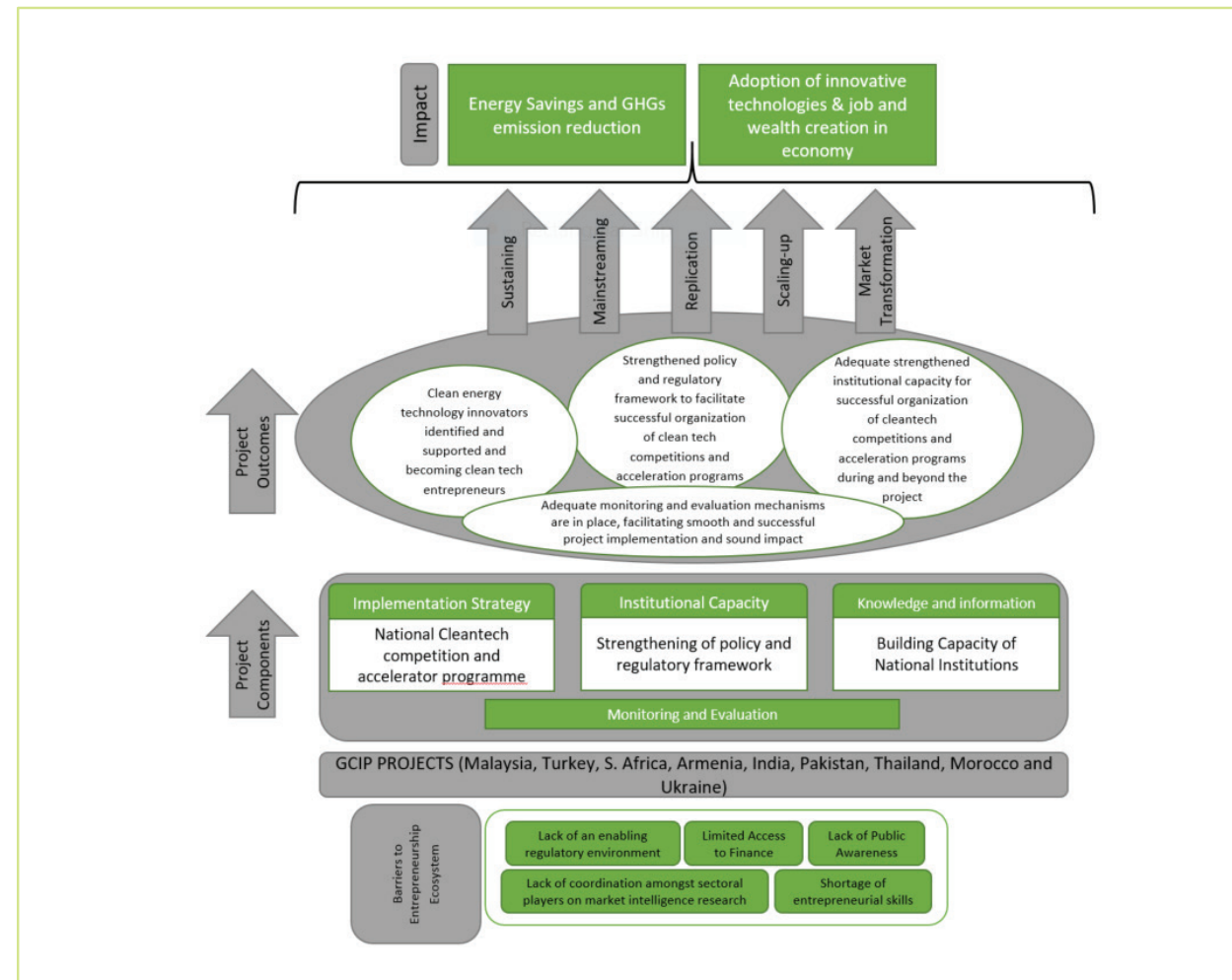
Each national project is an MSP receiving between \$1 and \$2 million in funding for approximately three years. The intention is to hold two to three cycles of the annual program. At the end of three years, the aim is for each national project to be

TABLE A.1 GCIP countries and grant amount

GEF ID	Country	GEF grant (\$)	Start	Duration
5146	Malaysia	990,000	September 2012	36 months
5505	Turkey	990,000	July 2013	36 months
5515	South Africa	1,999,000	August 2013	36 months
5145	Armenia	547,946	January 2013	36 months
5218	India	1,000,000	January 2013	36 months
5553	Pakistan	1,369,863	August 2013	36 months
5800	Thailand	1,826,500	April 2014	36 months
9485	Morocco	913,242	April 2016	36 months
9811	Ukraine	1,452,875	March 2017	36 months
Total		11,089,426		

SOURCE: GEF project approval documents.

FIGURE A.2 GCIP theory of change



fully operational with sustainable support from the public sector and private sector cosponsors.

A.4 Scope and purpose of the review

The scope of the evaluation will cover the GCIP as a whole, but will do in-depth case studies on a sample of SMEs in four partner countries that have participated in the GCIP since its inception in 2013: India, South Africa, Turkey, and Pakistan. These four countries are approaching the end of their project duration and have a cadre of entrepreneurs

that have gone through the accelerator, with whom one can assess outcomes and progress to impact.

The purpose of the evaluation is to independently assess the benefits and effect on SMEs after having gone through the GCIP. Have the accelerators produced viable companies? Created jobs? Produced windfalls for the founders and investors? Elicited greater private investment in start-ups? Generated global environmental benefits?

A.5 Evaluation objectives

- Assess the quality of advisory services provided by the program
- Assess the outcomes and benefits of the program in a variety of ways—environmental outcomes and economic outcomes of SMEs
- Assess the legal regulatory frameworks introduced and whether they have enabled cleantech SME ecosystem innovation
- Assess the demonstration effects of the program—replication/scaling up?

A.6 Approach and methodology

The evaluation will be carried out as an independent study using a participatory approach whereby all key parties associated with the project will be informed and consulted throughout the process.

The review will use mixed methods to collect data and information from a range of sources and informants. It will pay attention to triangulating the data and information before forming an assessment. The main instruments for data collection will be:

- Desk and literature review of documents related to the projects, including, but not limited, to, original project documents (endorsements), monitoring reports, midterm review reports, and terminal evaluations and relevant correspondence
- Stakeholder consultations will be conducted through structured and semi-structured interviews and focus group discussions. Key stakeholders to be interviewed include:
 - UNIDO management and staff involved in the project
 - GEF Secretariat staff involved in the design of the projects

- Representative SMEs
- Representative stakeholders from academic institutions, research institutions, and private sector, such as competition judges, mentors, and sponsors
- Country government officials
- Online Survey with SMEs that have been through the accelerator program
- Field visits associated with terminal evaluations to Turkey, India, South Africa, and Pakistan will also be factored into the analysis.

A.7 Key evaluation questions

- What is the relevance and additionality of this initiative in the participating countries?
- What gaps is this program seeking to address?
- What is the comparative advantage of the GCIP? How is the GCIP any different?
- What is the rationale for selection of country in the program?
- How effective has the program been in meetings its planned outputs and outcomes?
- What direct and indirect impacts did this initiative deliver?
- Is the program on track to bring SMEs to commercialization? (Evidence of contracts, evidence of investment?)
- What are the most important benefits to SMEs of going through the GCIP?
- If the GCIP was designed as a program right from the beginning (rather than individual country projects), what would have happened to the program's performance and results? Would the benefits and effects on SMEs been different?

- Which policies or regulations were initiated, established, or supported to create an enabling environment for the scale-up of project initiatives?
- What types of institutional capacity has been created in the country because of the GCIP?
- How efficient was project/program delivery?
- Were resources allocated sufficiently to achieve the expected results, particularly for the “strengthening of policy and regulatory framework” component
- Is the time frame and budget realistic to support the start-up companies to reach commercialization?
- To what extent are the program’s results likely to be sustained in the long term?

- What is the likelihood of scale-up and/or replication in the representative country?
- Has there been a viable entrepreneur ecosystem created for cleantech SMEs?
- What is the likelihood of the program continuing after the GEF project ends?

A.8 Literature review

The following section presents a brief review of some key pieces of literature. The review is not meant to be exhaustive or describe the entirety of information reviewed in considering the impact of business acceleration, training and mentoring.

The development community has for long supported the idea that a prosperous private sector is essential for economic growth. Enterprises have been praised as the engine of economic growth, playing a critical role at the heart of

TABLE A.2 Proposed workplan for evaluation of GCIP

Activity	Nov. 2017	Dec. 2017	Jan. 2018	Feb. 2018	Mar. 2018	April 2018	May 2018	June 2018	July-Aug. 2018	Sept. 2018	Oct. 2018	Nov. 2018	Dec. 2018
Document Collection	■	■											
Document Analysis		■	■	■									
Interviews with SMEs			■	■	■								
Interviews with UNIDO/ GEF Secretariat/ Cleantech Open Mgmt			■	■			■						
Survey design		■											
Survey administration				■									
Survey analysis					■	■							
Cleantech Open Global Forum			■										
Field visit to India				■									
Field visit to South Africa/ Pakistan								■					
Report drafting									■	■			
Report presentation													■
Knowledge dissemination													■

TABLE A.3 GCIP evaluation matrix

Key evaluation question	Pillar	Information sources	Possible approaches
<ul style="list-style-type: none"> What is the relevance and additionality of this program in the countries selected? What gaps is this program seeking to address? What is the comparative advantage of the GCIP? How is the GCIP any different? What is the rationale for selection of country in the program? 	Relevance	<ul style="list-style-type: none"> Council and GEF Secretariat documents Data/results from surveys, interviews Terminal evaluations 	<ul style="list-style-type: none"> Document review Interviews Surveys Meta-evaluations Comparative analysis with other accelerator programs
<ul style="list-style-type: none"> How effective has the program been in meetings its planned outputs and outcomes? What direct and indirect impacts did this initiative deliver? Is the program on track to bring SMEs to commercialization? (Evidence of contracts, evidence of investment?) What are the most important benefits to SMES of going through the GCIP? If the GCIP was designed as a program right from the beginning (rather than individual country projects), what would have happened to the program’s performance and results? Would the benefits and effects on SMEs been different? Which policies or regulations were initiated, established or supported to create an enabling environment for the scale-up of project initiatives? What types of institutional capacity has been created in the country because of the GCIP? 	Effectiveness	<ul style="list-style-type: none"> Data/results from surveys, interviews Terminal evaluations Supervision documents Interviews with UNIDO staff Interviews with GEF Secretariat staff Interviews with PMU staff 	<ul style="list-style-type: none"> Document review Interviews Surveys Meta-evaluation
<ul style="list-style-type: none"> How efficient was project/program delivery? Were resources allocated sufficiently to achieve the expected results, particularly for the “strengthening of policy and regulatory framework” component Is the time frame and budget realistic to support the start-up companies to reach commercialization? 	Efficiency	<ul style="list-style-type: none"> Council and GEF Secretariat documents Terminal evaluations Supervision documents 	<ul style="list-style-type: none"> Document review Interviews Surveys Meta-evaluation
<ul style="list-style-type: none"> To what extent are the program’s results likely to be sustained in the long term? What is the likelihood of scale-up and/or replication in the representative country? Has there been a viable entrepreneur ecosystem created for cleantech SMEs? What is the likelihood of the program continuing after the GEF project ends? 	Sustainability	<ul style="list-style-type: none"> Terminal evaluations Interviews with PMU staff, Cleantech Open and UNIDO staff Data/results from surveys, interviews 	<ul style="list-style-type: none"> Document review Interviews Surveys Meta-evaluation

entrepreneurship, especially in developing countries. Enterprise development has been hailed as the source of most new employment and productive investment, and the basis for growth and poverty reduction. But despite their enormous potential, enterprises face several challenges related to access to resources, finances, and services, which limit their potential for growth. Financial and nonfinancial services to support enterprises in their start-up and growth stage are being provided by governments, nongovernmental organizations, microfinance organizations, and business centers. While these services are common and widespread, the measuring of the impact of business incubation, investment, training, and mentoring is limited, mainly because of the challenges of doing so.

At the outset, it is important to note that there is a distinction between accelerators and incubators. Accelerators are typically for-profit organizations, owned and operated by venture capital investors who intend to generate returns from equity-based investments in their client firms. Accelerators provide a range of services to early stage firms, including financial support, business advice, and complementary services offered by partner organizations. Incubators are typically not-for profit organizations that offer similar services as accelerators but tend to provide longer tenure for participating firms and a broader suite of services in terms of physical space and mentorship. Incubators are often sponsored by universities, colleges, or economic development corporations (Gauthier, Birch-Jones, and Kishchuk 2016).

Accelerators offer impact enterprises support across their spectrum of needs as they seek to scale. There are several different platforms that can support enterprises as they grow. Many focus on just one of the myriad of challenges that face enterprises. For instance, impact investment firms, challenge funds, grant-making organizations, and crowd-funding platforms all address financing

needs but rarely support enterprises in refining their business models or establishing relationships with partners. Conversely, social entrepreneurship schools and social venture networks provide enterprises with this support, but they often do not help with funding or with establishing a rigorous monitoring and evaluation system. Accelerators focus not just on a single issue but typically aim to support a broad spectrum of impact enterprise needs as they seek to scale. This support is provided through an array of resources and services, offered both by accelerators themselves and through their networks.

Over the past several years, several incubators and accelerators have emerged that focus specifically on impact enterprises. In a 2013 landscaping exercise conducted by The Rockefeller Foundation and Monitor Deloitte, more than 160 of these “impact accelerators” were found just in the United States, Sub-Saharan Africa, and Southeast Asia (Monitor Deloitte 2015). The average age of the accelerators surveyed through this work was less than five years.

In their study for the Rockefeller Foundation, Monitor Deloitte sought to identify best practices and innovative new ideas for scaling impact enterprises. There were several phases of work under this project. The first phase focused on understanding the needs of impact enterprises as they seek to scale. In the second phase, the team conducted primary and secondary research and developed a landscape of more than 160 impact accelerators in the United States, Sub-Saharan Africa, and Southeast Asia to understand both the typical support accelerators provide for impact enterprises as well as promising new practices. The Rockefeller Foundation and Monitor Deloitte team began this research project by identifying the eight discrete needs or steps that impact enterprises follow in order to grow their organizations. They are:

1. **Market research:** Research and analytics on market dynamics, relevant policies, customers, and potential competitors. This research informs and shapes the development of business strategy.
2. **Business development and strategic planning:** Business structures and strategies that enhance the performance and impact of the enterprise. This category includes all the needs of an impact enterprise as they establish and develop their business, such as the procurement of physical office space, establishment of back-office functions (such as information technology [IT] support and human resources [HR]), recruitment of human capital, and any legal support. In addition, this category includes the development of a business plan and ongoing business strategy.
3. **Financing: Seed funding;** funds for ongoing operations, such as equipment, raw materials, marketing, and inventory; and funds for expansion.
4. **Supply sourcing and production:** Sourcing of raw materials and production of goods.
5. **Sales and marketing:** Promotion and sales of goods or services.
6. **Distribution and market access:** Access to appropriate distribution channels—both individuals and organizations—to reach target markets and consumers.
7. **Monitoring and evaluation:** Performance and impact metrics of the enterprise that provide insights on how to adjust and optimize the business model.
8. **Leadership skills and business acumen:** Leadership and business skills of the enterprise team—this component is the core of the enterprise and supports success in all other areas.

It addresses the inherent qualities that make an impact enterprise leader not just a social visionary, but also someone who has the skills to commercialize an idea and perform basic management tasks, such as conducting meetings, overseeing employees, and coordinating disparate workstreams.

As an impact enterprise grows, it will repeat the cycle and go through these eight steps again, but with nuanced needs depending on the stage. For instance, an early stage company will focus on developing the right business plan and getting seed funding while a more mature company will need to refine its strategy on an ongoing basis and secure growth capital.

A literature review on the impact of business incubation, mentoring, investment and training on start-up companies by the Overseas Development Institute assessed the existing literature and discussed the challenges of measuring impact in these areas, including that there is no standard methodology for measuring incubator performance, which makes comparisons between studies challenging (Pompa 2013). There are limited data available to measure the impact of business incubation, which can be explained by a number of reasons. Incubation can be difficult to assess as the outcomes may take years to materialize, basically, the time it takes an enterprise to develop its market and scale its production.

On average, it takes about three to four years to incubate a successful enterprise, and if one would like to measure the viability and growth rate of the incubated firms, one would have to wait at least another three or four years after graduation. Few studies capture the full impact of business incubation; for example, they take a measure of incubation impact over the incubation period rather than longer term, ignoring entrepreneurial learning and subsequent activity as a result of business

failure. Moreover, lack of data is also caused by the fact that many business incubators do not track their results beyond the number of enterprises they graduate. For those incubators that do track results, many times the data are not reliable.

Another constraint in measuring the impact of business incubation is that few studies have applied a robust evaluative approach to assessing the economic contributions of incubators. Many quantitative academic studies aiming at assessing the impact of incubators on enterprises have more conservative results than industry studies, and their findings are often contradictory. Dee et al. (2011) argues that taken together, these studies are indicative of the approaches that might work, but given the relatively small number of studies and the lack of comparability between them, any conclusions should be treated as indicative at best.

The most common type of accelerator support is capacity building for impact enterprises. Accelerators often provide formal training or workshops to teach entrepreneurs how to refine their model and scale their business. This can include specific courses regarding financing, marketing, or business plan development. Many accelerators also provide access to useful networks for enterprises—introducing them to investors and other funders, potential partners, suppliers, mentors, and customers and beneficiaries.

Looking across grantees and the broader impact accelerator landscape, Monitor Deloitte identified a number of best practices for successfully accelerating impact enterprises. They are as follows:

- **Develop a localized or sector-specific model.** As the impact accelerator market matures, there is increasing recognition that a one-size-fits-all approach is not effective. Market dynamics are highly unique in different industries or geographies, and thus it is most useful to give enterprises lessons and resources that are

directly related to their specific niche. Accelerators are increasingly developing customized models of support with local or sector-specific case studies, mentors, and instructors.

- **Build a strong ecosystem of support.** No accelerator can provide support for all enterprise needs on its own. They must build a strong ecosystem of support around the enterprise—including mentors, investors, and sector stakeholders. Through partnerships, accelerators can provide better curriculum, connections, and expertise on specific geographic or sector dynamics.
- **Carefully screen impact enterprises for appropriate fit.** Depending on the type of support provided by an accelerator program, some impact enterprises will benefit more than others. Accelerators must screen their applicants to ensure an appropriate fit with the program. A robust, up-front screening process ensures impact accelerators can be effective in providing support, and prevents impact enterprises from wasting time in a program that addresses skills they already have or that they are not ready for.
- **Develop a holistic model, but tailor support for individual enterprises.** Accelerators distinguish themselves from other intermediaries by offering holistic support across multiple scaling needs. They have a range of resources and curriculum from which they can draw. However, they are increasingly tailoring this holistic support to the needs of individual enterprises—taking the customized model highlighted above one level deeper.
- **Foster collaboration among impact enterprises.** Impact enterprises share a motivation to address complex social and environmental issues. Additionally, starting a business to address these issues involves common growth

challenges, which all impact enterprises face. This creates a unique opportunity for collaboration. These enterprises can provide highly constructive guidance to their peers given their on-the-ground perspective. Collaboration also allows impact enterprises to share best practices, make connections for one another, and even partner together.

- **Maintain long-term enterprise engagement.** The scaling process is often long and arduous. Impact enterprises must test new ideas, fail, and refine them over time. Accelerators acknowledge that providing long-term support through this process is desirable to ensure enterprises remain on track with their plans. It is also beneficial to provide new connections for enterprises as their needs evolve over time.

The Monitor Deloitte report also highlighted common impact accelerator challenges. Below is an overview of the common challenges that face impact accelerators as they seek to support impact enterprises and scale their impact.

- **Lack of awareness.** The relative nascence of the impact accelerator market means that many investors, impact enterprises, and other key stakeholders are unaware of their benefits. This challenge is especially acute in developing economies, where knowledge of even traditional accelerator models is not widespread. This limited awareness constrains accelerators' ability to attract both enterprises and relevant partners to their program. To mitigate, many accelerators cultivate strategic partnerships with other ecosystem players to raise awareness. These partnerships allow accelerators to present their work at industry trainings and conferences and make connections to investors, enterprises, and other key partners, such as potential mentors. Other accelerators have taken to traditional

advertising mediums, such as radio interviews, to reach broader audiences.

- **Developing a sustainable funding model.** The majority of impact accelerators cite funding as an acute constraint to their program. Accelerators reliant on philanthropic capital often find that donor timelines and spending requirements misalign with their own needs. For example, donors often need to fund specific initiatives that generate easily identifiable, large-scale impact, while accelerators often need funding to simply maintain and scale their operations or to test (potentially failing) innovations that could enhance their models. To mitigate, accelerators focused on philanthropic capital are more consciously selecting funders who have long-term goals that align with their program. Partnering with more niche funders allows accelerators to develop ongoing relationships with fewer spending restrictions.
- **Balancing business versus social impact.** For impact accelerators, “scaling” enterprises has many different facets. Impact enterprises need to focus on business growth, measured through traditional metrics such as revenue growth or employee growth. At the same time, they also need to increase social impact, measured through impact-specific metrics such as jobs created or GHG emission reduced. It is challenging for impact accelerators to provide support to enterprises for both scaling business impact as well as scaling social impact. Often, they struggle to balance these two objectives and identify the appropriate support to provide enterprises. To mitigate, some accelerators inherently link these two goals, whereby the social impact only increases as the business scales. Other accelerators focus on defining clear impact goals for an individual enterprise and then help the enterprise develop a strategy to meet these goals.

■ **Balancing standardization and customization.**

A standardized curriculum enables materials to be refined and perfected over many iterations and eases the process of scaling an accelerator program. On the other hand, a customized curriculum, case studies, and other tools allow impact enterprises to understand how to apply general lessons or theory to their own businesses. Accelerator programs need both, but finding the right balance is a challenge. Furthermore, customized programming is highly resource intensive. To mitigate, some accelerators have identified a set of issues that nearly all impact the experience of enterprises, and have crafted a standard curriculum that addresses them. They then layer on tailored services by drawing on relevant case study examples or appropriate mentors from their network.

- **Human capital resource constraints.** Impact accelerators need talented human capital to both deliver existing programs effectively and to scale their model. However, limited philanthropic funding for overhead costs, lower salaries compared with other private sector jobs, and often “unattractive” locations means that impact accelerators frequently cannot obtain the necessary talent. To mitigate, many impact accelerators rely on mentors or sector experts who are willing to contribute their time free of charge. Some accelerators utilize private sector secondees or graduate students to provide temporary support on a specific initiative

(e.g., developing a new course). Others focus on finding members of the local community that are capable of implementing a program and have the passion to support impact enterprises.

■ **Limited quantitative data to support insights on best practices.**

Right now, there are limited data being collected and analyzed to understand the quantitative impact of different accelerator methods and approaches. Insights remain qualitative. To help accelerators feel even more confident in their choices and help other accelerators make informed decisions, the field must augment the types of qualitative insights found in this report with quantitative verification. Greater impact measurement by impact enterprises and impact accelerators, and better tracking by all parties, will ensure that innovative models and initiatives can be tested, validated, and scaled. To mitigate, nearly all impact accelerators are prioritizing monitoring and evaluation, both for themselves and for their impact enterprises. The key is to standardize this data collection and share it with researchers, who can develop cross-cutting quantitative insights around what is working and what is not working in impact acceleration. To make this successful, accelerators and researchers need to collaborate and work together on standardizing data.

Annex B: Stakeholders interviewed

B.1 GEF Secretariat

David E. Rodgers, formerly Senior Climate Change Specialist, Programs Unit

B.2 Cleantech Open

Kevin Braithwaite, Vice President, Global Programs, Cleantech Open

Rex Northern, Senior International Trainer, Cleantech Open

B.3 UNIDO

James New, GCIP Project Manager for South Africa, Industrial Development Officer, Energy Department

Gerswynn McKuur, GCIP National Project Coordinator for South Africa

Marco Matteini, GCIP Project Manager for Turkey, Industrial Development Officer, Energy Department

Alois Posekufa Mhlanga, GCIP Project Manager for Pakistan and Morocco, Chief, Climate Technology and Innovations Division, Department of Energy

Jutamanee (Jip) Martchamadol, GCIP National Project Coordinator for Thailand

Josy Thomas, GCIP Project Manager for Thailand, Industrial Development Officer, Energy Department

Mark Draek, GCIP Project Manager for Armenia and Ukraine, Industrial Development Officer, Energy Department

Sanjaya Shrestha, GCIP Project Manager for India, Industrial Development Officer, Energy Department

Sandeep Tandon, GCIP National Project Coordinator for India

Tareq Emtairah, Director, Energy Department

Stefan Sicars, Director, Environment Department

Pradeep Monga, ex-GCIP Project Manager; currently Deputy Executive Secretary at UN Convention to Combat Desertification (UNCCD)

Tiep Nyguen-Khac, ex-GCIP Project Manager, formerly Industrial Development Officer, Energy Department

Sunyoung Suh, GCIP Project Team, Cleantech Innovation Expert, Department of Energy

Olga Gordiievska, GEF Coordination Office, Partnership Coordination Division, Department of Programmes, Partnerships and Field Integration

Pamela Mikschofsky, Associate GEF Coordination Expert, Partnership Coordination Division, Department of Programmes, Partnerships and Field Integration

Thuy Thu Le, Evaluation Officer, Independent Evaluation Division

Javier Guarnizo, Chief, Independent Evaluation Division

Muge Ulvinur Dolon, Evaluation Officer, Independent Evaluation Division

B.4 National stakeholders

Ram Mohan Mishra, Ministry of Micro, Small and Medium Enterprises (MSME), India

Sanjeev Rasal, Institute for Design of Electrical Measuring Instruments (IDEMI), India

Sansanee Huabsomboon, National Science and Technology Development Agency (NSTDA), Thailand

Seloua Amaziane, Direction du Partenariat, de la Communication et de la Coopération, Secrétariat d'Etat chargé du Développement Durable, Morocco

B.5 Start-ups

(interviewed during their participation in the Global Forum, January 2018)

Tarun Bothra, Saathi Eco Innovations, India

Kristin Kagetsu, Saathi Eco Innovations, India

Mousumi Mondal, Aspartika Biotech, India

Mridul Babb, Sagar Defence, India

Shilpa Parashar, Sagar Defence, India

Sandith Thandasherry, NavAlt Solar, India

Bandile Dlabantu, Khepri Innovations, South Africa

Sara Andreotti, Sharksafe, South Africa

Euodia Naanyane-Bouwer, Gracious Nubian, South Africa

Clive B, Bouwer, Gracious Nubian, South Africa

Murat Bahadır Kilin, Chief Executive Officer, Episome Biotech, Turkey

Murat Balaban, Chief Technology Officer, Episome Biotech, Turkey

Ali Acur, General Manager, Delphisonic, Turkey

Demet Seyhan, Team Leader, Re-Nu (Mitos Ltd.), Turkey

Guray Canli, Chief Technology Officer, Re-Nu (Mitos Ltd.), Turkey

Sevda Koksall Daban, Ecologic Leather, Turkey

Duygu Yilmaz, Biolive, Turkey

B.6 Innovation experts

Lea Firmin, CEO Venture Competition, Partner at McKinsey Consultants Switzerland

Hervé LeBret, Manager of Innogrants, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

Peter Vogel, Professor of Family Business and Entrepreneurship, International Institute for Management Development (IMD, Switzerland)

Matthew Simmons, Research Fellow, International Institute for Management Development (IMD, Switzerland)

Nanci Govinder, Start-up Advisor for Coaching Impact, Innosuisse Swiss Start-up Program

Mary Jean Burrer, Energy Researcher, Haute École d'Ingénierie et de Gestion du Canton de Vaud (HEIG-VD), Yverdon, Switzerland

Susan Gladwin, Senior Director, Entrepreneur Impact Program of Autodesk, San Francisco, USA

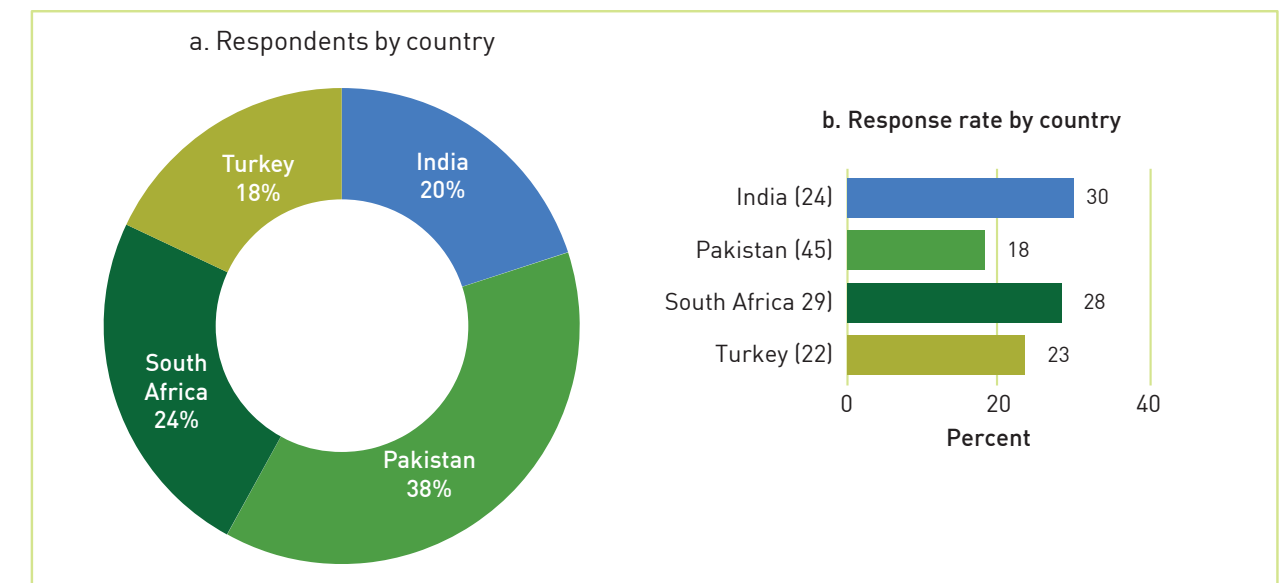
George Tilesch, Managing Partner, Innomine Group, San Francisco, USA

Albert Fischer, Venture Capitalist and Co-Owner, Yellow & Blue, Utrecht, The Netherlands

Brigitte Baumann, Early Stage Business Angel Investor, Founder & Chief Investment Officer of Go Beyond Investing

Annex C: Survey results: Start-ups

C.1 Response rates



C.2 Response summaries by country

Q1. Is your team leader female or male?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Female	2	8	10	22	6	21	6	27	24	20
Male	22	92	35	78	23	79	16	73	96	80
Total	24	100	45	100	29	100	22	100	120	100

Q2. What sector does your enterprise primarily work in?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Energy efficiency	13	54	17	38	9	31	6	27	45	38
Green building	0	0	3	7	2	7	1	4	6	5
Renewable energy	4	17	13	29	7	24	5	23	29	24
Waste beneficiation	3	13	2	4	5	17	1	5	11	9
Water efficiency	2	8	5	11	4	14	4	18	15	13
Other	2	8	5	11	2	7	5	23	14	12
Total	24	100	45	100	29	100	22	100	120	100

Q3. What stage would you characterize your technology pre-GCIP?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Beta testing	0	0	8	18	4	14	2	9	14	12
Concept	1	4	8	18	4	14	6	27	19	16
Early alpha prototype	4	17	8	18	9	31	4	18	25	21
Commercially ready, not yet deployed	4	17	7	15	8	28	2	9	21	17
Commercial pilot	4	17	10	22	3	10	5	23	22	18
Actively deployed and generating revenue (not yet profitable)	5	20	1	2	1	3	2	9	9	8
Actively deployed and generating revenue (profitable)	6	25	3	7		0	1	5	10	8
Total	24	100	45	100	29	100	22	100	120	100

Q4. How long had your enterprise been in existence when you went through the GCIP program?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Less than 1 year	0	0	21	47	4	14	8	36	33	28
1 year	0	0	10	22	8	28	3	13	21	17
2 years	5	21	6	13	10	34	3	14	24	20
3 years	7	29	1	2	2	7	3	14	13	11
4 years	1	4	2	5	1	3	2	9	6	5
More than 4 years	11	46	5	11	4	14	3	14	23	19
Total	24	100	45	100	29	100	22	100	120	100

Q5a. Is your enterprise incorporated?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
No	4	17	27	60	4	14	11	50	46	38
Yes	20	83	18	40	25	86	11	50	74	62
Total	24	100	45	100	29	100	22	100	120	100

Q5b. If your enterprise is incorporated, how many years has it been incorporated?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Less than 3 years	2	10	11	61	6	24	4	36	23	31
3 to 5 years	8	40	4	22	12	48	6	55	30	41
6 to 10 years	4	20	1	6	3	12	1	9	9	12
More than 10 years	6	30	2	11	4	16	0	0	12	16
Total	20	100	18	100	25	100	11	100	74	100

Q6. What is the range of your enterprise's capitalization (\$)?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
<100K	8	33	25	56	11	38	13	59	57	47
100K–500K	2	8	8	18	12	41	4	18	26	21
500K–1 million	5	21	5	11	3	10	4	18	17	14
1 million–1.5 million	5	21	1	2	2	7	1	5	9	8
1.5 million–2 million	1	4	2	4	0	0	0	0	3	3
> 2 million	3	13	4	9	1	4	0	0	8	7
Total	24	100	45	100	29	100	22	100	120	100

C.3 GCIP participation

Q7. In what year did you go through the GCIP?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
2013	3	13	0	0	0	0	0	0	3	3
2014	5	21	2	4	3	10	3	14	13	11
2015	4	17	7	16	9	31	7	32	27	23
2016	5	21	10	22	6	21	3	14	24	20
2017	7	28	25	56	11	38	9	40	52	42
Both 2016 and 2017	0	0	1	2	0	0	0	0	1	1
Total	24	100	45	100	29	100	22	100	120	100

Q8. What stage did you reach in the competition?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Finalist	11	46	21	47	17	59	12	55	61	51
Semifinalist	13	54	24	53	12	41	10	45	59	49
Total	24	100	45	100	29	100	22	100	120	100

Q9. How did you hear about the GCIP?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Internet search	4	17	12	27	4	14	13	59	33	28
Direct contact from GCIP	7	29	13	29	7	24	3	14	30	25
GCIP alumni	3	13	10	22	2	7	0	0	15	13
Government outreach	8	33		0	6	21	1	5	15	13
Other	2	8	10	22	10	34	5	23	27	23
Total	24	100	45	100	29	100	22	100	120	100

C.4 Changes to staffing profile

Q9a. How many employees did/does the enterprise have?

	India		Pakistan		South Africa		Turkey		Total											
	Pre-GCIP		Now		Pre-GCIP		Now		Pre-GCIP		Now									
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%								
≤5	5	21	1	4	32	71	27	60	24	83	23	79	21	95	19	86	82	68	70	58
6–10	8	33	9	38	9	20	12	27	4	14	5	18	1	5	3	14	22	19	29	24
11–25	8	33	8	33	2	4	4	9	1	3	1	3	0	0	0	0	11	9	13	11
>25	3	13	6	25	2	5	2	4	0	0	0	0	0	0	0	0	5	4	8	7
Total	24	100	24	100	45	100	45	100	29	100	29	100	22	100	22	100	120	100	120	100

Percentage change to size of staff base (derived from survey results)

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Less than 0% (staff base reduced)	2	8	9	20	3	11	4	18	18	15
0% (no growth)	5	21	15	33	12	42	8	36	40	33
Up to 25%	4	17	6	13	1	3	1	4	12	10
26–50%	3	12	4	9	1	3	3	14	11	9
51–100%	7	29	6	14	7	24	5	23	25	21
More than 100%	3	13	5	11	5	17	1	5	14	12
Total	24	100	45	100	29	100	22	100	120	100

Summary (derived from survey results)

	India	Pakistan	South Africa	Turkey	Total
	24	45	29	22	120
Average no. employees pre-competition	16.5	18.7	3.2	2.4	11.5
Average no. employees now (early 2018)	25.4	20.0	3.9	3.0	14.1
Average change to size of staff base	+54%	+7%	+24%	+25%	+22%

NOTE: In error, the India terminal evaluation said 78%.

Q9b. How many employees did/does the enterprise have? Female:male ratio.

	India		Pakistan		South Africa		Turkey		Total											
	Pre-GCIP		Now		Pre-GCIP		Now		Pre-GCIP		Now									
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%								
0	5	21	3	13	12	27	12	27	19	66	14	48	12	55	10	45	48	40	39	33
<1:2	12	50	14	58	14	31	16	36	3	10	7	24	2	9	2	9	31	26	39	33
<1:1	2	8	4	17	12	27	11	24	5	17	4	14	0	0	1	5	19	16	20	17
1:1	1	4	0	0	4	9	5	11	0	0	3	11	1	4	4	18	6	5	12	10
>1:1	4	17	3	12	3	6	1	2	2	7	1	3	7	32	5	23	16	13	10	8
Total	24	100	24	100	45	100	45	100	29	100	29	100	22	100	22	100	120	100	120	100

Summary (derived from survey results)

	India	Pakistan	South Africa	Turkey	Total
Average of pre-GCIP gender ratio	0.53	0.41	0.21	0.64	0.42
Average of post-GCIP gender ratio	0.59	0.35	0.31	0.58	0.43
Average change of female to male staff ratio	+6%	-6%	+11%	-5%	+1%

C.5 Quality assessment of the GCIP

Q10. Please rank the following components of the GCIP from most to least beneficial to your enterprise (%):

		India (n = 24)	Pakistan (n = 45)	South Africa (n = 29)	Turkey (n = 22)	Total (n = 120)
Training for business plan development	Ranked as most beneficial	33	44	34	45	40
	Ranked in top 3	67	71	59	73	68
Mentorship on business plan development	Ranked as most beneficial	25	13	17	27	19
	Ranked in top 3	54	38	66	82	56
Opportunities to showcase technologies	Ranked as most beneficial	25	13	10	0	13
	Ranked in top 3	67	47	48	23	47

India

1. Opportunities to showcase technology
2. Training for business plan development
3. Mentorship on business development
4. Connection with an investor network
5. Connection with potential business partners
6. Technical advice through sector experts
7. Increased capacity of supporting government institutions
8. Improving the policy and regulatory environment for business operations

Pakistan

1. Training for business plan development
2. Opportunities to showcase technology
3. Mentorship on business development
4. Connection with an investor network
5. Technical advice through sector experts
6. Improving the policy and regulatory environment for business operations
7. Connection with potential business partners
8. Increased capacity of supporting government institutions

South Africa

1. Mentorship on business development
2. Training for business plan development
3. Opportunities to showcase technology
4. Connection with potential business partners
5. Technical advice through sector experts
6. Connection with an investor network
7. Increased capacity of supporting government institutions
8. Improving the policy and regulatory environment for business operations

Turkey

1. Training for business plan development
2. Mentorship on business development
3. Opportunities to showcase technology
4. Technical advice through sector experts
5. Increased capacity of supporting government institutions
6. Connection with potential business partners
7. Connection with an investor network
8. Improving the policy and regulatory environment for business operations

Q11. How would you rate the quality of services you received?

	India		Pakistan		South Africa		Turkey		Overall	
	No.	Score	No.	Score	No.	Score	No.	Score	No.	Score
Training for business plan development	20	7.50	45	7.51	29	8.00	22	8.27	116	7.78
Connection with an investor network	23	4.61	45	4.76	29	4.69	21	4.86	118	4.73
Technical advice through sector experts	22	3.64	44	4.91	29	4.76	21	5.33	116	4.71
Mentorship on business development	21	5.90	45	6.04	29	6.41	21	7.33	116	6.34
Opportunities to showcase technology	24	5.92	45	5.91	29	5.66	22	5.45	120	5.77
Connection with potential business partners	23	3.76	44	4.64	29	4.28	21	4.76	117	4.40

Question 11 required respondents to rate the quality of various inputs on a six-point scale from "very poor" to "excellent." Weighted average score was calculated by first assigning numeric values to response choices (very poor = 0, excellent = 10),

then calculating the overall average according to the number of responses to each choice. An overall score above 5.00 is positive; above 7.50 is highly positive. "N/A" and blank responses were omitted and not included in response count.

Q12. Have you made changes to any of the following elements in your business as a result of the GCIP?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Revised financing plans	13	54	25	56	15	52	13	59	66	55
Revised business planning	16	67	32	71	19	66	14	64	81	68
Created new jobs within the enterprise	13	54	23	51	12	41	6	27	54	45
Made alterations in product	16	67	27	60	16	55	5	23	64	53
Revised marketing plan	16	67	31	69	18	62	11	50	76	63
Revised business pitch	18	75	28	62	20	69	9	41	75	63
Other changes	13	54	5	11	1	3	4	18	23	19
Have made no changes	14	58	24	53	12	41	7	32	57	48
Total	24		45		29		22		120	

Q13. What is the main strength of the GCIP (open-ended responses were clustered by theme)

- Business expertise: 25%
- Other: 18%
- Mentors: 16%
- Networking: 12%
- Overall quality of support: 11%
- Global reach/focus: 9%
- None given: 8%
- Brand: 2%

Q14. What is the main weakness of the GCIP (open-ended responses were clustered by theme)

- Quality of support: 29%
- Other: 19%
- None listed: 17%
- More focus on investor outreach needed: 13%
- Coordination issues: 7%
- Burdensome time commitment: 5%
- More follow-up support needed: 4%
- Too short: 3%
- Coverage is too small: 2%
- Lack of funding/financial support: 2%

Q15. Have you had any contact with the GCIP after completion of the program?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
No	5	21	27	60	5	17	9	41	46	38
Yes	19	79	18	40	24	83	13	59	74	62
Total	24	100	45	100	29	100	22	100	120	100

Q16. Which barriers to the development of your enterprise did the GCIP help address?

	India		Pakistan		South Africa		Turkey		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Policy or regulatory environment	5	21	14	31	6	21	10	45	35	29
Access to finance	6	25	18	40	6	21	8	36	38	32
Access to markets	7	29	16	36	10	34	11	50	44	37
Skill shortage	4	17	9	20	5	17	8	36	26	22
Not applicable	10	42	10	22	10	34	1	5	31	26
Other (please specify)	5	21	7	16	9	31	3	14	24	20

Annex D: Survey results: GCIP project managers

Q1. Name of respondent (confidential)

Country managed	Number of respondents
Malaysia	2
Turkey	2
South Africa	2
Armenia	2
India	2
Pakistan	2
Thailand	2
Morocco	2
Ukraine	1
Total respondents	17

Q2. What are the market failures this program is looking to address? Please rank these barriers from most to least important:

- Access to markets
- Access to finance
- Skill shortage (cleantech innovations developed by scientists and engineers with limited business expertise)
- Policy or regulatory environment
- Other

Q3. On a scale of “0” to “10” (where “0” is not at all and “10” is fully), where would you rank the country in terms of the extent to which the GCIP is now anchored in the country? Which criteria have you used to make this assessment?

Average answer: 6.9. Explanation:

More anchored:

- The national counterpart (TIA) has hardwired the GCIP South Africa program into two operations going forward—with a large operational budget
- In 2018, activities are financed largely by the executing agency (TIA)
- Project is relevant to country goals

Less anchored:

- The GCIP the only accelerator program for cleantech in country, unfortunately nothing to take its place (Turkey)
- More work needs to be done to anchor program
- Some lack of commitment by in-country agency to promote program
- A second phase might be useful

Q4. Please list the ways (be specific, including naming of organizations) in which entrepreneurs were made aware of the GCIP in order of importance.

Specific organizations mentioned:

- Council for Scientific & Industrial Research
- National Cleaner Production Centre
- National Hosting Institution, TUB-TAK Distribution Channel
- Start-up India database (Department of Industrial Policy and Promotion—DIPP)

- GCIP Thailand website
- Alive-to-Green
- Cape Media
- MAGIC
- Twitter
- Facebook

Other methods: Roadshows, university networks and school visits, newspaper advertisements, information sessions and presentations, incubation centers, email campaigns, promotional materials, word of mouth, through sponsors, outreach to other accelerators

Q5. What do you think are the most important impacts of the GCIP for the participating entrepreneurs?

- Opportunities to showcase technology
- Connection with potential business partners
- Connection with an investor network
- Mentorship on business development
- Training for business plan development
- Technical advice through sector experts
- Increased capacity of supporting government institutions
- Improving the policy and regulatory environment for business operations

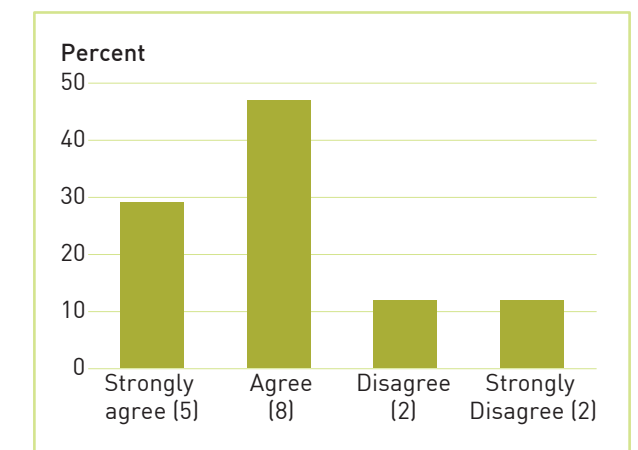
Examples from explanation:

“GCIP programme emphasized on the non-technological aspects of business development. Participants often came from an engineering and/or academic background and were invariably focused (often solely focused) on technology, product design and proof-of-concept. By insisting that competition participants engage in training, mentoring and webinars on ‘softer’ aspects such as business model development, market segmentation, and financial projections, GCIP India helped

participants to recognize and address critical barriers to the commercialization of their products. For many participants, the fact that they only identified such barriers as a direct result of their participation in the programme represented a clear indicator of the work’s relevance to their needs, even if such needs were only appreciated retrospectively. Moreover, GCIP India provided entrepreneurs various platforms nationally and internationally to showcase their technology such as Festival of Innovation hosted by the President of India, Vienna Energy Forum, CoP 22 & 23, and World Environment Day 2018 in New Delhi.”

“A comment on the Policy and Regulatory Environment. The original design/intentions in this area should be revised to make the projects’ impact greater. Policy and Regulatory challenges vary substantially from country to country. In the case of Turkey, the challenges/gaps are not at the level of general policies, but rather at the level of policy and regulatory compliance for the individual technology innovations.”

Q6. Please indicate your level of agreement with the following statement: Further emphasis on gender mainstreaming would deliver the desired impacts foreseen for the GCIP.



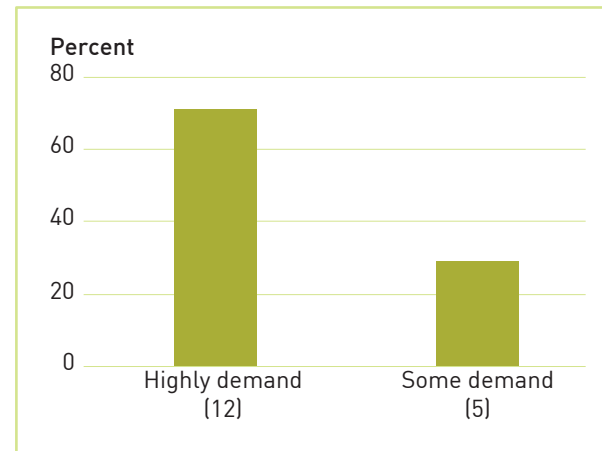
Explanation: Some respondents said innovation is gender neutral. Others discussed the strong efforts at gender mainstreaming already made,

while others said program had done a good job (for example, Pakistan’s best female led team prize) but improvements were possible. Further emphasis has obvious impact in terms of greater reach.

Q7. Please explain the ways that gender mainstreaming could add value to the GCIP’s objectives?

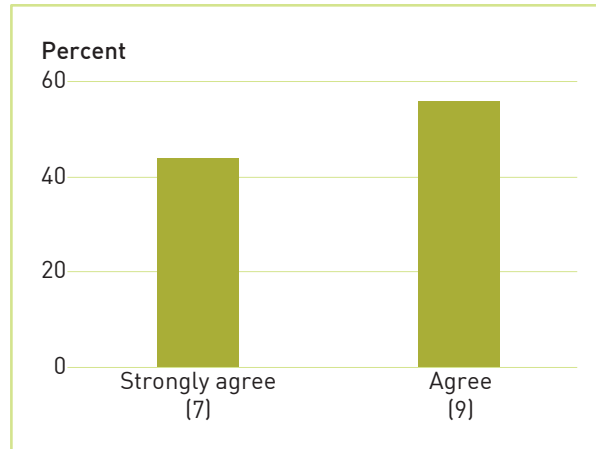
- Increased participation (women half of the productive economy) would broaden impact, more applicants to program
- More gender diversity and balance could lead to more tailored and effective innovations, better fitting differentiated needs, increased focus in innovations that address issues women face
- Women are more abundant at university base start-ups and thus need to be supported further
- Gender mainstreaming contributes toward innovation agenda

Q8. To what extent is the project demand driven?



Explanation: Demand was driven by government and entrepreneurs.

Q9. Concerning interactions/communications and coordination between implementation partners (UNIDO HQ, UNIDO PMU, Executing Agencies) please indicate your level of agreement with the following statement: Roles, responsibilities and accountabilities have been clear.



Explanation: Roles have been clear, communication and coordination has worked well, years of implementation have made roles clear.

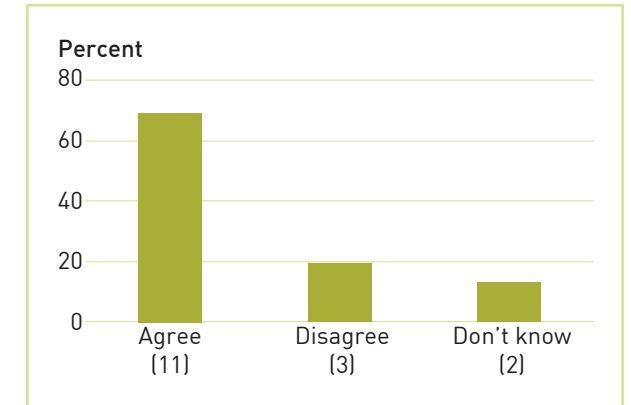
Q10. How would you change project management and implementation? Please explain.

- No recommended changes
- By getting more local institutions involved in the execution in different geographic regions, project management and implementation will be more effective. While responsibilities were sufficiently clear throughout the project period, a stronger push for the local executing partner from the start of the project could have had even better results (rather than the national partner only getting more active in the final project period). Nevertheless, results were positive, but this could have led to even more achievement. Increased focus on transferring the process to a national entity that has financial resources, mandate, and capacity to run the GCIP. National executing agencies managing the project under the government regulations also need longer lead time to process and approve.
- Stronger control at UNIDO level; i.e., managing the platform internally by UNIDO and not the Cleantech Open. Diversify service providers. Cleantech Open has been the main service provider so far and this brings complacency.

But the global innovations landscape is rapidly changing. Some countries are more connected to Europe than to the United States. China and Korea are also increasingly active in the innovations space, and this brings opportunities. As such, we can also consider bringing other service providers on board, especially as the GCIP is planned to expand to 20 countries.

- More room for innovation at the implementation end
- Capacity assessment should be done before the selection of agencies hired for the implementation of various components.
- I think that there is a need for an adaptive approach. Some National Execution Partners would be able to take more responsibility now for some activities. At the same time, new activities would be added to the follow-up project, and for these, UNIDO’s direct involvement would be needed and would bring added value. UNIDO remains uniquely positioned in its ability to support entrepreneurs with networking with international investors, customers, and business partners and can also help with the capitalization of knowledge assets.
- New coordinators should be trained, and should be learning by doing GCIP activities again and again.

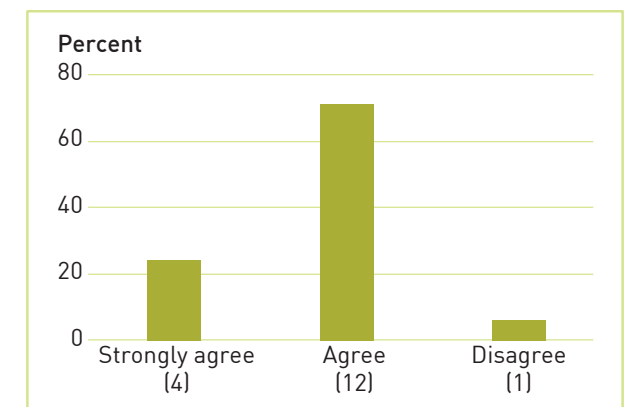
Q11. Please indicate your level of agreement with the following statement: Work on policy and regulatory strengthening for cleantech SME development is being achieved.



Explanation: As an example, “Partly; a number of initiatives were taken, but a comprehensive policy (across Ministries) on innovation and cleantech turned out to be rather ambitious. Longer-term efforts, and inter-ministerial coordination could partly address this.”

Multiple respondents said the implementation length was not sufficient for regulatory change, “policy is a long-term process.” In some countries, work on studies of government innovation frameworks and advisory materials were developed as part of program. In other countries (Malaysia), program was in line with government development priorities from the start.

Q12. Please indicate your level of agreement with the following statement: Arrangements are in place/being made to continue the work beyond the project implementation period?



Explanation: In some cases, the national partner has clearly stepped in to take over (TIA, TÜBITAK) or expressed interest. Other respondents said that even with national partners stepping in or expressing interest, more handholding, or a second phase, is needed.

Q13. What is the single most significant result that the GCIP work has contributed to?

Summary of combined answers:

- High number of teams supported, and number still surviving after program, their success after going through program
- Help to entrepreneurs in leveraging grants

- Network of cleantech entrepreneurs created, increased interest in clean tech from entrepreneurs, demonstration that cleantech ideas can become businesses
- Building capacity of the executing agency to further scale up project results
- Launch of the Clean Future Fund in Turkey
- The ideas/products produced and resulting impact on economy
- Establishment of high-quality green economy/environmental incubation system, international platform

Annex E: GCIP accelerator performance

TABLE E.1 Performance of the GCIP's competition-based accelerator by country, 2014–17

Annual cycle	Applications			Semifinalists selected (no. with female team leader)	Teams that finished accelerator (no. with female team leader)
	Total initiated ^a	Attrition ^b	Total deemed eligible to enter competition		
Malaysia: launched April 2013, closed August 2017					
2014	57	—	—	25 (4; i.e. 16%)	—
2015	58	19 (33%)	39	25 (3; i.e. 12%)	17
2016	51	2 (4%)	49	29 (4; i.e. 14%)	—
Total	166	—	60	79	—
Annual average: 55					
Armenia: launched May 2013, closed April 2016					
2014	64	—	—	24	—
2015	45	—	—	30 (4; i.e., 13%)	—
Total	109	—	—	54 (4; i.e., 7%)	48
Annual average: 55					
India: launched May 2013, closed June 2018					
Target				No target set	No target set
2014	183	81 (44%)	102	30 (3; i.e., 10%)	24
2015	160	51 (32%)	109	20 (0)	17
2016	191	82 (43%)	109	20 (1; i.e., 5%)	17
2017	232	113 (49%)	119	20 (4; i.e., 20%)	19
Total	766	327 (43%)	439	90 (8; i.e., 9%)	77
Annual average: 191					
Pakistan: launched September 2013, closed June 2018					
Target			100 (10% women)	No target set	No target set
2014	81	33%	54	28 (2; i.e., 7%)	19 (0%)
2015	451	61.5%	174	55 (12; i.e., 22%)	27 (7, i.e., 26%)
2016	592	47%	314	82 (23; i.e., 28%)	33 (11, i.e., 33%)
2017	511	46%	275	84 (25; i.e., 30%)	26 (10, i.e., 38%)
Total	1,635	47%	818	249 (62; i.e., 25%)	105 (38, i.e., 36%)
Annual average: 408					

Annual cycle	Applications			Semifinalists selected (no. with female team leader)	Teams that finished accelerator (no. with female team leader)
	Total initiated ^a	Attrition ^b	Total deemed eligible to enter competition		
South Africa: launched October 2013, closed September 2018					
Target			100–300 (10% women)	40–50; then set at 20–25	10–15
2014	68	34%	45	23 (1)	8 (0%)
2015	120	50%	60	28 (4)	10 (2; i.e., 20%)
2016	221 (52)	60%	88 (18)	26 (5)	9 (5; i.e., 56%)
2017	198 (51)	59%	81 (30)	25 (8)	11 (4; i.e., 36%)
Total	607	51%	274	102 (19)	38 (11)
Annual average: 152					
Turkey: launched October 2013, closing December 2018					
Target			100 (10% women)	No target set	No target set
2014	217	56%	96	27 (17; i.e., 18%)	25 (8; i.e., 32%)
2015	199	56%	88	28 (21; i.e., 24%)	25 (5; i.e., 20%)
2016	210	54%	97	27 (17; i.e., 18%)	17 (3; i.e., 18%)
2017	149	36%	96	32 (19; i.e., 20%)	28 (7; i.e., 25%)
Total	775	50.5%	376	114	95 (23; i.e., 24%)
Annual average: 193					
Thailand: launched March 2016, closing June 2019					
Target			100 (30% women)		
2016	33 (4)	0%	33 (4; i.e., 12%)	21 (4; i.e., 19%)	11 (3; 27%)
2017	44 (10)	0%	44 (10; i.e., 23%)	25 (6; i.e., 24%)	11 (3; 27%)
Total	77		77 (14; i.e., 18%)	46 (10; i.e., 22%)	22 (6; i.e., 27%)
Annual average: 39					
Morocco: launched August 2016, closing September 2019 (extension is under discussion)					
Target			100 (10%–15% women)		
2016	201 (23%)	—	—	30	30
2017	218 (17.9%)	4%	209	30 (6)	30 (6)
Total	419			60	60
Annual average: 209					

NOTE: — = not available. GCIP Ukraine was still in project preparation phase at the time of this evaluation.

a. Applications initiated^a refers to people who started the online application process (i.e., responded to the call for applications); including those who (1) completed the process, and (2) did not complete the application process, or (3) were deemed ineligible.

b. Due to noncompletion or because deemed ineligible.

TABLE E.2 Start-ups' projected GHG emissions reduction, job creation, and revenue potential

Company and innovation	Environmental benefit of innovation	Projected by 2020		
		Annual GHG emissions savings	Revenue increase	Jobs created
Armenia				
YSU Biofuel Team: Biohydrogen produced from biomass to be used as fuel	Biohydrogen is a 100% ecologically clean fuel with no CO ₂ emissions at all.	0	—	30
Bitlismen: Water flow measurement system	Using the system in pumping stations decreases their energy consumption, thereby reducing energy demand from thermal power plants, reducing CO ₂ emissions.	0	—	1
SolVar Systems: Novel solar photovoltaic modules for energy generation	Reduces CO ₂ emissions by over 30 tons per year (estimated).	30 tCO ₂ e	4,900%	10
EcoTechnology LLC: Biodegradable water absorbent material (Aquasource) for agriculture and decorative plants	Application in rooting neighborhood of each plant reduces irrigation needs by 50–60%, increasing crop productivity up to 40–60% and improving soil structure.	—	3,471%	25
Black Solar: A new anti-reflection layer formation technology for solar photovoltaic products, utilizing a proprietary 1-step plasma etching process	This critically differentiated manufacturing process produces low-cost, high-efficiency solar modules for the large solar photovoltaic market.	—	—	—
N/ANO HI: Nanotechnology and nanoproducts of 2-dimensional atomic materials (nanostructures, nanosheets, nanopowder)	Significantly increases the efficiency of solar photovoltaic panels by using flexible graphene solar cells (replacing conventional ones by replacing indium tin oxide electrodes with flexible and transparent graphene ones).	0	—	—
Technolog: New heat exchange technology for individual heating systems based on new rule of liquids mass - heat transfer	This new approach to water heating systems in all domains has 25% gas savings.	0.25	—	—
AM-ESKA: Used tires are recycled: turned into diesel fuel, carbon black, and still cord	Makes the environment cleaner by recycling one of the most dangerous types of waste (old, used tires), as well as producing high-quality diesel fuel.	—	36%	—

Company and innovation	Environmental benefit of innovation	Projected by 2020		
		Annual GHG emissions savings	Revenue increase	Jobs created
India				
Nishant Bioenergy Pvt Ltd: Biomass fuel pellet manufacturing plant (350–400 kgs/hr) and pellet-fueled cook stoves and burners	We are going to propagate decentralized biomass fuel manufacturing from local biomass, and employ local people. Each franchisee will be buying local biomass worth Rs 50 Lakh/year. With 20 franchisees, total purchase would be more than Rs 10 Crores per year. This money will help the local economy around the pellet factories. Biomass is a rural thing, thus most benefit will go to poorest in the area. Our solution replaces fossil fuels with locally made, sustainable low-cost fuel, thus end consumers using our stoves/burners will also benefit. User saves ~35–40% in fuel cost while shifting from fossil fuel to our pellet stoves/burners.	26,000 tCO ₂ e	900%	240
Aarshadhaatu Green Nanotechnologies India Pvt Ltd: Nano copper-based, anti-corrosive and anti-fouling coatings	Energy calculations	—	—	40
Agnisumkh Energy Solutions Pvt Ltd: Gas-fueled radiant heat applications	>10 million metric tCO ₂ emissions reduction	30,000 tCO ₂ e	24,900%	5,000
Atomberg Technologies: Energy efficient ceiling fan	Number of ceiling fans in India: 246 million with 10-hour average running time on 300 days: 2782 units saved per year, which should be enough to provide electricity access to 200 million families.	0	900%	500
Rhino Machines Pvt Ltd: Energy efficient sand plant (Ecoflex)	CO ₂ emission reduction is cumulative and will keep on increasing. Working environment and competitiveness also improves.	14,400 tCO ₂ e	150%	50
Rhino Machines Pvt Ltd: Multiflex energy efficient moulding machine	CO ₂ emission reduction is cumulative and will keep on increasing. Working environment and competitiveness also improves.	14,700 tCO ₂ e	400%	100
Brisil Technologies Pvt Ltd (previously Bridgedots Techservices Pvt Ltd): Highly dispersible silica, activated carbon	Reduces total energy required for silica production by over 15%, saving ~600 kg of CO ₂ for every ton of silica produced. The silica produced from our technology will reduce GHG emissions from vehicles by 7% because of fuel consumption improvements. Every ton of silica will eventually reduce 125,000 kg of CO ₂ emissions from vehicles through fuel savings. As we are expecting to produce ~8,000 tons of silica in 2020, it is expected to result in saving 942,000 tCO ₂ emissions.	4500 tCO ₂ e/ (direct) + 937500 tCO ₂ e (indirect)	5,900%	50

Company and innovation	Environmental benefit of innovation	Projected by 2020		
		Annual GHG emissions savings	Revenue increase	Jobs created
Inficold India Pvt Ltd: Power backup integrated bulk milk cooler and integrated cold storage	Reduction of CO ₂ emissions	>10 million metric tCO ₂ emissions reduction	3,900%	100
GIBSS: Geothermal cooling system	22 million metric tCO ₂ emissions reduction by 2022	2 million tCO ₂ e	400%	200
Oorja Energy Engg Services Hyd Pvt Ltd: Radiant panels, parabolic trough, compound parabolic collector	Reduction of over 1 million tCO ₂ e in next 5 years	400,000 tCO ₂ e	1,150%	45
Promethean Energy: ChillerMate/CompMate	100 million metric tCO ₂ emissions reduction	1 million tCO ₂ e	6,150%	20
Pakistan				
HempCoO: Energy efficient construction material using hemp as insulation material	Reduces building heating and cooling costs by 70%, thereby reducing carbon emissions (100 tCO ₂ e)	500 tCO ₂ e	400%	100+
Green Team: Converts municipal solid waste into briquettes used to heat boilers, thereby replacing coal burning	Replaces coal with municipal solid waste, which reduces carbon emission and results in cleaner cities (40 tCO ₂ e)	250 tCO ₂ e	400%	50
SavCon: An energy efficient geyser, consuming 70% less energy	Reduces methane consumption in winter and will help in overcoming seasonal gas shortages of companies (80 tCO ₂ e)	150 tCO ₂ e	67%	20
Project Roshni: Intelligent device that collects energy consumption details	Energy efficiency on multiple levels and reduced carbon emissions (100 tCO ₂ e)	250 tCO ₂ e	100%	35
Tawanai: Agricultural dry biowaste gasifier using pelletized dry crop waste	Reduced consumption of diesel and higher utilization of agriculture waste (30 tCO ₂ e)	300 tCO ₂ e	500%	30
Bitsym: Water tank disinfectant device	Contributes to controlling water-borne diseases (e.g., cholera), thereby saving lives of thousands of people (5 tCO ₂ e)	25 tCO ₂ e	100%	100
Zaheen Machines: Intelligent device for gas-burning water heaters	Reduces methane consumption in winter and will help in overcoming seasonal gas shortages of companies (60 tCO ₂ e)	150 tCO ₂ e	100%	100
DC solar water pump: Solar-powered water pump	Uses solar power to pump water, thereby increasing agricultural production and incomes in off-grid areas (10 tCO ₂ e)	150 tCO ₂ e	900%	50
Biofire Renewables: Biomass-fired cooking stoves run by pelletized dry agriculture waste	Encourages use of biomass for cooking purposes (0.5 tCO ₂ e)	75 tCO ₂ e	900%	25
Chitral Engineering Works: Energy efficiency hydro-electric turbine	A more efficient way of generating more electricity; i.e., 100 KWH from hydro sources (40 tCO ₂ e)	100 tCO ₂ e	100%	50

Company and innovation	Environmental benefit of innovation	Projected by 2020		
		Annual GHG emissions savings	Revenue increase	Jobs created
South Africa				
Ducere Holdings (PTY) Ltd.: Miser Hydraulic Hybrid Transmission	By end of 2020, we will be reducing CO ₂ emissions by 2.25 m tons per year for the automotive sector. Our new patents address power utilities, larger transport types, and some other energy storage abilities. It is not possible to quantify this now but it will be significant.	1.2 million tCO ₂ e/yr	1,400%	375
Paseka Lesolang (entrepreneur)	We intend to save ~346 million liters of water per year (~138 Olympic-sized swimming pools)	—	200%	150
Ekasi Energy: Smokeless stove	We are substituting fuel made from wood waste instead of cutting down indigenous trees. Our objective is twofold. Eliminate smoke through bad combustion technology and use waste products to create compressed biomass fuel. The compression process does use electricity but improves combustion by removing water and making the fuel denser.	4,131 tCO ₂ e/yr	547%	50
Pegasus Engineered Green Mobility: Pegasus multifuel technology	By end of year 5, the projected reduction of 10,000 tCO ₂ e	3,424 tCO ₂ e/yr	401%	140
Rob Smorfitt (entrepreneur)	As with GHG emissions, we cannot calculate. However, our equipment halves the time taken to produce a kiloliter of water, thereby reducing electrical usage by half.	—	4,900%	22
Solar Turtle	Assuming each Turtle produces 3,570 kWh per year, that is 3498,6 tCO ₂ e saved (Eskom Grid power = 0.98 tCO ₂ e/kWh)	117,945 tCO ₂ e/yr	577%	9
Baoberry	For each m ² of vegetation of an aWetbox, carbon is sequestered at 300g C/m ² /year, which is significant	Sequestering carbon up to 300 g c/m ² /year	8%	20
Dave Pons (entrepreneur): Ceiling in a Can (do-it-yourself ceiling for low-cost housing)	Shack dwellers usually use electric heaters in winter and fans in summer. Ceiling in a Can installation eliminates the use of these. A fan uses 15 KWh and a heater 75 KWh; therefore, a total of 90 KWh per household, and there are over 7 million low-cost homes without ceilings in South Africa. About 70% have fans and/or heaters. A heater is on for the night in the winter for 8 hours and for 120 nights. A fan is on for 180 nights. If only half of the low-cost houses install an insulating Ceiling in a Can ceiling, then savings will be EM-2.62. 2.5 million homes save 0.9 tCO ₂ = 2.25 million tons CO ₂ . Carbon footprint calculator. 0.9 tCO ₂ per household saved each year.	90,000 tCO ₂ e/yr	78%	9

Company and innovation	Environmental benefit of innovation	Projected by 2020		
		Annual GHG emissions savings	Revenue increase	Jobs created
Eco-V: GreenTower microgrid	We aim to replace 1 million electric boilers in Africa over the next 10 years with GreenTower microgrids, with an annual GHG reduction of more than 3 million tons by saving the utility grid ±3,000 million kwh in energy and more than 1 GW in peak demand. Each electric boiler (geyser) replaced represents an annual utility grid energy saving of ±3,240 kWh .	21,000 tCO ₂ e/yr	392%	60
Carbotect: Color-based diagnostic aid	—	—	43%	—
Lightspere: Wireless water meter and associated billing metering software	Climate change patterns affect conventional weather patterns and result in drought and water scarcity in certain areas. Therefore, the management of water as a critical resource, its availability, current use, and distribution is critical. This is where our energy efficient low-cost metering technology is effective.	—	400%	65
Turkey				
Positive Energy: BEAD is an Internet of Things system that helps commercial building managers optimize their energy consumption and operations by adapting the day cycle and occupancy changes of building with the buildings automation system	Commercial buildings account for ⅓ of the total energy consumption by all buildings. Every year, \$10 billion worth of energy is wasted by not knowing HOW we consume energy during the day according to human behavior and daily routine of the building. Another important issue is that human behavior contributes up to 25% of energy waste in buildings. With our BEAD technology engaging the occupants with the building, technology will decrease carbon emission by 20% and energy waste by 25%. The impact to climate will be over 5 million tons of GHG emission savings representing financial savings of \$2.5 billion every year.	500 million tCO ₂ e/yr	7,400%	5 disabled people and 25 engineers by 2020; 50% female engineers as of 2018
ErikTronik Mühendislik: tarla.io is a next generation hardware and software platform for farmers that helps optimize their farm's yield and profit	We help farmers adapt to climate change and hence give them decision support tools to decrease input usage while increasing their yield. Therefore, we can say 10–50% reduction in agricultural inputs could be achieved.	—	1,900%	50
Kodeco Design and Engineering: 3-wheel vehicle that provides nonstop mobility by solar power	In 10 years from 20,000 vehicles: 104,369 tCO ₂ reduced	3,131 tCO ₂ e/yr	3,900%	15
Capstudio: GreenCoat	New coating material for roof and facades, made of pumice, minerals, and organic binder and seed, for sound and heat insulation with hydroponic plants	0	—	20

Company and innovation	Environmental benefit of innovation	Projected by 2020		
		Annual GHG emissions savings	Revenue increase	Jobs created
Ze Yak Organik San/Ayi Ve Ticaret A.Ş.: Charcoal produced from olive core/waste	With the current production capacity of 100 tons per month, a savings of 10.8 million kg CO ₂ could be made annually.	32,400 tCO ₂ e/yr	1,289%	10
Momentum Araştırma Geliştirme Teknoloji Mühendislik ve Peyzaj Sanayi ve Ticaret Ltd Şirketi: Karayel	Karayel is a small-scale wind turbine solution that can be configured according to a client's energy consumption. We are planning to sell thousands of products globally. As a result of these sales, more than 200 kton CO ₂ savings are expected.	92 tCO ₂ e/yr	1,650%	45
RF-SENS: Bacteria sensors for water	Water wastage and contamination will be reduced.	0	—	6
Temiz Yaratıcı Teknolojiler (TYT) HydroSolar: Floating solar photovoltaic systems	Floating solar photovoltaic system produces clean energy. It also prevents water evaporation, which is one of the main environmental problems in the world. Only 1 MW floating solar photovoltaic plant provides 1,6 TWh/year energy production and 61,000 m ³ /year water by blocking evaporation.	56,000 tCO ₂ e/yr	—	10
HyperCFD: Day-ahead power production forecasting service for wind farms	0	None	49,900%	15–20
Enwair Energy Technologies Corp.: Lithium ion battery, silicon anode, lithium-rich cathode	Lithium ion batteries are used for electric vehicles that are part of the solution portfolio for replacing fossil fuel usage in vehicles. Another issue is to use batteries in the renewable energy production systems, where discontinuous production of energy in renewable system is a problem.	Cannot be predicted before battery production plant plan is available	—	0
Beray Engineering Ltd.: Marnas	Marnas is a system where hydrological forecasts and energy optimization modules work together in order to maximize the income of hydropower plants.	0	300%	30
UNDA Mühendislik A.Ş.: Adaptive Living Facade	<ul style="list-style-type: none"> ~12,000 metric tCO₂ emission reduction per year per building 17,500 MWh electricity saving per year per building 	125,000 tCO ₂ e/yr	200%	16
GökSehan Teknoloji Ras: Omni-directional low-speed wind turbine	0	0	78%	700

Company and innovation	Environmental benefit of innovation	Projected by 2020		
		Annual GHG emissions savings	Revenue increase	Jobs created
Fatih Sultan Mehmet Vakif University (student team start-up): Energy Tracker device and Android/IOS mobile app	The project will decrease misuse of electricity. It is directly related with CO ₂ , because devices release a lot of CO ₂ . When we control our energy and its usage, emissions will be decreased by 30% and by 25.7% in CO ₂ emission. Additionally, it will remove the electricity readers (meter readers), and this will automatically save paper and devices.	27,000 tCO ₂ e/yr	—	15
Cukurova Green Team: Phosphorescence dye	Nano phosphor pigment (dye) with long-lasting luminescence that can be stimulated by daylight; 1 m ² phosphorescence dye = 1,000 m ³ clean air	x	—	We do not have foresight right now
Misal Design: Electric-powered water jet outboard motor	Official emission standards confirm that dramatically higher pollution is permitted for outboards motor. Even small 5 hp outboards may produce up to 22 times the NO and HC emissions compared to a car. For this reason, electrical outboards have a very important role.	1,300 tCO ₂ e/yr	0%	0
Misal Design: Multiple blade shaftless wind turbine	Main aim of our project is to have a wind turbine in urban concept, which has high efficiency and low noise	1,800 tCO ₂ e/yr	25%	0
Diploid Biotechnological Products: Heat insulation material	Our product is produced using waste and fungal cells. Therefore, the product is recyclable and sustainable. Most of the insulating materials found in the market are petrochemical-based or mineral-based products produced at a temperature of 1200°C. Our product can be produced in a dark environment with approximately 10 times less energy than other materials. Since fungal cells are used, carbon emission is minimal at the production stage. The use of waste and low-carbon emissions will facilitate the provision of carbon emission values for countries in climate conferences like Paris.	Do not know	—	20
Hidrotürbin Teknoloji Enerji Arvida: Micro hydroelectric power systems	—	—	4,900%	20

NOTE: — = not available.

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