



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION



# Global Cleantech Innovation Programme (GCIP)

CLEANTECH INNOVATION  
POLICY STRATEGY  
FRAMEWORK

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# Introduction

## Purpose of this document

The Global Cleantech Innovation Programme (GCIP) is designed to respond to the increasing global demand for environmental sustainability, climate action and to unleash the potential of cleantech innovation and entrepreneurship to help transform priority sectors and systems. Under GCIP's Theory of Change, the desired impact of the overall program is to enable innovative cleantech small- and medium-sized enterprises (SMEs) to significantly contribute to climate mitigation in order to attain low carbon development and job creation.

This framework is part of the GCIP Pillar 2 activity addressing Cleantech Innovation and Entrepreneurship Ecosystem (CIEE) strengthening and connectivity. Pillar 2 supports the strengthening of national cleantech innovation and entrepreneurship ecosystems of GCIP partner countries, the identification of synergies across national ecosystems, and the connection of different CIEEs for knowledge exchange and partnership building.

The purpose of this framework is to guide policymakers and project executing entities (PEEs) in the GCIP partner countries in defining and implementing policy strategies to promote cleantech innovation and entrepreneurship and increase the participation of women and youth in cleantech entrepreneurial activities and as leaders in the sector. The framework does this by analyzing learnings from policymakers in countries which have demonstrated tangible results, to identify policy strategies, programs and actions which have contributed to success and can be replicated by the GCIP partner countries.

**Section 1** profiles countries which demonstrate observable success in innovation, and especially cleantech innovation and entrepreneurship, and describes that success in terms of tangible results.

**Section 2** examines policy strategies which those countries have deployed to achieve these results.

**Section 3** profiles countries which demonstrate observable success in providing opportunities to women and youth through cleantech innovation and entrepreneurship and describes what that success looks like.

**Section 4** examines the characteristics of successful ecosystems which lead to those opportunities and suggests interventions to develop those characteristics.

# Methodology

## General approach

In this section we describe our approach, sources and other key inputs. A full list of sources is available in the appendix.

The general approach is based on:

- Identifying countries which have demonstrated success in cleantech
- Innovation and/or in providing opportunities to women and youth in cleantech innovation
- Understanding how that success was achieved, in order to produce a replicable framework which GCIP countries can implement

## Selection of countries leading on innovation policy

We considered two groups of countries: countries who are leading on innovation policy globally, and countries who share certain characteristics with GCIP countries who are demonstrating good results, according to success metrics identified in the rankings below.

We used the following global innovation rankings to identify countries which are demonstrating the best results in general and cleantech innovation:

- Information Technology and Innovation Foundation (ITIF): 2021 Global Energy Innovation Index
- World Intellectual Property Organization (WIPO): 2022 Global Innovation Index<sup>1</sup>
- Startup Genome & Cleantech Group: 2021 Global Cleantech Startup Ecosystem Rankings

Leading countries were defined as globally top-ranking (global top 10) in two or more of these indexes.

The second set of countries we have profiled display either economic, demographic or climate risks similarities with GCIP partner countries, measured by comparing the following factors:

- Income level
- Population and geographical characteristics
- Most important climate risks faced
- Sectors at risk from climate change

This produced a list of 12 countries which are leaders in innovation, either globally or leaders of cohorts with similar characteristics to one or more GCIP countries. The countries are profiled in section one.

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1 The Global Innovation Index measures innovation inputs (institutions, human capital and research, infrastructure, market sophistication and business sophistication) and innovation outputs (knowledge and technology outputs, creative outputs).

## Selection of countries leading on opportunities for women and youth

Countries were selected according to past success in positive outcomes for women and youth in cleantech innovation and entrepreneurship. Specifically, success in providing opportunities in cleantech innovation for women and youth was defined as countries producing women or youth-led start-ups ranking in one of the following indexes:

- 2022 Cleantech Group 50 to Watch list
- 2023 Cleantech Group GCT 100
- 2022 Mastercard Index of Women Entrepreneurs
- GEM 2021/22 Women's Entrepreneurship Report
- Startup Genome Top 10 Startup Ecosystems for Female Founders

# Executive Summary

**Countries that are successful globally in cleantech innovation share common strategies which have contributed to that success.** Likewise, countries that have achieved a high level of participation of women and youth in cleantech entrepreneurship also demonstrate common strategies. GCIP partner countries can apply these policy strategies to enhance their internal capacity for cleantech innovation and to increase the participation of women and youth in domestic cleantech start-ups and SMEs.

**Successful countries design and deploy targeted interventions to achieve innovation priorities and wider targets.** They also design and implement support mechanisms which work to incentivize private investment in innovation. The most effective set of policies differs according to the stage of innovation countries wish to prioritize. Early-stage innovation covers the lab to prototype stage, or the earliest stages of company formation. Mid-stage innovation includes the demonstration and first commercialization stages, while later-stage innovation includes scaling and internationalization.



**Figure 1: The most effective set of policies differs according to stage of innovation <sup>2</sup>**

**Policy strategies to increase the supply of early-stage innovation** include establishing a national body dedicated to innovation, setting long-term policy signals, aligning R&D funding with national climate and innovation priorities, implementing measures to maximize the impact of R&D funding, encouraging intra-governmental coordination on innovation, educating future innovators, and measures to retain talent and attract an international workforce.

**Policy strategies to support demonstration and commercialization** include encouraging active participation of the private sector, using targeted financing mechanisms to de-risk first commercial projects, developing enabling infrastructure, green public procurement and responsive regulation.

**Policy strategies to accelerate the growth of scaling companies** include sharing best practices with other nations, partnering with global innovation leaders, proactively developing international trade opportunities, and creating a level playing field to allow emerging cleantech solutions to compete with incumbent technologies.

**Increasing the participation of women and youth in cleantech entrepreneurship can lead to**

<sup>2</sup> Key components of cleantech innovation policy include distinct support mechanisms in early stages of innovation, demonstration and commercialization, scaling and internationalization with an underlying premise of inclusive policy for women and youth in cleantech. Source: Cleantech Group

**increased economic growth.** Encouraging women and youth to start cleantech businesses and supporting them with a fair percentage of investment generates wealth and enables populations to close earnings gaps. Spurring entrepreneurship from these groups increases job creation and leads to innovation which anticipates market needs from diverse perspectives.

**Coordinated action of key ministries drives cleantech entrepreneurship opportunities for women and youth.** Ministries with business, innovation, gender, and youth focus in high-performing countries coordinate on programs, funding, data tracking, and monitoring and evaluation to streamline the policy building process and improve outcomes. Outcomes include the establishment of policies and budget, allocated funding for programs, and increased participation of priority groups in the sector.

**Countries prioritizing access to STEM education, green jobs and entrepreneurship while addressing biases in hiring practices have higher involvement of women and youth in the cleantech sector.** Education curricula on climate change, sustainability, and cleantech innovation will engage youth and expose available career pathways.

**As leaders, women and youth are more likely to promote further access to funding and opportunities for marginalized groups.** Programs for women and youth which provide training, mentoring, networking and recognition offer pathways to leadership positions in government, financial institutions and corporations. Such programs recognize the diversity of perspectives including socio-economic backgrounds, ethnicity, locality, abilities, gender and life experiences.

**Establishing policy and programs to incentivize funding for women, youth, and marginalized groups in cleantech spurs access to capital through nonprofits and private industry.** Designated funding sources for priority groups address historically unequal distribution of capital, while increased access to capital for these groups directly expands inclusion, representation and successful outcomes for entrepreneurs.

**Publicly recognizing the achievements in innovation of women and youth improves prospects for these groups.** When success is amplified through media and events, these founders gain interest from future investors, customers, and partners.



# I. Global Innovation Success Stories

The countries profiled in this section are identified either as global innovation leaders or as cleantech innovation leaders, according to leading global innovation indexes. Each of the countries has ranked highly, either globally or regionally, in the WIPO's Global Innovation Index (GII), a leading publication which uses more than 80 indicators to rank countries based on recent global innovation trends. Several of these countries are home to some of the world's leading global cleantech clusters, according to Startup Genome's 2021 report. We have also included learnings from 5 of the top 10 countries on ITIF's 2021 Global Energy Innovation Index, which measures national contributions to global energy innovation system.

The second group includes countries which share similarities to one or more GCIP partner countries including income level and economy, climate hazard risk, sectors at risk from climate change and other geographical and demographic factors.

## Global Innovation and Cleantech Innovation Leaders

### Canada

Canada is among the top 15 global innovators, returning to the top 15 for the first time since 2016. Canada performs above the high-income group average in all GII pillars, with particular strengths in market sophistication, human capital and institutions. Canada has a well-developed investment ecosystem, placing 1st in Venture capital recipients and performing strong in indicators like availability of credit and access to international markets. Canada is home to some of the best universities globally, and ranked 9th for University-industry R&D collaboration. Canada also ranked high in metrics measuring political and regulatory environment. Canada is home to four of the world's top 100 science and technology clusters.

### Denmark

Denmark ranks as the tenth most innovative country in the world according to WIPO, thanks to its robust and well-developed innovation ecosystem which outperforms the high-income country average in all seven pillars used to compose the ranking. Denmark's key strength is its infrastructure and its institutions: Denmark's political and operational stability, government effectiveness, regulatory quality and Rule of Law are all ranked within the top six in the world. Denmark is also an R&D leader, being one of ten countries to reach 3% of GDP in R&D spending annually.

### Finland

Finland ranked 9th in the WIPO 2022 Global Innovation Index, performing above the high-income group average in all GII pillars. Like its Nordic neighbors, Finland's greatest innovation strengths are in its institutions, infrastructure and human capital. Finland ranked 1st globally in Rule of Law, and 3rd in government effectiveness and regulatory quality, illustrating the country's institutional soundness. Finland also ranked 1st in the world for financing start-ups and scale-ups due to the availability of credit and the protection provided to both borrowers and lenders.

## Israel

Israel is well-known for its outstanding innovation and vibrant start-up ecosystem. Israel is a leader in both market sophistication and R&D. Israel ranks first globally in venture capital deals, while also grabbing the top spot in R&D expenditure as a % of GDP; Israel is the only country in the world that spends more than 5 % of GDP on R&D, reaching 5.4 % in 2020. The country's university-industry research collaboration is also among the highest in the world. Finally, Israel is a world leader in women employed with advanced degrees and PCT patents.

## Japan

Japan ranks 4th in Asia & Oceania and 13th globally in the 2022 Global Innovation Index, scoring high in metrics like R&D, patent creation, domestic market scale, political stability, and regulatory environment. Japan ranks first in production and export complexity, demonstrating their high value-added economic outputs. Japan's Tokyo -Yokohama cluster is globally recognized as one of the most important in the world, ranking as the top science and technology cluster in the Global Innovation Index, and placing 9th in Startup Genome's 2021 Ecosystem report.

## Switzerland

Switzerland has ranked first in the Global Innovation Index for the last twelve years. The country scores highly on government effectiveness and favorable policies for doing business) and has strong research and development and a high level of university-industry R&D collaboration. Switzerland ranks second globally in high-tech manufacturing. Switzerland also is a leader in knowledge creation, ranking first in patent creation on a per capita level.

## United States

The United States of America (US) ranked second in WIPO's Global Innovation Index for 2022. The US leads in terms number innovation indicators for which it ranks top globally, placing first in 15 of the 81 indicators used to build the index. The US ranks first in R&D, quality of universities, university-industry R&D collaboration, venture capital investors, and quality and impact of its scientific publications. According to Startup Genome's 2021 Ecosystem report, 7 of the top 14 global start up ecosystems are in the US, with Silicon Valley and New York City ranked as number 1 and 2 respectively.

## Successful Countries similar to GCIP Partner Countries

### Bulgaria

Bulgaria placed 2nd in innovation amongst upper-middle income countries in 2022 and has been categorized as an "innovation achiever" since 2020 for performing above expectations on innovation for its income level. Despite parliamentary conditions which have obstructed the legislative process, Bulgaria performs very in innovation outputs, including utility models/patent applications and creative outputs<sup>3</sup>, and ranks 19th in the impact of innovation activities at the micro- and macro-economic level.

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<sup>3</sup> Creative Outputs is one aspect of WIPO's ranking mechanism and includes intangible assets, creative goods and services and online creativity.

## Chile

Chile is the most innovative country in Latin America and the Caribbean, having placed 1st in the region in the WIPO rankings for the past seven years (since 2016). It is the only Latin American country in the top 50, ahead of the other regional powerhouses like Brazil and Mexico. Chile has strong institutions - including Rule of Law, regulatory quality and government effectiveness – while also having a developed education system, ranking among the top 25 for both school life expectancy and tertiary education enrollment. Chile's capital, Santiago de Chile, is featured as an important global science and technology cluster.

## China

China's leading status as a global innovator is largely due to heavy investment in R&D as well as strong science and technology clusters. China is the 2nd highest spender in overall R&D globally, with total R&D spending increasing 9.6% in 2021 alone. China ranked amongst the top 5 countries in the world for patents and high-technology exports, a testament to their strong R&D culture. Furthermore, China has 21 science and technology clusters in 2022, tied with the United States for 1st place, including the crucial Beijing cluster.

## India

India reached 40th place in the 2022 Global Innovation Index, up from 76th place in 2014. India also ranks first amongst lower-middle income countries and first in Central and South-East Asia. India continues to be the world leader in ICT service exports and has a fast-growing start-up environment; India is now home to the third biggest start-up economy in the world, and ranked 8th for financing start-ups and scale ups, with an active venture capital ecosystem. India's strong science and engineering programs also provide quality human capital.

## Viet Nam

Viet Nam has climbed nearly 30 spots on the Global Innovation Index over the last ten years, and is currently ranked second amongst lower-middle income countries. Viet Nam has a comprehensive innovation framework and scores above average even when compared to upper-middle income countries in every innovation pillar except for human capital and research. Viet Nam ranks 1st worldwide in high-tech imports and 3rd in high-tech exports, as its technological assembly and strong trade framework allows it to actively participate in global supply chains.

## II. Successful Innovation Policies enacted in countries leading on Cleantech Innovation

### Introduction

Innovation is essential to economic growth, job creation, and global competitiveness. Furthermore, cleantech innovation has the power to deliver economic growth without increased GHG emissions and to create decentralized jobs in different regions, as well as to improve living and working conditions for populations without access to electricity and water networks. Cleantech start-ups and SMEs can also provide alternative employment to those dependent on exploitation of the earth's resources for livelihood.

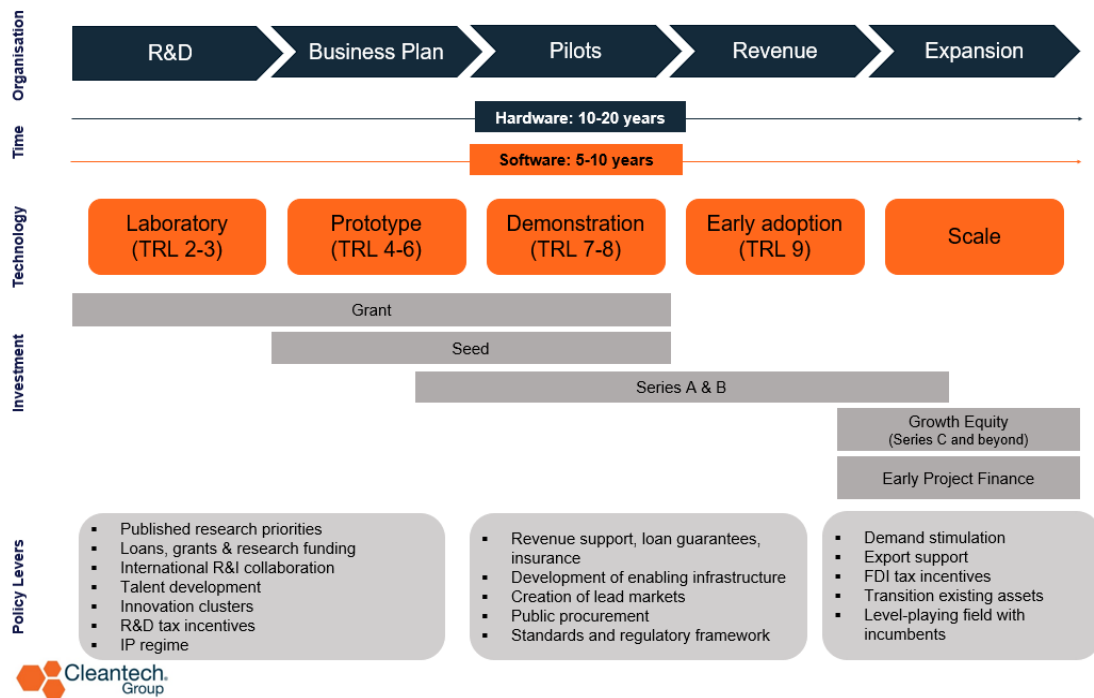
Governments have a critical role to play in creating an environment that fosters innovation by implementing policies that support and incentivize innovative activity. This includes direct support, as well as approaches which encourage all participants to contribute to the innovation ecosystem. International collaboration can enhance national success both by exploiting synergies to maximize leverage of committed resources, and by increasing the demand connection opportunities for domestic innovation.

The most successful countries we interviewed all deploy the following mechanisms to increase results:

- They design and deploy targeted interventions to achieve innovation priorities and wider targets
- They design support mechanisms which work to incentivize private investment in innovation

Innovation priorities may differ at different stages of ecosystem maturity. Nascent ecosystems may prioritize R&D and early-stage support to increase the 'innovation supply', in other words, the creation of start-ups and SMEs. A mid-stage ecosystem may target measures towards encouraging demonstration or commercialization of new technologies, while the most developed ecosystems, who already have a vibrant supply of scaling ventures, may look to boost national and international demand for those companies and their innovative solutions. In the cleantech space, effective policy also includes measures to address common barriers to scale shared by many cleantech innovators, such as the first commercialization 'valley of death', and the need to compete with lower-priced, polluting incumbent technologies. Figure 2 shows the high-level policy levers which may be deployed to accelerate cleantech innovation according to different priorities.

Figure 2: Policy Levers by Lifecycle Stage<sup>4</sup>



This chapter explores in more detail the tools governments can use to strengthen their innovation ecosystems, according to the stage of startup and SME development they wish to prioritize. The first section examines the ways in which leading governments use policy interventions to support early-stage startup growth. The next section details policies which target growth at the demonstration and commercialization stage. The final section analyzes policies which may be implemented to support companies which have reached the growth stage and need to scale. Each stage considers both policies offering direct support, as well as those incentivizing private sector involvement.

4 Source: Cleantech Group research

## Policy Strategies to increase supply of early stage innovation

As described in the previous section, governments play an essential role in spurring innovation activity by laying down the structures, policies, and initial support needed to prompt research, innovation, and commercialization, especially in underserved technologies.

### Establish a national body dedicated to furthering innovation

Countries which demonstrate innovation results often have a dedicated government ministry or agency focused on developing innovation throughout the country. Prominent examples of countries with dedicated innovation agencies include Finland, Israel and Mauritius.

The Israel Innovation Agency is the governmental agency responsible for promoting innovation through investment, R&D and other local and ecosystem support. They support companies at all stages, including start-ups, growth-stage companies, R&D and technology innovation funding, and connect all types of companies to global innovation initiatives. The Israel Innovation Authority operates as an independent office, with directors and board members different from those serving its parenting government ministries such as the Ministry of Science and Technology. This autonomy allowed public efforts aimed at strengthening innovation to continue through five successive changes of government between 2019 and 2022.

Business Finland is a public organization that supports innovation through funding, increasing access to export markets, supporting international growth, and ecosystem strengthening. Business Finland assists companies across all stages, including funding R&D, broad funding and ecosystems support for SMEs and helping large companies improve international growth and access global R&D cooperation schemes. Business Finland operates a five-year strategy (2020-2025) which gives long-term policy signals to the market. Business Finland provided €701 million in innovation and research funding in 2021 alone to 3,912 companies.<sup>5</sup>

Mauritius, ranked the most innovative country in Sub-Saharan Africa<sup>6</sup>, directs its innovation activities through the Mauritius Research Innovation Council (MRIC). The MRIC's objective is to promote research for sustainable development to enhance the quality of life across the country. MRIC is government-funded and has different schemes to support innovation and research in academia and industry. Some examples include a National Innovation Scheme to support prototypes and the launch and growth of start-ups, a Proof of Concept scheme to validate the business case for novel research ideas and the Collaborate Research and Innovation Grant Scheme, which connects local businesses with academia and research centers to perform collaborative research. The country's innovation agenda is guided by its National Roadmap for Research and Innovation, which will operate between 2023-2027. Between 2014-2019, the total number of projects carried out by the MRIC increased from 489 to 773, while project value increased more than threefold.<sup>7</sup>

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5 Business Finland (2021). Results and Impacts. [https://www.businessfinland.fi/493904/globalassets/finnish-customers/news/events/2022/results-and-impacts\\_2021\\_en.pdf](https://www.businessfinland.fi/493904/globalassets/finnish-customers/news/events/2022/results-and-impacts_2021_en.pdf)

6 Global Innovation Index (2022). World Intellectual Property Organization. [https://www.wipo.int/global\\_innovation\\_index/en/2022/](https://www.wipo.int/global_innovation_index/en/2022/)

7 Mauritius Research and Innovation Council (2019). Mauritius Research Council 2018 – 2019 Annual Report. [https://www.mric.mu/files/ugd/d4e70d\\_967f0b1c99b1465db05092218927ee36.pdf](https://www.mric.mu/files/ugd/d4e70d_967f0b1c99b1465db05092218927ee36.pdf)

## Set long-term policy signals which are consistent over time

Governments with consistent, actionable policies towards innovation have better success at driving public measures to support innovation as well as private sector activity.

Business Finland and China's National Research and Development Council both produce five-year plans to send stable, long term policy signals to the private sector and wider innovation ecosystem. Finland's plan defines strategic priorities in terms of economic growth, sustainability and competitiveness. The UK, on the other hand, operates a three-year spending review budget planning cycle. Policymakers commented that this shorter planning cycle leads to uncertainty over the long term, and increases the risk premium on private sector engagement, which reduces the leverage of public-private investment. In other words, every unit of public spending results in a correspondingly lower amount of private investment.

It is important to maintain long-term priorities through changes of government. Granting some level of autonomy to the national innovation agency can help with this: Israel's Innovation Authority has the mandate to build long-term plans to promote start-ups, industry, and engage with stakeholders to foster innovation, which has allowed it to maintain results through successive changes of governments. The separation of the Israel Innovation Authority from the other branches of government was made intentionally to prevent the Authority's work from focusing on the specific needs or wants of the government and ministries in power and to maintain the long-term vision of Israel's innovation policy.

On the other hand, Bulgaria has faced challenges in progressing key legislation which would promote cleantech innovation, including the Innovation Strategy Implementation Plan, the Hydrogen Strategy and the Research and Innovation Law. Although Bulgaria has a Ministry dedicated to Innovation and Growth, stakeholders said that this was not enough to ensure the prioritization of climate strategy above other political considerations.

## Publish clear, national R&D priorities and align R&D funding with these priorities

There is a positive correlation between gross domestic spending on R&D and a country's innovation performance. Some of the most innovative countries in the world, including Denmark, Israel, Finland, and the U.S., have historically spent above the OECD average on research. Israel has the highest gross domestic spending on R&D as a percentage of GDP globally, with 5.4%.<sup>8</sup>

Some of these countries have set R&D targets for research spending or research spending. Finland, for example, has a goal of 4% of GDP spending on R&D; while the country is currently 1% behind its target, it is still spending a higher proportion of GDP than other developed economies. China has increased overall R&D spending nearly threefold from 0.9% of GDP in 2000 to 2.4% of GDP in 2020.<sup>9</sup> Contributors to this report cited Chinese national government commitment to R&D as a key driver of China's innovation success in recent years.

The Israel Innovation Agency invests more than \$500 million a year in its innovation activities, with Climate Tech as one of its priority areas. Research from the Hebrew University of Jerusalem on the impact of government support on innovative R&D on business concluded that this

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8 OECD Data (2022). Gross domestic spending on R&D. <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>

9 Ibid.

government support resulted in the creation of 5-10 times more value to the industry than the initial government investment.<sup>10</sup>

Impact of R&D spending is maximized by aligning with national climate targets and innovation priorities. The UK has committed to achieving Net Zero by 2050, and has signaled that innovation is an important enabler to reach this target. The government has identified R&I needs to reach the 2050 target, which are then used to determine short term priorities for the next 5-10 years. The UK expects much of the necessary investment to be delivered by the private sector.

## **Maximize the impact of R&D investment through international collaboration**

One way Mauritius overcomes the challenges of being a small island nation is by working with international stakeholders to promote research and development. The Research and Innovation Bridge program, sponsored by the MRIC, provides grant funding to support local companies to work with international companies or research institutions to collaborate on R&D projects with commercial potential. Mauritius also offers a scheme through the Higher Education Commission, which funds international professors to spend time in Mauritius and provide expertise on priority areas.

## **Focus early-stage support on developing novel industries and high-growth ventures**

Policymakers interviewed for this report commented that direct government support is most effective when geared towards supporting nascent technologies, industries, and innovators, as opposed to supporting large corporations or existing technologies. Many contributors agreed that grants and subsidies should no longer be used once a technology is commercially available and able to compete in the market, as it is not an optimal use of public resources. Similarly, several country representatives highlighted how resources should be targeted towards SMEs given that large corporations generally have the balance sheet to finance innovation, especially compared to innovators. Ensuring public support is directed to innovators ensures that assistance is targeted towards the innovation which is least likely to happen anyway, encouraging efficient use of government funds.

Countries like Denmark, Finland, Israel, and Chile have used a mix of policy tools, including subsidies, grants, loans, and R&D incentives to support early-stage start-ups and SMEs and in some cases kick-start new industries.

Denmark has successfully deployed subsidies to develop its offshore wind industry. After identifying offshore wind as a future strategic technology in the 1990s, the Danish government provided grants to offshore wind developers for deployment. This kickstarted the industry by creating a business case and driving down costs for developers. Today almost 50% of the country's energy comes from wind power,<sup>11</sup> and developers are competing for rights to build offshore wind platforms. The Danish government considers that their support for nascent technology through policy and grants has had an outsized impact on the country's innovation and economy.

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10 Israel Innovation Authority. Innovation Authority – Strategy and Policy. <https://innovationisrael.org.il/en/contentpage/strategy-and-policy>

11 IEA (2021). Wind Energy in Denmark. <https://iea-wind.org/about-iea-wind-tcp/members/denmark/#:~:text=In%202021%2C%20the%20net%20installed,wind%20accounts%20for%202%2C300%20MW.>



Using offshore wind as a model for success, the government is now using similar grant-based schemes to support nascent technologies such as green hydrogen. Business Finland operates programs targeting innovation at different stages, ranging from R&D to corporate engagement. However, between 2010 and 2021, 65% of its innovation funding went to start-ups and SMEs (with the remaining 35% going to large companies).<sup>12</sup>

**Business Finland** uses the following tools to support SMEs:

- Innovation Vouchers - intended for SMEs to buy expert services that bring new knowledge and expertise required for innovation in their company
- Research, Development, and Pilot funding – both in the form of grants and low-interest loans (1%) that cover up to 50% of project cost
- Talent funding – grant that covers up to 50% of project cost to improve capacity for international growth by creating working, organizational, and management practices that support internationalization
- EU and International Funds – participation in Horizon 2020 programs and International Financial Institutions programs

Business Finland also supports SMEs collaborate with universities and larger corporations by incentivizing large companies to commit to increases in R&D spending and work with smaller companies to support their R&D and innovation needs. Business Finland has had a tremendous impact on the innovation ecosystem and growth of SMEs: Between 2017 and 2020, exports by supported SMEs increased 25%, revenues increased 22% and number of jobs increased by 15,000.<sup>13</sup>

The Israel Innovation Authority has focused its policy on supporting innovators. The Israel Innovation Authority's objective is to increase the number of start-up companies and get them to the point where they can obtain investment from the private market. Therefore, the agency invests mainly in pre-seed, seed, and Series A rounds. The Authority also offers convertible loans to support SMEs; if the innovator is successful, they pay back their loan up to the amount received, but if they are not, there is no penalization for the innovator. There is a match-funding requirement, which mandates that SMEs receiving government funds must also receive "matched" support from other investors and/or companies. Nearly 40% of all cleantech start-ups in the country receive support from the Israeli Innovation Authority (250 of the 650 cleantech start-ups in Israel), including innovators in clean energy, transportation, alternative protein, and green construction. The Israel Innovation Authority also runs seven specialist cleantech incubators with themes including agritech, foodtech, net zero and smart industry.

Chile's Corporación de Fomento de la Producción (CORFO), the government agency in charge of supporting innovators, innovation, and competitiveness, is implementing specific programs and expanding existing programs to better support early-stage innovators. CORFO's dominant early-stage program, Start-up Chile, is a public accelerator which provides equity-free funding and a 4-8 month program to help develop businesses across all stages. Start-up Chile has supported over

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12 Business Finland (2021). Results and Impacts. [https://www.businessfinland.fi/493904/globalassets/finnish-customers/news/events/2022/results-and-impacts\\_2021\\_en.pdf](https://www.businessfinland.fi/493904/globalassets/finnish-customers/news/events/2022/results-and-impacts_2021_en.pdf)

13 Business Finland (2021). Results and Impacts. [https://www.businessfinland.fi/493904/globalassets/finnish-customers/news/events/2022/results-and-impacts\\_2021\\_en.pdf](https://www.businessfinland.fi/493904/globalassets/finnish-customers/news/events/2022/results-and-impacts_2021_en.pdf)

2,000 innovators since its inception, who have collectively generated more than \$1 billion in sales.<sup>14</sup>

## **Incentivize private sector investment through R&D tax credits**

To further strengthen innovators, the Chilean government is examining ways to ensure that the country's R&D tax law, which provides up to 30% cashback on R&D investments, is utilized by more innovators, not predominantly large corporations.

## **Implement mechanisms to ensure cross-departmental collaboration on innovation issues**

Improving innovation is a complex goal that requires coordination of elements including research, science, business and commercialization, financing, trade, and international collaboration. As a result, governments leading on innovation often implement mechanisms to facilitate communication between the various ministries, agencies, and other actors that participate in the innovation process.

The United Kingdom's Net Zero Innovation Board (NZIB) provides oversight of public net-zero programs, identifies opportunities for enhanced collaboration on energy innovation, and ensures spending is aligned with government priorities. The board has representatives and observers from all major government departments active in Net Zero programs, including Ministries of Business, Energy, Environment, Housing, Research & Innovation, Transport, and Treasury.

Chile similarly imposes mechanisms to facilitate coordination between ministries working on innovation and commercialization. Chile's CORFO works on commercializing innovation, while Agencia Nacional de Investigacion y Desarrollo (ANID) focuses on early-stage R&D and technological innovation. As a result, CORFO frequently coordinates with ANID, as ANID is more in touch with the latest research developments from universities and other research partners that could have a commercial impact. CORFO will also work with ANID to find solutions for the technological demands identified by industry.

Even countries with innovation barriers can also successfully use coordination mechanisms among government actors. Bulgaria's Hydrogen Strategy (still in draft status), has been developed through cross-ministry collaboration. The Ministry of Economy and Ministry of Innovation and Growth, who will both have important roles in executing its delivery, have been especially strong collaborators. Similarly, the Research and Innovation law (also in draft) is a joint effort between the Ministry of Education and Science and the Ministry of Innovation and Growth, given their overlapping mandates and responsibilities regarding research and innovation.

## **Develop the right programs to educate the next generation of innovators**

Improving access to and quality of education has high potential to promote entrepreneurship and innovation.<sup>15</sup> Consequently, innovation policy should ensure that sufficient education and upskilling to meet future skills needs are integrated into the innovation ecosystem through public and private education, training and development within corporations, and other relevant organizations.

Chile improved the country's human capital by partnering directly with research institutions set

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14 CORFO. Start-Up Chile – Our Impact. <https://startupchile.org/en/our-impact/>

15 National Bureau of Economic Research (2021). Education and Innovation. [https://www.nber.org/system/files/working\\_papers/w28544/w28544.pdf](https://www.nber.org/system/files/working_papers/w28544/w28544.pdf)

up by industry. While most research and innovation in Chile happens via tech-transfer offices at universities, Chile was interested in the success of models of other developed nations which provided innovation from non-university research institutes. Chile launched the International Excellence Centre Attraction Program 10 years ago, which brought ten research centers to Chile from France, Germany, Australia (through the Sustainable Mining Institute), and other nations to improve the country's human capital. Chile now has the human capital necessary to manage technical development projects that match technology demand from industry with the technology supply from research centers and universities.

A common concern amongst policymakers interviewed for this study was the need to catalyze innovation, especially scientific innovation, for future workers. Some innovation ecosystem actors in Finland want to further examine the role the ecosystem can play in accelerating education for the next generation. While home to one of the best educational systems in the world, Finland also has fewer adults with tertiary education than their OECD peers (40% of Finnish adults vs 47% OECD average).<sup>16</sup>

## **Implement measures to retain talent and attract an international workforce**

Talent development is a crucial part of the successful socio-economic development of a country. Attracting international talent can drive innovation and growth in key sectors and lead to increased competitiveness in the global marketplace, higher levels of economic growth, and the creation of new job opportunities.

“Brain drain” is a major problem for Mauritius, which has a limited technical workforce. The departure of the better-educated population risks damage to the country's innovation ecosystem as future talent leaves to pursue opportunities abroad. Mauritius has tried to limit the impact of this “brain drain” by facilitating work visas and other permits to remove the red tape involved in the migration process as well as to attract talent to the island.

The China 1000 People Program is an example of a government-led initiative aimed at attracting and retaining highly skilled professionals. The program provides incentives such as funding for research projects, salary and housing subsidies, and access to research facilities and equipment to attract Chinese professionals living abroad to return to work in China. This program has been successful in attracting a significant number of talented individuals back to China, which has contributed to the growth of key sectors such as science, technology, engineering, and mathematics (STEM), as well as finance, management, and education. Additionally, the program has helped to develop China's human capital and increase its competitiveness in the global marketplace.

## **Support regional development across the country to promote balanced economic growth, reduce regional disparities, and reach untapped potential**

Governments across the world push towards spurring development across the country and providing funding through a range of initiatives aimed at supporting regional development and promoting sustainable economic growth.

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<sup>16</sup> OECD Data (2022). Population with tertiary education. <https://data.oecd.org/eduatt/population-with-tertiary-education.htm>

For example, the UK government provides funding for feasibility studies through various programs and initiatives aimed at promoting economic growth and development in different regions across the country. One such initiative is the Regional Growth Fund (RGF), which was established in 2010 to support economic growth and create jobs throughout England. The RGF provides funding to businesses, local authorities, and other organizations to support projects that will create long-term economic growth in their region. This funding can be used for a range of activities, including feasibility studies.

Another UK initiative that provides funding for feasibility studies is the Industrial Strategy Challenge Fund (ISCF), which was launched in 2017. The ISCF aims to support research and innovation in areas of strategic importance to the UK, such as clean energy, artificial intelligence, and mobility. The fund provides funding for feasibility studies, as well as R&D projects.

## **Work with all key actors across the innovation ecosystem – nobody can do this alone**

Developing and deploying innovation requires buy-in from all stakeholders: government, universities, business enterprises, communities, and citizens. Innovation policy should target multi-stakeholder management approaches that allow all participants to voice thoughts, concerns, and ideas to strengthen and coordinate innovation ecosystems.

Finland has high degrees of cooperation among all actors in their innovation ecosystems, as it is well understood that getting affected stakeholders together is vital to solving problems. Finland benefits from being a small country – geographically and demographically – which makes cooperation amongst diverse players easier. One example of stakeholder management in Finland comes from hydrogen development. There is active coordination not only between government, business, and research bodies, but also with the communities located in proposed project sites, as they must be actively involved in related zoning issues.

Bulgaria's work on hydrogen has also encapsulated a multi-stakeholder approach. Although the Hydrogen Strategy is a government initiative, the Ministry of Innovation and Growth is involved in thematic groups involving stakeholders from areas ranging from academia to business to best develop the country's hydrogen roadmap. Lessons from Bulgaria illustrate how a multi-stakeholder approach leads to better information sharing, improving the decision-making process and lending outcomes more legitimacy, as a range of actors has decided on them instead of one in isolation.

Hydrogen Denmark, an organization that brings together all ecosystem actors working in green hydrogen and fuel cells, has members from industry, research institutions, public institutions, and network organizations that ensure it engages in dialogue with all relevant actors across the value chain.

A final example of a multi-stakeholder approach is the Israeli government's work to invest and participate in consortia. Each consortium represents dozens of companies and researchers across several innovative industries, ranging from plastics to meat production. The ultimate aim of these groups is to bring together large companies, smaller innovators, and researchers from universities and institutions to work together to address the challenges of specific industries and technologies. They have been an effective way to bring together stakeholders, promote widespread cooperation, hear different voices, and ultimately resolve industry challenges.

## Policy Strategies to support demonstration and commercialization

### Encourage the private sector to own the innovation agenda

Successful countries all demonstrate strong private sector engagement with the innovation agenda and ecosystem. Policy must be designed to promote active participation of the private sector in innovation activities: while government is instrumental in the earliest stages of the innovation lifecycle, it is generally the private sector that scales innovation for material climate and economic impact.

Innovation leaders like the USA, Finland, Israel, and the UK all leverage the private sector to create the majority of the impact derived from innovation. For example, Business Finland recognizes that most innovation results come from the private sector and therefore sees its role as an enabler to encourage and support the innovation process. Similarly, the private sector will predominately deliver the United Kingdom's multi-billion dollar Net Zero framework. Finally, Israel Innovation Agency focuses on supporting early-stage businesses with the idea that once self-sufficient, their participation in the market will be the biggest driver of innovation and impact on the country.

A strong example of the power of the private sector leading innovation is in Bulgaria. Although key policies have not yet been implemented, the private sector has succeeded in driving innovation forward in several highly innovative areas, including IT, hydrogen, high-efficiency electrolyzers, and advanced water treatment. The country is home to many small start-ups in cleantech and other sectors, as well as large industrial areas like the Trakia Economic Zone, a cluster of 200 companies (including world-renown firms like ABP and Schneider Electric) that have proactively set a target for carbon neutrality by 2040. Industrialism in Bulgaria has been almost exclusively an entrepreneurial venture and has become a significant driver in attracting investments from companies worldwide. While Bulgaria could likely achieve even more innovation with stronger political backing, it is impressive to see how the private sector can work to foster local innovation without significant political support.

One crucial barrier that can prevent the private sector from engaging in innovation is the complexities of the local policy framework and regulation. In Denmark, for example, one of the challenges the government identified in supporting cleantech innovation was that companies, especially SMEs with limited resources, could not successfully navigate all the rules, procedures, permit processes, and other bureaucratic elements part of setting up an innovative company. A survey carried out by Cleantech for Europe found that start-ups in the EU consider that the opportunity cost of applying for EU funding is too high, and that timeframes for receiving the funds are too long to help start-ups who need to grow quickly.<sup>17</sup> Accelerating and simplifying these processes, for example by streamlining application processes for public support, can facilitate innovators' and SMEs' involvement in innovation. To help facilitate funding applications by young companies, the US DoE allows start-ups and investors to approach its officers directly with queries about the application process to help them understand how to increase the quality of their applications.

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17 Cleantech for Europe. (2023, March 7). Horizon Europe, A Powerful Asset in the Global Cleantech Race. Retrieved from Cleantech for Europe: <https://www.cleantechforeurope.com/policy/horizon-europe-a-powerful-asset-in-the-global-cleantech-race>

## **Case Study: Market Creation through Joined Up Policy and Regulation**

**in the UK Electricity Sector** Innovative electricity sector companies we spoke to both within the UK and abroad pointed to the UK's electricity sector as a leader in adopting reforms which accelerate the transition to clean energy production and enable innovative start-ups and SMEs to play a role in this transition.

In the UK, start-ups provide services such as alternative electricity supply to consumers, aggregation and trading of small-scale flexibility, and grid optimization services. This case study describes how the coordinated policy and regulatory environment both permits this, and creates a market for these innovative services.

The UK government has had a clear high level commitment to climate targets for the last ten years, and the Net Zero by 2050 target has been law since 2019. This wider context has driven wide general interest in climate innovation. Specifically on energy policy, Ofgem (the regulator) and the Department for Energy Security and Net Zero (formerly BEIS) have collaborated continuously over several years on policy and strategies which give a clear signal that energy transition and incorporation of flexibility assets are a priority.

The Smart Systems and Flexibility Plan (first published in 2017) sets out priorities for transforming the UK's energy system, including supporting flexibility from customers, removing barriers to flexibility on the grid, and reforming electricity markets. Ofgem's price control framework (RIIO) has also requested proposals for the provision of flexibility services, sending a clear market signal which has driven commercial contracts between network operators and innovative start-ups working in this space.

The combination of consistent policy signals and clear regulatory and market direction, over a number of years, has resulted in a growing market and a supportive environment for electricity system innovators.

## **Deploy targeted financing mechanisms to de-risk first commercialization**

Many cleantech ventures fail at the point when they are ready to take their product or solution to market. This is sometimes called the 'Valley of Death'. By this point, the company has a working prototype or demonstration, and is ready to serve its first customers. But many companies, even those with promising order books, fail to attract either the equity financing they need to scale their company, or the debt financing they need to ramp up production facilities or generation installations. Targeted public support including revenue support and loan guarantees can help to give private sector investors and other finance providers the confidence to fund newly commercializing ventures.

The UK has used Contracts for Difference (CfDs), a form of revenue support, as a way to secure private investment to grow a domestic offshore wind industry. CfDs offer a government-backed guarantee to 'top-up' the offtake price for a wind farm, which limits a portion of the commercial risk for potential financiers of that project. Since the scheme began in 2015, it has supported more than 5.2GW of new offshore wind generation capacity. The UK is now planning to use CfDs to support the growth of other emerging technologies, including green hydrogen production. Canada's Export Credit Agency, Export Development Canada, is primarily focused on helping

scaling companies to enter international markets. However, when EDC started to work with the cleantech sector, they realized that earlier-stage Canadian cleantech companies face significant financing difficulties. Therefore, EDC developed a suite of financial tools aimed at supporting cleantech companies to commercialize, including loan guarantees, performance guarantees, credit insurance and small-scale project finance. These tools are all aimed at incentivising commercial banks to finance cleantech companies.

## **Develop enabling infrastructure**

Finland is heavily dependent on energy to support cleantech derivatives including green hydrogen production, battery technologies and industrial decarbonization. This is supported by a high-performance grid structure which guarantees high availability and allows reliable power transmission from production sites to demand centers.

Finland's economy is also dependent on exports, and 90% of international trade move by ship. Therefore, the country has also invested in port infrastructure, with ports that are able to remain operational through the country's harsh winters.

The US Department of Energy's Technology Transitions office works to connect infrastructure projects with early stage innovation programs to ensure that supporting infrastructure is in place when new technologies get to the commercialization stage.

## **Boost demand for green products and services through public procurement**

Unless tendering procedures specifically include sustainability as part of the decision criteria, tenders will usually be awarded on the basis of price alone, which may disadvantage green solutions. Canada's government has committed to net zero procurement of goods and services by 2050, as part of a wider pledge towards net zero operations. The commitments apply to all core government departments and agencies and will be monitored by the Centre for Greening Government.<sup>18</sup>

By increasing market demand, Green Public Procurement also helps bring down the price of sustainable products and services, by increasing volumes.

## **Ensure regulation responds to the pace and ambition of innovation**

Regulation can help or hinder technological progress in novel industries. Innovation, especially in the cleantech sector, may bring new hardware and technologies that have never been used at a commercial scale before, and therefore may not be covered by existing regulatory frameworks. Regulators should work with innovators to make sure that regulation recognizes and encourages innovation and development, while simultaneously ensuring that novel technologies are safe and fit for commercial applications.

Chile's green hydrogen industry provides an example of the importance of regulation in cleantech. Traditionally, petrol and other fuels in Chile have been charged at a high tax rate to increase government income. New e-fuels such as green hydrogen are at the forefront of the national

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<sup>18</sup> Government of Canada. (2023). Greening Government Strategy: A Government of Canada Directive. Retrieved from Government of Canada: <https://www.canada.ca/en/treasury-board-secretariat/services/innovation/greening-government/strategy.html>

agenda; it could be more appropriate to tax them at a lower rate to encourage growth in the sector. To date there is no regulation on how these new products will be taxed: CORFO is working with Chilean regulators to identify relevant gaps and ensure the entire value chain of green hydrogen (including windfarms, electrolyzers etc.) are not impeded by regulatory practices.

## **Policy Strategies to accelerate scale up of growth-stage companies**

### **Implement measures to boost demand for clean technologies**

The US Department of Energy (DoE) has developed an Adoption Readiness Level (ARL) scale to assess a community or market's willingness to deploy new cleantech solutions. The DoE plans to integrate this assessment into future funding calls to spread awareness of the need for behavioral change among purchasers.

The DoE's Office of Clean Energy Demonstrations is also requesting public input during 2023 on effective demand-side measures to accelerate the adoption of clean technologies, to inform the design of future interventions. These may include advanced market commitments, direct procurement and guaranteed offtake.<sup>19</sup>

### **Share best practices with other nations**

Connecting global innovation ecosystems has several critical advantages, including learning best practices from other countries, working with international actors for increased sophistication of local economic activity, and leveraging international networks to improve export, investment, and research. A key advantage of international collaboration is the opportunity to learn the best innovation practices implemented worldwide. A good case study of this is China's Emission Trading System.

Another area where China has adopted best practices from the EU is geographical indication trademarks, which identify the region and/or country from which a specific product originates. To address China's problem with trademark and intellectual property infringement, the government reached an agreement with the EU to protect European geographical indication trademarks for particular products, such as regional wines or food. China now has three organizations dealing with trademarks and intellectual property rights to reduce mimics and protect local and foreign intellectual property and trademarks. China's collaboration and modernization of its own intellectual property systems have had strong results in protecting imports, showing the effectiveness of international cooperation. These initiatives are not always straightforward to progress: the agreement with the EU was the result of ten years of negotiations.

### **Partner directly with global innovation leaders to bring added-value and innovation to economic activity**

Another exciting opportunity for global cooperation on innovation comes from the ability to work hand-in-hand with innovation ecosystems worldwide to bring value-added activities to local economies. Building on its success in building human capital development to increase innovation capacity by working with industry research leaders in ten countries to build and operate research

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<sup>19</sup> Office of Clean Energy Demonstrations. (2023, February 2). Public Insight Requested for Demand-Side Support for Clean Energy Technologies. Retrieved from [Energy.gov](https://www.energy.gov/oced/articles/public-insight-requested-demand-side-support-clean-energy-technologies): <https://www.energy.gov/oced/articles/public-insight-requested-demand-side-support-clean-energy-technologies>



centers, Chile is now examining a similar approach to add more value to its exports.

Chile is an export-oriented economy, with some 32% of the country's GDP deriving from the export of goods and services.<sup>2021</sup> However, well over half of Chile's exports are raw materials; predominately copper, but also other materials, including iron ore and lithium. Chile is the second largest lithium exporter globally.<sup>22</sup> Chile believes that its cheap renewable energy prices, driven by abundant solar resources in the North of the country, will support the economics for more value-added manufacturing. Instead of exporting raw materials to be processed in other countries, Chile intends to leverage its human capital and cheap, easy access to these resources to manufacture value-added products at source and then ship them abroad. To do so, Chile plans to attract industrial capabilities from abroad, including China and the European Union, to carry out processing and manufacturing of raw materials on-site. By collaborating with innovative companies with the required skills and knowledge, Chile plans to increase domestic innovation capacity, further upskill its workforce and enhance economic growth. Other examples of collaboration of climate innovation are seen in green hydrogen, such as the Team Europe Initiative (TEI) on Green Hydrogen (GH2) joint effort with Chile to develop the country's hydrogen economy and create jobs while providing green hydrogen imports for the EU.<sup>23</sup>

## Find international trade opportunities

Building international trade through collaboration with global innovation ecosystems is a good way to enhance the development and scaling of domestic innovation, especially for smaller economies with limited internal markets for cleantech.

Finland and Denmark are both heavily dependent on trade, with 40% and 60% of GDP respectively deriving from exports of goods and services.<sup>24</sup> Consequentially, both countries take measures to guarantee all infrastructure and services related to exports are well set up. In Finland, about 90% of export is done by ship, and as a result, the country has invested heavily in good harbor networks and connections to facilitate trade. Similarly, Business Finland has a presence in 40-50 countries to attract talent and companies to come to Finland and promote exports and trade, doing important work to network and connect companies locally and abroad. Denmark has its own programs to attract foreign companies, talent, investment, and technology.

In Israel, the Innovation Authority and the Department of International Collaboration work together to collaborate with research organizations, institutions, multinational companies, foreign innovation agencies, and other relevant actors to promote innovation within Israel and abroad and support mutual needs shared by international innovation ecosystems. The Israel Innovation Authority also supports global companies and investors through various programs, including seed investment and technology innovation programs.

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20 World Bank (2021). Exports of goods and services (% of GDP) – Chile. <https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?locations=CL>

21 This is on a par with the global average, but is substantially higher than the UK, US, and Japan

22 World Economic Forum (2023) Which countries produce the most lithium? <https://www.weforum.org/agenda/2023/01/chart-countries-produce-lithium-world/#:~:text=The%20three%20largest%20producers%20of.3%20million%20tonnes%20by%202030.>

23 Chilean Delegation to the European Union (2022). Developing Chile's green hydrogen potential: Fast forward to carbon-neutrality. [https://www.eeas.europa.eu/node/109785\\_es?s=192](https://www.eeas.europa.eu/node/109785_es?s=192)

24 World Bank (2021). Exports of goods and services (% of GDP) - Finland, Denmark. <https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?locations=FI-DK>

The Japanese External Trade Organization (JETRO) is funded by the Japanese government to promote internationalization of Japanese start-ups. The start-ups are mentored to explore product-market fit and accelerate the journey to market. Because the main challenges for Japanese start-ups are around scaling and commercialization, JETRO works to engage international investors, including CVCs, who can bring both investment and market opportunities. They also work with international mentors to encourage founders to develop a global mindset. In a joint research project with the University of Tokyo, JETRO has identified three success factors to create global minded startups: involvement of serial entrepreneurs, international mentors, and diversity in the founding team.

## **Create a level playing field with incumbents**

China's national ETS is at the core of how the country tackles climate change and pollution by putting a price on emissions and limiting the amount companies can pollute. In this way, greener products become more competitive with respect to their cheaper, more polluting alternatives. China learned how to develop a successful ETS through the EU, which has the world's oldest ETS. Representatives from both governments took part in ETS workshops which involved open discussion on innovation, research, and science, and the EU taught China the keys to a successful ETS implementation.

### III. Countries with observable success in facilitating opportunities for women and youth through cleantech innovation

This report refers to women as adults of 25 years and older who live and identify as female and follows the United Nation's definition of youth as those persons between the ages of 15 and 24 years.<sup>25</sup>

Women are notably underrepresented in the cleantech industry. Most data are available for women in entrepreneurship broadly, but not specifically for cleantech. Globally, just 5 percent of private equity investment across industries goes to female-founded businesses.<sup>26</sup> This picture mirrors the lacking gender parity in Venture Capital (VC) firms where only 5.7 percent of VC partners are women.<sup>27</sup> In 2021, cleantech ventures with at least one female founder received \$26.1 million in private equity investment worldwide while male-founded cleantech businesses received \$10 billion.<sup>28</sup> Between 2015 to 2021, there were only 62 women for every 100 men considered green talent.<sup>29</sup> Changing this disparity is not only encouraged, but necessary for driving cleantech innovation that is relevant to all consumers and for fueling a country's economy.

Companies with more women in leadership can expect to increase net profit by at least 6 percent across industries.<sup>30</sup> Studies have shown that companies, whether cleantech or not, that have women in leadership or management positions have higher levels of innovation<sup>31</sup> and profit.<sup>32</sup> Ensuring success for women-led cleantech innovation will have profound economic and social benefits across ecosystems.

The current situation is due to insufficiencies including training opportunities, mentorship, workplace support, and both conscious and unconscious bias. Barriers to achieving gender parity in the STEM field range from high cost of education and qualifications, limited opportunity to attend training, family commitments, workplace bias, and rarity of mentors. Progress is visible in national priorities, private sector initiatives, and resulting women-led cleantech businesses emerging in each country.

As countries evaluate economic development plans, innovation for climate adaptation and

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25 United Nations. (2023). Global Issues: Youth. Retrieved from United Nations: <https://www.un.org/en/global-issues/youth>

26 Ibid.

27 Gourani, S. (2021, December 28). These Investors Want More Women to Become VCs. Retrieved from Forbes: <https://www.forbes.com/sites/soulaimagourani/2021/12/28/these-investors-want-more-women-to-become-vcs/?sh=72d8b2bd5de1>

28 Furness, V. (2022, April 28). Clean tech: Are females excluded from green economy? Retrieved from Capital Monitor: <https://capitalmonitor.ai/asset-class/equity/clean-tech-females-green-economy/>

29 LinkedIn. (2022). Global Green Skills Report 2022. LinkedIn Economic Graph.

30 Ibid.

31 Lorenzo, R. et al. (2017) The Mix That Matters: Innovation Through Diversity. Boston Consulting Group. <https://www.bcg.com/publications/2017/people-organization-leadership-talent-innovation-through-diversity-mix-that-matters>

32 Noland, M., Moran, T., and Kotschwar, B. (2016) Is Gender Diversity Profitable? Evidence from a Global Survey. Working Papers 16-3. Peterson Institute for International Economics. <https://www.piie.com/publications/working-papers/gender-diversity-profitable-evidence-global-survey>

resilience is becoming top priority. Currently, there are not enough people in Science, Technology, Engineering and Math related industries globally, so including women in these disciplines would ensure there are more people with the relevant skills in the workforce. Filling the personnel gap through women and youth inclusion in the cleantech workforce is the only way countries will capitalize on the transition to net zero. Cleantech is the future, and green skills will be well-remunerated. With a projected 24 million jobs set to open in the green economy, countries must afford women the same economic advantages and opportunities as men.<sup>33</sup> Women and youth have unique perspectives of issues, including climate and how it affects them and their communities, meaning these populations bring innovative ideas to the cleantech sector. The effects of climate change disproportionately impact women, youth, and vulnerable communities so it is imperative to include them in the solutions.

Governments are pairing new climate policies and commitments with incentives to engage youth in STEM education, opportunities for research and development, and growing a culture of entrepreneurship. If women and youth who wish to pursue a cleantech career feel there is no space for them to do so in their home countries, and if they have the means to go abroad to do so, they will. This means they will build clean technology overseas instead of at home, which is a missed opportunity for any economy.

The following countries have produced successful women- or youth-led cleantech startups or SMEs which have been successful on the world stage (as determined by the rankings detailed in the methodology section). The profiles in this section detail the successful outcomes which are specific to each country. The next section analyzes the factors which have contributed to this success.

## Argentina

Female-founded enterprises in Argentina are recognized on the Cleantech 50 to Watch, a list of up-and-coming private innovation companies in clean technology published annually.<sup>34</sup> In 2019, 41 of the 63 science, technology and innovation projects had a female director. The country continues to work with international and national governing bodies to achieve a higher standard for women and youth inclusion in cleantech.

The national policies and programs for women and youth inclusion in Argentina's cleantech sector offer valuable insights into how this success has been achieved. The quality and access to education in Argentina sets the country apart for youth development. In Buenos Aires 40 percent of youth hold a college degree.<sup>35</sup> Prestigious public universities such as the University of Buenos Aires, the highest ranked university in Latin America, offer citizens as well as international students from Brazil, Paraguay, Uruguay, and Venezuela free enrollment. For this reason, Argentina ranks as the top student destination in Latin America.<sup>36</sup> Since 2017, university enrollment rates have been higher for female students over male students.<sup>37</sup> Female researchers in Argentina's public

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33 International Labour Organization. (2018). Greening with jobs – World Employment and Social Outlook 2018. Retrieved from International Labour Organization: <https://www.ilo.org/global/research/global-reports/weso/greening-with-jobs/lang--en/index.htm>

34 Cleantech Group. (2022). 2022 Cleantech 50 to Watch. Retrieved from i3 Connect: [https://i3connect.com/50\\_to\\_watch](https://i3connect.com/50_to_watch)

35 Startup Genome. (2022, December). Argentina - Buenos Aires. Retrieved from Startup Genome: <https://startupgenome.com/ecosystems/buenos-aires>

36 Ibid.

37 Bello, A. (2020). Women In Science, Technology, Engineering and Mathematics (STEM) In the Latin America and The Caribbean Region. Montevideo: UN Women.

sector have achieved parity, with over 70% of female tertiary graduates with a degree in Natural Sciences, Mathematics and Statistics.<sup>38</sup>

In addition to the country's success in education initiatives, there is also a high output of entrepreneurial activities. Argentina has established networks, programs, and policies aimed at empowering women and youth entrepreneurs to join the renewable energy sector.

## Canada

Canada is ranked third globally for women entrepreneurship with almost 30% of businesses in the country being women owned. Government funded accelerators provide resources, incentives, and networking to help female founders turn their ideas into viable businesses. The country has mandated a national priority for increasing the participation of women in the cleantech sector.<sup>39</sup> Directives within Canada's policy and investment sector are not only requiring a boost in cleantech innovation, but also requiring gender balance in the innovation community. Coordinated efforts between government agencies are catalyzing data collection and policy making processes.

## India

India ranks third for number of female founders, with an estimated 1,108 female founders across all sectors.<sup>40</sup> Bangalore, India, where the average deal size for women is over \$5 million, is among the top ten cities in the world where women receive the largest average deal size.<sup>41</sup> As the government of India is ramping up its renewable energy transition, the Ministry of New and Renewable Energy is emphasizing the importance of women's participation. Regional governments create exclusive schemes for women to access capital and business support for building innovative ventures. In India, the share of female students who completed a bachelors, masters, or doctoral level education in the engineering field is among the highest in the world.<sup>42</sup>

## Malaysia

Malaysia is among the top ten countries with the highest percentage of female founders.<sup>43</sup> Key stakeholder collaboration between Malaysia's government ministries is progressing cleantech entrepreneurship activities for women and youth. In 2013, the government established its National Policy on Science, Technology, and Innovation as a strategic reform initiative for socio-economic transformation and inclusive growth to promote inclusion of these priority groups within the cleantech sector.<sup>44</sup> National accelerators funnel young engineers into entrepreneurial career paths and drive innovation in science and technology.

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38 Ibid.

39 Mastercard. (2022). The Mastercard Index of Women Entrepreneurs. March: Mastercard.

40 Ibid.

41 Startup Genome. (2021, August 26). Gender Disparity within Global Venture Capitalist Investments. Retrieved from Startup Genome: <https://startupgenome.com/articles/gender-gap>

42 IEA. (2019, February). Women working in the rooftop solar sector. Retrieved from IEA: <https://www.iea.org/reports/women-working-in-the-rooftop-solar-sector>

43 Startup Genome. (2021, August 26). Gender Disparity within Global Venture Capitalist Investments. Retrieved from Startup Genome: <https://startupgenome.com/articles/gender-gap>

44 Prime Minister's Office of Malaysia. (2013). National Policy on Science, Technology & Innovation (NPSTI). Kuala Lumpur: Government of Malaysia.

## New Zealand

New Zealand ranks second in the top countries for women in business, with the country's strong support of entrepreneurial conditions, and high quality of governance.<sup>45</sup> Women own three of every 10 businesses in the country.<sup>46</sup> National policy initiatives through the Ministry of Business, Innovation and Employment (MBIE) prioritize funding for women and youth, as well as the indigenous Māori population.

## United Kingdom

In the United Kingdom, one in three entrepreneurs are women. In 2021, although the number of applications for bank financing was significantly lower for women than men, the success rates of approved applications was nearly equal, with 91% of female-led applications approved, compared to 90% for male-led applications.<sup>47</sup> A push for data collection and transparency on funding access for women recognized that access to venture capital networks is crucial. The government has partnered with the private sector to encourage venture capital dedicated to priority groups as well as legislation to reduce barriers and address biases for women entrepreneurs.

## United States

In the last five years, the number of jobs in the country's cleantech sector increased by 237 percent, providing not only an opportunity, but a need for women and youth inclusion in the talent pool.<sup>48</sup> The United States has the highest number of female founders globally, with over 10,353 female founders across all industries.<sup>49</sup> The country hosts a variety of funding mechanisms, accelerators, and awards to recognize women, youth, and minority founders' achievements in cleantech innovation. State funded accelerators bridge the transition between research and development at universities to internship programs at small- and medium-sized enterprises (SMEs) to facilitate green jobs. Furthermore, top universities, such as Harvard University, are producing research on gender diversity in the cleantech industry with an intersectional lens on many topics.<sup>50</sup> Government agencies such as the U.S. Department of Energy are committed to breaking down barriers for girls in STEM education and creating pathways for women into leadership positions.<sup>51</sup>

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45 Mastercard. (2022). The Mastercard Index of Women Entrepreneurs. March: Mastercard.

46 Women Entrepreneur India. (2022, October 8). 6 Best Countries for Women Entrepreneurs. Retrieved from Women Entrepreneur India: <https://www.womenentrepreneurindia.com/viewpoint/experts-column/6-best-countries-for-women-entrepreneurs-nwid-2450.html#:~:text=According%20to%20ACG%20Inc.'s,and%20Sweden%20in%20the%20list>

47 Department for Business, Energy & Industrial Strategy. (2022, June 28). Report shows progress in boosting investment in UK's women entrepreneurs. Retrieved from [gov.uk: https://www.gov.uk/government/news/report-shows-progress-in-boosting-investment-in-uks-women-entrepreneurs](https://www.gov.uk/government/news/report-shows-progress-in-boosting-investment-in-uks-women-entrepreneurs)

48 LinkedIn. (2022). Global Green Skills Report 2022. LinkedIn Economic Graph.

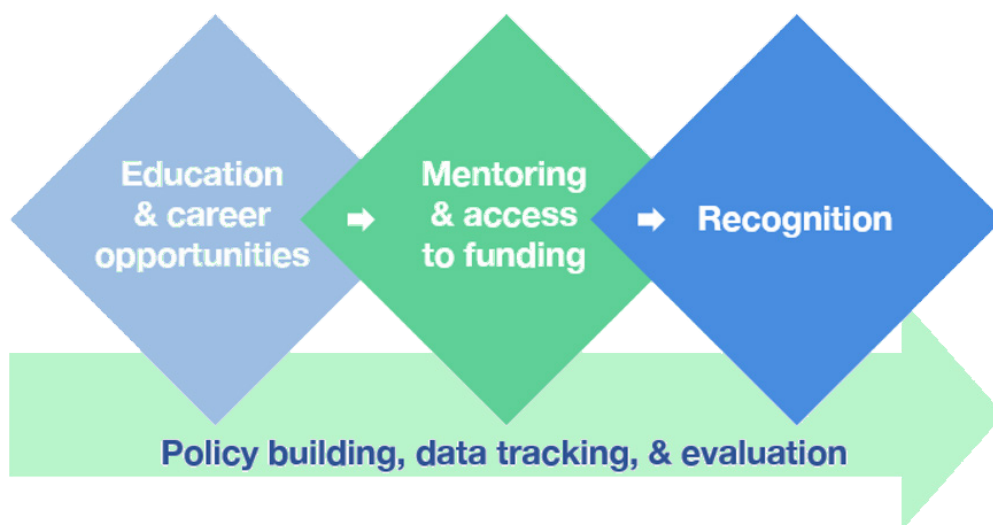
49 Startup Genome. (2021, August 26). Gender Disparity within Global Venture Capitalist Investments. Retrieved from Startup Genome: <https://startupgenome.com/articles/gender-gap>

50 Harvard Kennedy School Women and Public Policy Program. (2023). 297 studies aiming to close gender gaps. Retrieved from Gender Action Portal: <https://gap.hks.harvard.edu/search?topic=1816>

51 U.S. Department of Energy. (2023). Women in Energy. Retrieved from U.S. Department of Energy: <https://www.energy.gov/women-energy>

## IV. Effective Cleantech Innovation Ecosystem Characteristics for providing opportunities to Women and Youth

Types of interventions employed by countries achieving observable success



**Figure 3: Interventions to provide increased opportunities to women and youth**

Successful countries with policies and programs to promote gender equality and youth inclusion first identify root causes for inequality and discrimination, then take action to promote access and dismantle barriers. Countries showing higher levels of female representation in the cleantech industry successfully promote access to STEM education, ensure advancement to decision making roles, enlist public administration and private industry to co-create opportunities, use gender statistics and studies to understand policy gaps, prevent gender-based violence through a proactive approach, and work to eliminate gender stereotypes and roles. Figure 3 summarizes these steps.

The next sections analyze these steps in more detail, giving examples of policies and programs which successful countries have implemented to achieve observable results.

## Policy building, data tracking, and evaluation

### Coordinate action in data tracking, policy building, and monitoring and evaluation across ministries with business, innovation, and gender and youth focus

In Argentina, national policies protecting women's rights and advancing involvement in cleantech business activity span themes of employment access, capacity building, gender identity, female quotas in the labor force, and gender-based violence. Argentina's government has committed to derive 20% of the country's energy from renewable resources by 2025, which will increase local production as well as open employment opportunities where women can take on technical, professional, and decision-making roles.<sup>52</sup> National non-profit, the Association of Women in Sustainable Energy (AMES) Argentina, is capitalizing on this climate target and job growth to ensure women are included in these employment opportunities. AMES is working with the Inter-American Development Bank (IDB) to facilitate the collaboration between government departments. The organizations have called on the National Directorate of Electricity Generation under the Ministry of Energy, National Directorate of Gender and Economy under the Ministry of Economy, the Chamber of Renewable Energies, the National Institute of Industrial Technology, the Chamber of Industrialists of Projects and Engineering of Capital Goods, Center for the Study of Energy Regulatory Activity, Argentine Wind Energy Association, and the Association of Electric Power Generators of the Argentine Republic to close existing gender gaps in the cleantech sector through inclusive policy and data tracking on gender equity in cleantech.<sup>53</sup>

The government of India hosts online events where government officials, CEOs, CMDs, NGOs, industry leaders, banking institutions, and international organizations collaborate on identifying and creating pathways for women in cleantech. At these events of over 200 attendees, women entrepreneurs have a platform to share their success stories, and the impact of how regular trainings and capacity building efforts are improving outcomes. Results of the collaboration include allocating public funds for women and providing exclusive coworking spaces at incubation centers for women-led start-ups.<sup>54</sup> Government ministries acutely focused on women and youth inclusion are the Ministry of New and Renewable Energy and the Ministry of Women and Child Development, which work together to progress these opportunities.

Malaysia's coordination of key ministries is driving opportunities for cleantech entrepreneurs. Notable collaboration has been between the Malaysia Digital Economic Cooperation (MDEC) under the Ministry of Entrepreneurial Development, Ministry of Environment and Water, Ministry of Youth and Sport, and Ministry of Women and Children.<sup>55</sup> In 2018, key ministries in Malaysia undertook an extensive assessment initiative to show gaps in data for Sustainable Development Goals related to gender equity. The resulting initiatives were a combined effort from the ministries

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52 Global Wind Energy Council. (2019, August 21). AMES to promote gender equality in Argentina's renewable energy sector. Retrieved from Global Wind Energy Council: <https://gwec.net/ames-to-promote-gender-equality-in-argentin-as-renewable-energy-sector/>

53 Beaujon Marín, A., López Soto, D., & Magdalena Méndez, F. (2022). Género y Energía en Argentina: La participación de las mujeres en el sector de generación eléctrica. Banco Interamericano de Desarrollo.

54 Jacob, S. (2022, December 30). Tamil Nadu starts packages for green tech, rural impact, women-led start-ups. Retrieved from Business Standard: [https://www.business-standard.com/article/economy-policy/tamil-nadu-starts-packages-for-green-tech-rural-impact-women-led-start-ups-122123000782\\_1.html](https://www.business-standard.com/article/economy-policy/tamil-nadu-starts-packages-for-green-tech-rural-impact-women-led-start-ups-122123000782_1.html)

55 Ministry Of Women, Family And Community Development. (2020). Malaysia Progress Report 2014-2019. Kuala Lumpur: Government of Malaysia.



to run programs to increase leadership competencies among women, starting from youths, which resulted in 1,051 participants in the Women Directors Program, and 1,286 participants in leadership programs.<sup>56</sup>

## Education and career opportunities

### Promote access to high quality Science, Technology, Engineering and Math (STEM) education and green jobs

Public universities in Argentina offer tuition-free undergraduate education, resulting in over 40 percent of youth in the capital of Buenos Aires holding a college degree. The city has more than 50 esteemed universities with affordable education, attracting international students as the highest-ranking student destination in Latin America.<sup>57</sup> The University of Buenos Aires enrolls 300,000 students and is the highest ranked university in South America. The extensive access to high quality education and a culture of entrepreneurship in the country positions youth in Argentina for success in developing cleantech ventures.

Due to efforts from the Engineering Accreditation Council (EAC) in partnership with Malaysia's institutions of higher learning, 365 engineering degree programs have been accredited since 2000. This has resulted in a robust talent pool of 172,900 young graduate engineers and over 15,000 professional engineers as of December 2022.<sup>58</sup> Universities filter students into national accelerator programs to create job prospects in entrepreneurship for the country's young engineers and innovators. Malaysia's successful coordinated action between government, universities and private sector offer valuable insights.

New Zealand nonprofit KiwiNet offers multiple programs to support innovation and entrepreneurship for both women and youth. The organization's Investment Committee and Pipeline Committee partner with 19 universities and research organizations to source researchers with commercially viable technology and pool funding to get these discoveries to market. The Spin-Out Programme gives university students and researchers the tools and knowledge necessary to turn successful research discoveries into investment-ready companies. Corporate partners and KiwiNet commercial mentors guide entrepreneurs with viable technologies on how to connect with investors and secure venture capital.<sup>59</sup>

In Kenya, free access to STEM education for girls and women in technical schools has been transformational for women entering the cleantech workforce. The government of Kenya is working with NGOs such as UNESCO, the World Bank, USAID among others to measure gaps in women in STEM to implement mentoring and sponsorship programs throughout girls' education. Technical schools and extracurricular programs such as the UNESCO/GoK STEM mentorship program have increased the participation of girls and women going on to careers in this field.<sup>60</sup> Women in Tech and Women in Energy programs in the country direct companies to hire female graduates,

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56 Ibid.

57 Startup Genome. (2022, December). Argentina - Buenos Aires. Retrieved from Startup Genome: <https://startupgenome.com/ecosystems/buenos-aires>

58 Malaysian Global Innovation & Creativity Center (MaGIC). (2021). Transitioning to Greater Impact Annual Report 2021. Kuala Lumpur: MaGIC.

59 KiwiNet. (2022). 2022 Annual Report. Hamilton: KiwiNet.

60 Karanja, F. N. (2021). Unlocking the Potential of Girls in STEM in Kenya: An Assessment Report on the Impact of the UNESCO/GoK STEM Mentorship Programme. Nairobi: UNESCO.

creating immediate opportunities for female graduates to enter the cleantech workforce. These companies succeed when senior leadership has committed to gender equality in hiring, using data to link a diversity and inclusion strategy to business growth strategy, and develop a workplace culture committed to inclusion and empowerment of female colleagues.<sup>61</sup>

## **Allow for flexible working arrangements and set up a public social security system to cover personnel costs of parental leave and childcare**

Recognizing that primary care responsibilities are the greatest barrier for female entrepreneurs, the United Kingdom's government is ramping up support systems for entrepreneurs who are parents. The government has already committed £6 billion in childcare support to eligible working parents of 3 and 4-year-olds to receive free childcare and is working to expand free childcare to all children under 5-years-old.<sup>62</sup> Although this will cost several billion pounds, the economy is expected to benefit up to £10 billion from the estimated 60,000 parents who would rejoin the workforce.<sup>63</sup> Other initiatives include a Tax-Free Childcare law, which provides up to £2000 per child per year to support families and a Universal Credit, which extends the Tax Credits to meet up to 85 percent of childcare costs.<sup>64</sup>

## **Address biases towards women and youth in the workforce**

Livelihoods Kenya is a social enterprise in Kenya focused on addressing biases for women and youth experiencing poverty. The non-profit empowers women and youth in slums to take ownership of sales distribution channels of clean energy products in slum communities. The program has generated an estimated 2,332 jobs through training, job creation and product distribution. Pillars of outreach, training, employment, and access to cleantech products and networks support the women and youth in Kenya's urban slums to become agents of change in their communities. Over 67 percent of participants in the Livelihoods Kenya workforce are women. Additionally, while around 30 percent of staff have been promoted from a sales role to management position, around 50 percent of the sales agents go on to start their own businesses.<sup>65</sup>

## **Mentoring and access to funding**

### **Create ringfenced funding sources and mentoring for women and youth**

In 2018, the Canadian government established a three-year financing scheme for women entrepreneurs totaling CAD\$1.4 billion called the Women Entrepreneurship Fund. An additional CAD\$200 million is allocated to invest in women-led technology firms. Canada set a target to double the country's women-owned businesses by 2025 through a \$30 million fund for

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61 International Bank for Reconstruction and Development; The World Bank. (2020). Stepping Up Women's STEM Careers in Infrastructure: An Overview of Promising Approaches. Washington, DC: The World Bank.

62 BBC. (2023, March 15). Free childcare expanded to try to help parents back to work. Retrieved from BBC: <https://www.bbc.com/news/uk-politics-64959611>

63 Ibid.

64 Ibid.

65 Livelihoods Kenya. (2021, May 10). What Does Livelihoods Mean? Retrieved from Livelihoods Kenya: <https://www.livelihoods.org/what#how-we-work-section>

female entrepreneurs, and an additional \$2.5 million specifically for indigenous women-owned businesses.<sup>66</sup>

India has established several funding schemes to increase women entrepreneurs' access to capital. The state of Tamil Nadu has supplied over \$16.2 million in loans and \$4 million in subsidies to over 1,558 women entrepreneurs under the Prime Minister's Employment Generation Program (PMEGP).<sup>67</sup> Recently, Tamil Nadu Startup and Innovation Mission (StartupTN), announced the Tamil Nadu Startup Seed Grant Fund (TANSEED). The TANSEED scheme has resulted in a 50% increase in grant funding for special-category start-ups, mandating 25% to women-founded and 10% to rural-based green technology ventures.<sup>68</sup> Within the TANSEED fund is the Tamil Angels platform where angel investments are focused on women-led start-ups. To qualify for this funding, the startup should be either women-owned or where women have at least 75% equity in the venture.<sup>69</sup> Other funding opportunities for India's women entrepreneurs include the New Swarnima Scheme, Tamilnad Mercantile Bank Ltd, Centre for Entrepreneurship Development, Women Entrepreneurs Welfare Association, and Women Entrepreneurs India.<sup>70</sup>

Entrepreneurs in New Zealand can take advantage of government funded programs such as the Resurgence Support Payment Scheme, Wage Subsidies, Small Business Cash Flow Loan Scheme, Business Finance Guarantee Scheme, and Debt Hibernation. New Zealand's government has recognized a need for legal reparations and capacity building for the indigenous Māori people. The Te Ara Paerangi Future Pathways is a program through the Ministry of Business, Innovation, and Employment which provides opportunities for Māori science and technology researchers to receive national and international investment.<sup>71</sup> New Zealand also has a dedicated Ministry of Māori Development with a Māori Enterprise team to support with capacity building in business management, finance, strategy, marketing and sales, risk assessment, and digital capability. Included in the mission is the Ministry's progressive procurement initiative offering support and priority for government procurement processes to Māori-owned enterprises.<sup>72</sup>

In the United Kingdom, the Treasury department is addressing barriers through legislation to increase funding for women-led businesses, improve family care support, and establish local networks of entrepreneurs and mentors to make entrepreneurship more accessible to women. In 2019, the HM Treasury commissioned the country's top female executive, Alison Rose to publish a review of the state of female entrepreneurship in the country. From this review, the

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66 Superscript. (2020, March 19). 7 top global fempreneur initiatives. Retrieved from Superscript: <https://gosuperscript.com/news-and-resources/7-female-entrepreneur-initiatives-from-across-the-globe/>

67 The Hindu. (2022, December 29). Tamil Nadu women are the frontrunners in entrepreneurship. Here's why . Retrieved from The Hindu: <https://www.thehindu.com/brandhub/tamil-nadu-women-are-the-frontrunners-in-entrepreneurship-heres-why/article66316383.ece>

68 Jacob, S. (2022, December 30). Tamil Nadu starts packages for green tech, rural impact, women-led start-ups. Retrieved from Business Standard: [https://www.business-standard.com/article/economy-policy/tamil-nadu-starts-packages-for-green-tech-rural-impact-women-led-start-ups-122123000782\\_1.html](https://www.business-standard.com/article/economy-policy/tamil-nadu-starts-packages-for-green-tech-rural-impact-women-led-start-ups-122123000782_1.html)

69 Ibid.

70 SheAtWork. (2023, February). Tamil Nadu. Retrieved from SheAtWork: <https://sheatwork.com/government-schemes-india/tamil-nadu/>

71 Ministry of Business, Innovation & Employment. (2023, February). Te Ara Paerangi - Future Pathways. Retrieved from Ministry of Business, Innovation & Employment: <https://www.mbie.govt.nz/science-and-technology/science-and-innovation/agencies-policies-and-budget-initiatives/te-ara-paerangi-future-pathways/#:~:text=In%20December%202022%2C%20MBIE%20released,to%20implement%20the%20reform%20programme.>

72 Ministry of Māori Development. (2023, February). Pakihi Māori – Māori Enterprise. Retrieved from Ministry of Māori Development: <https://www.tpk.govt.nz/en/nga-putea-me-nga-ratonga/maori-enterprise>

HM Treasury and the Department for Business Energy and Industrial Strategy for Small Business established the Investing in Women Code (IIWC). The IIWC is a commitment from all organizations that finance entrepreneurs to support female founders with access to business tools, resources, and finance.<sup>73</sup> The initiative serves as a tool for public and private sector to understand barriers female entrepreneurs face through open-source data to benchmark the funding disparities for female founders. As a result, several UK-based VCs and Angel firms are directing money to women founders. Some of the prominent investors with female-dedicated funds and female-focused funding networks are Angel Academe, Angel Investment Network, Astia, BBG Ventures, The British Business Bank, Cartier Women's Initiative, Catalyst at Large, Diversity VC, Female Founders Fund, Femstreet, Girl Geeks with Transmit Start-Ups, Global Invest Her, Jane VC, and Voulez Capital.<sup>74</sup>

## **Strengthen pathways to decision-making positions in government, financial institutions, and corporations for women and youth through leadership training, mentoring, and networking**

A notable initiative in Argentina supporting young women in the cleantech sector is Chicas en Tecnología. The organization not only influences policy to reduce gender barriers in the technology sector, but also offers free, online programs, workshops, and events. Chicas en Tecnología takes a youth-centered approach, inviting youth to share experiences and strategize ways to motivate more girls to choose STEM education and career paths. Their semi-annual event, Girl Leaders in Technology, includes workshops, panels, talks, and networking opportunities with women leaders who share their journeys and experiences in the technology industry to inspire young women to join the field.<sup>75</sup>

Canadian nonprofit, MaRS, launched an accelerator with federal funding from Natural Resources Canada (NRCan) specifically for women-led start-ups. Government funding included a \$1 million prize incentive and a stipend for the 6 women selected for the first cohort. The Toronto based RBC Women in Cleantech Accelerator has attracted cohorts of up to 10 women-led start-ups across the country from as far west as British Columbia to as far east as Newfoundland. The organization found that it is important to source cohorts of entrepreneurs at a similar Technology Readiness Level (TRL) stage, extend the program to two years for earlier stage companies to succeed in the market, and provide community and networking support. Further government support included matching entrepreneurs with federal government national labs to conduct research and development and prototyping with in-kind lab equipment and research facilities. With the success of this initiative, the accelerator is now privately funded, but maintains the matching of entrepreneurs to national labs.

The state of Tamil Nadu in southeast India is the leading ecosystem for women entrepreneurs in the country. This can be attributed to the high female representation in government, as 11 of the 20 mayors are women.<sup>76</sup> Consequently, the state is establishing benefits and capacity building

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73 HM Treasury. (2019). The Alison Rose Review of Female Entrepreneurship: government response. London: HM Treasury.

74 Superscript. (2021, September 28). 15 female-focused VC opportunities (UK). Retrieved from Superscript: <https://gosuperscript.com/news-and-resources/15-female-focused-vc-opportunities-uk/>

75 Chicas en Tecnología. (2023, February). Chicas Líderes TEC. Retrieved from Chicas en Tecnología: <https://chicasentecnologia.org/chicasliderestec/>

76 The Hindu. (2022, December 29). Tamil Nadu women are the frontrunners in entrepreneurship. Here's why. Retrieved from The Hindu: <https://www.thehindu.com/brandhub/tamil-nadu-women-are-the-frontrunners->

programs for start-ups with a women founder or co-founder.

In addition to the Spin-Out Programme, New Zealand's KiwiNet runs the Women in Leadership Development (WILD) Programme and Emerging Innovator Programme for priority groups to access PreSeed Accelerator Funding and a chance to win one of the annual Research Commercialization Awards (KiwiNet Annual Report 2022). The WILD Programme aims to overcome barriers to career progression and retention for women in science and innovation. Each year, the WILD Programme supports a cohort of 10 women with STEM backgrounds in gaining leadership, governance, and decision-making experience. This program offers coaching from experts at KiwiNet and Brandon Capital Partners and peer-to-peer learning. An additional opportunity offers hands-on leadership and governance experience through participating in board meetings of successful companies while receiving mentorship from a director on the board (WILD). Over 40% of participants have shown career progression since the start of the WILD Programme in 2019 (KiwiNet Annual Report).<sup>77</sup> The Emerging Innovator Programme helps early-stage start-ups and provides participants with commercial mentors, coaching on media engagement, and training for pitching to investors. Included in the curriculum is the Rewa Ake Programme, which is a free three-day online course focusing on customer engagement and discovery for entrepreneurs. Topics range from customer discovery, customer segmentation, customer conversations and active listening, marketing language and positioning, developing questions, and seeking feedback.<sup>78</sup>

## Recognition for achievements

### Create platforms for women & youth to recognize achievements in innovation through awards and publicity

Canada's leading sustainable economy news outlet, Corporate Knights, selects and publishes the Top 30 Under 30 Sustainability Leaders. Nominations are open to the public, then winners are reviewed and selected by a panel of industry leading judges. The list is a curated selection of outstanding youth leading cleantech innovation initiatives.<sup>79</sup>

Kenyan nonprofit, Ongoza, offers a two-year program of customized weekly business advisory, networking opportunities, and debt financing for young female entrepreneurs to scale their environmental enterprises. The Ongoza Business Acceleration Program for Women In Climate provides business development training and mentorship, connections to climate-related funding opportunities, and an additional \$5,000 reward to the two highest performing entrepreneurs in the program. While the incubation structure is highly valuable and replicable, the nonprofit also hosts a national summit where young leaders in cleantech from across the country unite with a political platform to amplify voices of women and young entrepreneurs in policy dialogue.<sup>80</sup> Awards presented at the annual GreenBiz event showcase the women and youth dedicated to

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[in-entrepreneurship-heres-why/article66316383.ece](https://www.kiwinet.org.nz/in-entrepreneurship-heres-why/article66316383.ece)

77 KiwiNet. (2022). 2022 Annual Report. Hamilton: KiwiNet.

78 Ibid.

79 Vasil, A., & Robinson, A. (2022, November 2). The fight for a better tomorrow: Canada's top 30 under 30 sustainability leaders of 2022. Retrieved from Corporate Knights: <https://www.corporateknights.com/rankings/30-under-30-rankings/2022-30-under-30/top-30-under-30-sustainability-leaders-of-2022/>

80 Ongoza. (2022, May 1). Ongoza Business Acceleration Program For Women In Climate. Retrieved from MoveMeBack: <https://www.movemeback.com/initiatives/ongoza-ongoza-business-acceleration-program-for-women-in-climate/>

net zero. The Women in Sustainability Leadership Awards (WSLA) recognizes women leaders dedicated to environmental preservation, social justice, and equity. Winners are Fortune 500 executives, politicians, inventors, professors, and women business owners. The WSLA is awarded to ten women each year who then join the WSLA Alumnae Group to create a network of women supporting each other in their careers and ambitions.<sup>81</sup> The Emerging Leaders program by GreenBiz is a cohort of the next generation of Black, Indigenous and people of color (BIPOC) leaders in sustainable business.<sup>82</sup> Recipients of these awards gain exposure and recognition to over 1,800 sustainable business leaders from corporations, government, nonprofits, start-ups, and academia who attend the event in-person and online.

Startup India is a government initiative aimed at building a culture of entrepreneurship and an inclusive innovation ecosystem. The Department for Promotion of Industry and Internal Trade under the Ministry of Commerce and Industry created Startup India as an accessible platform with information on funding, schemes and policies, resources for challenges, procurement, and capacity building, as well as a hub for key stakeholders to network and drive innovation. The website has a Startup India Showcase where investors can learn more about India's top start-ups.<sup>83</sup> The Startup Showcase offers start-ups visibility, credibility, networking, and access to pilot opportunities with government and corporate buyers.<sup>84</sup>

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81 Women in Sustainability Leadership Awards. (2023, February 16). Honoring Leadership. Retrieved from Women in Sustainability Leadership Awards: <https://www.wsla.global/>

82 GreenBiz. (2023, February). GreenBiz 23. Retrieved from GreenBiz: <https://www.greenbiz.com/events/greenbiz/2023>

83 [https://www.startupindia.gov.in/content/sih/en/startup\\_india\\_showcase.html](https://www.startupindia.gov.in/content/sih/en/startup_india_showcase.html)

84 Ibid.

## Conclusion

The innovation policy framework of GCIP Pillar 2 takes learnings from countries with successful models of cleantech innovation policy as well as countries with similar regional and economic qualities to GCIP partner countries. These best practices are presented and analyzed to determine mechanisms for growing ecosystems focused on early-stage innovation, demonstration and commercialization, and scaling and internationalization of clean technologies. Women and youth are priority groups to include in policy-building to ensure economic benefit and inclusion of these populations, and address barriers to enter and succeed in the cleantech sector. PEEs in GCIP partner countries should refer to the national priorities they identified for growing cleantech innovation in their respective country, and then use this framework to replicate best practices and implement the proper mechanisms for building policy that drives cleantech innovation.

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