

POLICY BRIEF

WHEN WOMEN ARE IN CLEANTECH, WE ALL WIN



EXECUTIVE SUMMARY

- In the cleantech sector, which has the potential to promote economic growth, reduce negative environmental impact and help countries build back better, women entrepreneurs encounter multiple challenges. However, there are also opportunities to engage more women in the cleantech sector.
- The main challenges women entrepreneurs experience in the cleantech sector are related to (i) funding, (ii) the male-domination of the industry; (iii) traditional cultural norms and gender perceptions of the society; (iv) lack of government policies;
- Main recommendations: (i) emphasis on gender-responsive approaches, (ii) awareness raising; (iii) more targeted incubator/accelerators programs, (iv) gender-responsive government policies favoring entrepreneurship

“A woman empowered is not a threat. In celebrating diversity, everyone prospers.” –

Feridun Hadi Sinirlioglu

Do we have sufficient data on the cleantech sector?

Data on the cleantech sector is scarce and does not always differentiate between men and women. Additionally, much of the academic research is limited to the field of renewable energy, thus excluding other types of clean technologies that can have a positive impact on the environment. More gender-responsive research on the sector and its potential in ensuring a more sustainable and inclusive future is needed.

Authors & Contact details

Tamari AKHALADZE, MA student in International Relations at the Free University of Berlin
Elisabeth VAN HOLTHE TOT ECHTEN, MA student in Global Studies at the University of Vienna
Tanja RAJKOVIC, MA student in International Development at the University of Vienna
(tanja.rajkovic236@gmail.com)

Building Back Better post-COVID-19: Gender Equality in Cleantech for Sustainable and Inclusive Development

The Entrepreneurship, Cleantech & Gender nexus

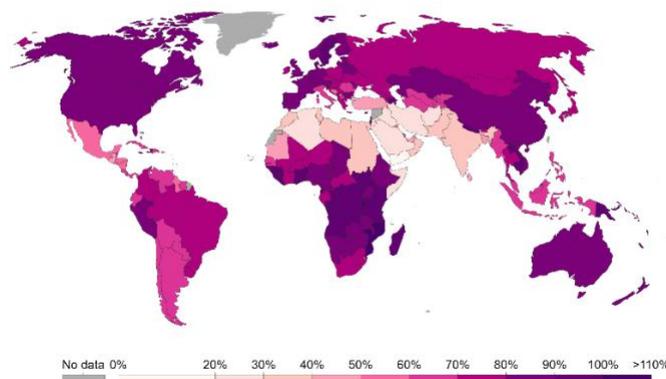
Due to many ongoing challenges, such as the Covid-19 pandemic, climate change, unemployment, and inequality, reaching SDGs is slow. However, the clean technology sector has the potential to mitigate and adapt to climate change by providing products with no or a low environmental footprint and clean and renewable energy. In this regard, cleantech entrepreneurship has a potential to create more employment opportunities and innovation, which helps to improve countries' resilience and paves a path to a more sustainable future. However, cleantech is traditionally a male-dominated sector, and participation of women is limited due to gender-specific barriers. This hinders achieving the full potential of the industry. To ensure sustainable and equitable progress for the Agenda 2030 gender-responsive measures are needed.

How to address gender inequality?

There is growing international consensus that both women's and men's interests must be equally considered and that they should equally contribute to policy making. However, implementation remains insufficient. This is related to a dearth of gender-disaggregated data on the one hand, which makes it difficult to develop solutions specifically tailored to a certain field or issue, and a countertrend of returning to traditional norms and values caused by increased unemployment on the other hand. Additionally, the absence of universal indicators and measurement tools in the cleantech sector hinders comparison within and between countries and sectors.

Ratio of female to male labor force participation rates (%), 2017

The female-to-male ratio of labor force participation rates is calculated by dividing the labor force participation rate among women, by the corresponding rate for men. The labor force participation rate is defined as the proportion of the population ages 15+ that is economically active. All figures correspond to 'modeled ILO estimates' (see source for details).



Source: World Bank

OurWorldInData.org/female-labor-force-participation-key-facts • CC BY

This policy brief is based on the RAUN paper 'Sustainable and Inclusive Development: Challenges and Opportunities for Women Entrepreneurship in Clean Technology'. The paper is available on ra-un.org

POLICY BRIEF

Which challenges do women entrepreneurs in cleantech face?

Women lack access to funding, which limits their ability to start, maintain and scale-up their startup. Access to this is crucial for operation, expansion and R&D of an innovation driven company. Barriers experienced include (i) gender-related discrimination, (ii) sexual harassment, (iii) corruption, and (iv) the absence of collateral for bank loans.

The cleantech sector is dominated by men, which influences woman's opportunities to succeed. These barriers range from finding investors to cooperation along the value chain and networking. Women entrepreneurs reported that (i) they do not feel taken seriously by male investors unless they are accompanied by a male team member, (ii) they experienced sexual harassment and (iii) are excluded from networking opportunities.

Traditional cultural norms and ideas about gender roles are still persistent in many societies. Gendered perceptions hinder women-led start-ups to develop into profitable businesses. Gender stereotypes are most present in older generations but persist in younger generations too. Women constantly need to fight these ideas, which demotivate and take away valuable time and energy that could be spent on advancing their business.

A lack of gender-responsive public policies for clean technologies impede women entrepreneurs to grow their start-ups into successful businesses. Initiatives implemented by the local governments on cleantech entrepreneurship are scarce, often inefficient and gender-blind. While some of the policies only exist on paper, others do not fully grasp the complexity and real needs of women entrepreneurs who are struggling with keeping their businesses alive.

POLICY RECOMMENDATIONS

Governments and (international) institutions should implement gender-responsive approaches across all policy-making levels and stimulate the tracking of gender-disaggregated data. Without accurate data, it is impossible to make informed, evidence-based policy decisions. It is important to make trends in gender (in)equality visible and to track the effectiveness of implemented policies. To do so, the UN, and other organisations, already provide toolkits to implement gender mainstreaming. These toolkits need to be kept up-to-date and evaluated on a regular basis. (International) organisations, NGOs, academia, and civil society groups can support governments by collecting gender-disaggregated data on the cleantech sector.

Governments and (international) institutions, civil society organisations, and academia should raise awareness among women and men, girls and boys about gender stereotypes and (unconscious) biases. Stereotypical ideas about different genders are not innate, but rather stem from social norms, upbringing and education. These biased perceptions later have a huge impact on the career choice and success of an individual. It exceptionally affects women in STEM fields, which are still predominantly dominated by men. To solve this issue, governments and (international) organizations should focus more on creating gender-responsive education and debunking gender stereotypes through various campaigns and initiatives.

Governments and (international) institutions, private and financial sectors should invest in accelerator programs, mentoring, networking and coaching to help women cleantech entrepreneurs succeed. Accelerators, such as GCIP, are essential for the survival and further development of cleantech start-ups, especially in the initial phases of development. They provide necessary training and coaching for entrepreneurs. Also, accelerators enable better access to networks and funding. Hence, governments and other organizations should concentrate on creating diverse cleantech accelerator programs and incubators for women entrepreneurs, which will support and train them. In addition, there should be enough diversity in what different programs offer, so as to make sure there are relevant programs for each stage of entrepreneurship. In addition, the implementation of a gender mainstreaming approach to the program proved to be essential to ensure equal opportunities. Thus, it is recommended that gender-responsive approaches are included in all accelerators.

Governments should develop and implement policies that encourage women to pursue a professional career in clean technology. Increased participation of women in this sector will ensure a more gender-balanced environment. It will also help combat challenges like a lack of role models for women, male-dominated networks, and gendered roles and perceptions.

CONCLUSION

Clean technologies are at the forefront of sustainable development and economic recovery. Although this industry can help governments deal with the dire social and economic consequences of the ongoing Covid-19 pandemic, its potential is impeded due to the exclusion of women from the sector. Women entrepreneurs experience diverse challenges in this sector, from which the lack of access to funding, male-domination of the field, traditional cultural norms and gender biases, and absent government policies are the most pressing. The way forward to solving the issue of gender disparity in cleantech is to address challenges women entrepreneurs encounter and implement relevant policies.

REFERENCES

- IRENA. (2019). *Call to Action in Response to COVID-19: Renewable Energy is a Clean Part of the Solution*. Abu Dhabi.
- Naude, W. (2011). *Entrepreneurs and Economic Development*. United Nations University.
- OECD. (2012). *Gender Equality in Education, Employment and Entrepreneurship: Final Report to the MCM*
- UN. (2020). *The Future We Want. The United Nations We Need. Update on the Work of the Office on the Commemoration of the UN's 75th Anniversary*.
- USAID & IUCN. (2014). *Women at the Forefront of the Clean Energy Future. A White Paper. Initiative Gender Equality for Climate Change Opportunities* (GECCO)
- The London Sustainable Development Commission. (2018). *Women in Cleantech: Is Cleantech Entrepreneurship missing out on the Diversity Dividend?* (pp. 1-68.)



Sustainable and Inclusive Development: Challenges and Opportunities for Women Entrepreneurship in Clean Technology

Authors:

Tamari AKHALADZE, FREE UNIVERSITY OF BERLIN

Tanja RAJKOVIC, UNIVERSITY OF VIENNA

Elisabeth VAN HOLTHE TOT ECHTEN, UNIVERSITY OF VIENNA

Agency: United Nations Industrial Development Organization (UNIDO)

Mentor: Cecilia Ugaz Estrada

Peer+: Constanze Fetting

Acknowledgments

We would like to express our sincere gratitude to our mentors from UNIDO - Cecilia Ugaz Estarda, Carmen Schuber, Ulvinur Müge Dolun, Nicolas Schmidt, Katharina Pröstler and Sunyoung Suh, for their expertise, guidance and valuable feedback. We would also like to thank the coordinators of GCIP, Petronella de Wet, Muhammad Hammad Saeed, Omar Agodim and Jutamane Martchamadol for their insights and for connecting us to the entrepreneurs. Furthermore, we would like to thank Constanze Fetting, our peer+ counsel, for her feedback and support during this project. In addition, we are very grateful that we had the opportunity to participate in RAUN, and we thank all the volunteers who make this programme possible. Lastly, we thank the entrepreneurs who took the time to have an interview with us and shared their experiences so openly. This research would not have existed without them.

Abstract

The clean technology sector brings significant potential for creating more employment opportunities, sustainable development, country resilience, and building back better from times of crisis. However, it is also a male-dominated sector in which women entrepreneurs encounter diverse challenges to start and sustain their businesses, which range from general entrepreneurship and cleantech-related to gender-specific ones. Focusing on the Global Cleantech Innovation Programme (GCIP) in Thailand, Pakistan, South Africa, and Morocco, that is implemented by UNIDO and funded by the GEF this qualitative research paper seeks to unveil and analyze these challenges and how to eliminate them. This data comes both from desk research as well as semi-structured interviews with experts and entrepreneurs. Results were analyzed using the method of qualitative content analysis. Our study showed that women entrepreneurs in the clean technology sector experience different kinds of obstacles in establishing and maintaining their startups. The analysis identified sixty challenges in total, with fifteen directly related to gender. While some of the challenges found include personal characteristics, personal environment, access to market and clients, legal procedures, particularities of the clean technology sector, the highest number of identified challenges stems from the funding difficulties and professional environment in which women entrepreneurs operate. However, the research identified several recommendations to overcome these challenges, such as developing more accelerators for startups, providing suitable funding opportunities, appropriate government policies, and providing more networking opportunities.

Key words: clean technology; women entrepreneurs; challenges; gender equality; GCIP.

| | |
|--|----|
| Introduction | 4 |
| Methodology | 5 |
| 2.1 Qualitative Research Method | 5 |
| 2.2 Limitations | 5 |
| Global Cleantech Innovation Programme (GCIP) | 6 |
| Literature Review | 7 |
| 4.1 Women entrepreneurship | 7 |
| 4.1.1 Internal challenges | 7 |
| 4.1.2. External challenges | 9 |
| 4.2 Women entrepreneurship in cleantech | 11 |
| Results | 12 |
| 5.1 Coordinator interviews | 12 |
| 5.2 Entrepreneur interviews | 13 |
| 5.2.1 Funding | 13 |
| 5.2.2 Professional environment | 14 |
| 5.2.3 Specificities of the cleantech sector | 16 |
| 5.2.4 Covid-19 | 17 |
| 5.3 GCIP benefits and other enabling factors | 17 |
| Discussion | 18 |
| Conclusion and Policy Recommendations | 19 |
| Bibliography | 21 |
| APPENDIX | 27 |
| Appendix A: Methodology | 27 |
| A1: List of questions interviews national programme coordinators | 27 |
| A2: List of question interviews GCIP alumni | 27 |
| A3: Table of main- and subcategories | 28 |
| Appendix B: Literature review | 32 |
| B1: Figure of internal and external challenges | 32 |
| Appendix C: Results | 32 |
| C1: Graph of challenges related to funding | 32 |
| C2: Graph of challenges related to professional environment | 33 |
| C3: Graph of challenges related to cleantech | 33 |
| C4: Graph of challenges related to Covid-19 | 34 |
| Appendix D: Discussion | 34 |
| D1: Table of comparison between primary and secondary data | 34 |

I. Introduction

The importance of entrepreneurship for socio-economic development is immense. Not only does it fuel economic growth (Naude, 2011), it may also provide a path to a more sustainable future by fostering innovation. In this regard, clean technologies can offer viable solutions. The cleantech sector has an enormous potential to mitigate and adapt to climate change, provide clean and renewable energy, create employment, and improve countries' resilience, especially in times of crisis (Business at OECD, 2020). Pernick and Wilder (2007) define cleantech (firms) as “technology-oriented organizations that produce and/or commercialize any product, service, or process that delivers value using limited or zero nonrenewable resources and/or creates significantly less waste than conventional offerings.” (p.2).

As cleantech entrepreneurship comes to the forefront of ensuring sustainability and inclusiveness, so does the need for women participation in this sector, especially in leadership positions. The cleantech industry has traditionally been a male-dominated field (IRENA, 2019; USAID & IUCN, 2014). Women's limited participation in cleantech entrepreneurship is closely connected to the challenges they are experiencing. As presented in the literature review, there are several personal, institutional, and cultural obstacles that are seriously impeding women's engagement in this field (SEDA, 2019; Bosma et al., 2020; Thakur & Walsh, 2013).

The relevance of the cleantech sector is well grasped within UNIDO's mandate, which is to promote inclusive and sustainable industrial development (ISID) for poverty reduction, inclusive globalization, and environmental sustainability, as well as by the Sustainable Development Goals, including SDG 9, which calls to “Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation” (United Nations, n.d.). On the other hand, gender equality and the empowerment of all women and girls is both a cross-cutting SDG principle as well as a goal in itself (SDG 5) – neither inclusive and sustainable industrial development, nor any other SDG can be achieved if gender inequality persists. Thus, it is of utmost importance to close the gender gap in the cleantech sector and ensure that women have equal opportunities in every field and at every level.

Despite the progress achieved in the area of gender equality, the current Covid-19 pandemic threatens to jeopardize this advancement. Indeed, it will likely hinder future improvements - or even revert already made progress - unless gender-responsive measures are taken. Women are disproportionately represented among the most vulnerable of the world's population, and preliminary analyses on the effects of the pandemic have shown that now too, they are the ones to be hit hardest (Ugaz Estrada et al., 2020; Miranda, 2020). Taking into consideration the male dominance in cleantech, gender (in)equality in general, and Covid-19, a closer look into avenues to enhancing female representation and gender equality in the cleantech sector is needed. Therefore, the objective of our paper is to answer the following research question: ***“What are the barriers women entrepreneurs in the cleantech sector encounter, and how can these challenges be eliminated?”*** By focusing on the UNIDO-implemented and GEF-funded Global Cleantech Innovation Programme (GCIP) in Morocco, Pakistan, South Africa and Thailand, we aim to uncover different types of gender-specific and general challenges women entrepreneurs encounter while starting, maintaining and expanding startups in the cleantech sector.

The remainder of this paper is structured as follows: Section 2 explains the research design and methodology. Section 3 provides information about the Global Cleantech Innovation Programme (GCIP). Section 4 provides a literature overview of the challenges faced by women entrepreneurs, both in general as well as in the cleantech sector specifically. The results of our research are presented in section 5, followed by a discussion in section 6. Finally, we conclude our paper and propose policy recommendations for the way forward in section 7.

II. Methodology

2.1 Qualitative Research Method

To answer the research question, *What are the barriers women entrepreneurs in the cleantech sector encounter, and how can these challenges be eliminated?*, a twofold methodology was applied. First, a desk research was conducted, in which relevant literature on barriers faced by women entrepreneurs was analyzed. Challenges were divided into those that apply to women entrepreneurship generally, and those specific to entrepreneurship in the cleantech sector. This desk research functioned as a basis for the semi-structured interviews conducted in the second phase of the research. Afterwards, the primary data was compared to the secondary data and potential differences were explained.

Primary data was gathered from the interviews conducted with alumni and national project coordinators of the Global Cleantech Innovation Programme (GCIP). This programme contributes to the success of sustainable and inclusive development put forward by UNIDO. Although the first phase of GCIP was implemented in nine countries - Armenia, India, Malaysia, Morocco, Pakistan, Thailand, Turkey, and Ukraine (UNIDO, 2018), due to the availability of data and to avoid potential language barriers, we decided to concentrate on four of them, namely Morocco, Pakistan, South Africa and Thailand.

In total sixteen qualitative interviews with GCIP coordinators and alumni of the programme have been conducted. Four semi-structured interviews were held with GCIP's national project coordinators from Morocco, Pakistan, South Africa and Thailand (See Appendix A1 for interview questions). The other twelve interviews were also semi-structured, and were held with GCIP alumni, who are still active in the cleantech sector as entrepreneurs (See Appendix A2 for interview questions). In total, twenty interview requests were sent out to women entrepreneurs (five entrepreneurs from each country), from which ten agreed to an interview (50% response rate). The response rate for men entrepreneurs (16.6%) was considerably lower, with only two responses to twelve requests. In total, four women entrepreneurs from Thailand, three from Morocco, two from South Africa, and one from Pakistan were interviewed. Our male respondents were from Morocco and Pakistan.

To analyze the interviews, the method of Qualitative Content Analysis (QCA) has been used (Kukartz, 2019). Using semi-structured interviews, and thus a qualitative method, has the advantage that it allows to obtain an in-depth understanding of the underlying causes that form extra barriers to women. The QCA method is centered on the development of a category system, consisting of different codes/categories using deductive or inductive methods. The challenges were categorized following an inductive or data-driven coding method. Rather than using a predefined set of categories, this allowed for ensuring that no crucial categories would be overlooked. Once all categories were established, they have been divided into main- and subcategories. In total, ten main categories and thirty subcategories were derived, both including challenges as well as enabling factors (see Appendix A3 for an overview of the categories).

2.2 Limitations

Four limitations to our study need to be made explicit. First, due to the small size of the sample group, the generalizations should be made with caution and only with regard to the respective countries. Moreover, the limited scope doesn't allow for giving an exhaustive list of all challenges faced by women entrepreneurs in the sector. Second, the concepts *gender*, *men*, and *women* are used in a limited fashion. In other words, we only refer to the binary gender concept rather than to different gender identities and expressions. This is not because we are ignorant of other possible gender identities and expressions, but merely because within our sample group, they were not present. Third, although intersectionality encompasses an important part of a gender analysis (European Institute for Gender Equality, 2019), differences within one gender group were not taken into account in this study. The reason for this is again the small size of our sample group, which does not allow us to draw any conclusions on this. Lastly, the possibility of pre-emptive bias of interview responses caused by the disclosure of the research topic is another potential limitation of the paper. Prior to the interview, respondents were told that the study focussed on challenges experienced by cleantech entrepreneurs. Additionally, some interview questions explicitly asked

about gender-related challenges. While this has the potential to influence respondents' answers, we chose not to ask these questions covertly, as important barriers might have been left uncovered.

III. Global Cleantech Innovation Programme (GCIP)

The cleantech industry, which is a relatively new field, can bring us one step closer to achieving sustainable and inclusive development goals. Thus, it is of utmost importance for the international society to support cleantech innovation that can alleviate the environmental and societal challenges we are facing today. With this goal in mind, UNIDO with financial support from the Global Environment Facility (GEF) established the Global Cleantech Innovation Programme (GCIP), a UNIDO flagship programme that promotes clean technology innovation.

GCIP's approach is twofold: On the one hand, the programme promotes a more innovation-friendly environment, a conducive innovation ecosystem through active support of national partners and endorsement of the government in innovation-related topics. On the other hand, GCIP supports promising cleantech startups, which can have a positive impact on society. It does so through supporting entrepreneurs in growing their SMEs and startups into viable, investment-ready businesses and by creating an enabling ecosystem that stimulates innovations. The programme includes training for entrepreneurs, coaches, mentors and policy makers as well as connecting cleantech entrepreneurs with potential investors, partners, mentors, among other activities.

Starting with a pilot project in South Africa in 2011, GCIP has been conducted in eight countries¹, with the expectation to expand to additional countries. During this period, more than 865 startups have participated and enhanced their knowledge as well as network, 329 new jobs were created, and a US \$23 million revenue was generated in the cleantech sector. The environment also benefited from GCIP. The programme contributed to the decrease of greenhouse gas emissions (estimates for 2020 project 4.8 Mtons of CO₂ reduced) and the more effective use of natural resources (UNIDO, 2018).

Besides the positive influence of the programme on cleantech innovation technology, GCIP also started to consider gender dimensions early during the life cycle. The programme foresees specific measures for women's empowerment, and hence it is specifically beneficial for women entrepreneurs. This was due to two developments: (i) UNIDO gender policy and (ii) engagement of staff implementing the projects in the country. Since UNIDO recognizes that entrepreneurship is an integral part of women's economic empowerment, GCIP emphasizes women's rights and equal participation in the cleantech sector through an active gender mainstreaming approach. To engage more women, GCIP is actively reaching out to women-led startups and female students from technical disciplines and informs them about the programme. Besides the vigorous promotion of the programme, GCIP also ensures a gender-equal environment inside the accelerator and actively informs all the participants about it. Years of dedication to streamlining gender policies across the board of its activities resulted in 53% of female-led GCIP ventures at the 2018 GCIP Global Forum. (UNIDO, 2018)

Some of the GCIP's gender mainstreaming efforts included: (i) Setting targets for the number of women entrepreneurs participants, (ii) Creation of special category awards, such as the Most Promising Woman-Led Business Award (Pakistan); Women-Led Entrepreneur (Turkey); Best Female Team (South Africa); Woman Entrepreneur Award (Morocco, only in 2016), (iii) Selection criteria to provide preferential entry for women, (iv) Specific efforts to attract female mentors, judges and trainers (GEF, 2018). Such efforts echoed throughout the countries since, for instance, in Pakistan, during 2014-2017, women figured in 25-40% alumni team leader positions; in Turkey, between 2014-2017, women held 18%-32% of team leader positions; and in Thailand the percentage of women semi-finalists rose from 19% in 2016 to 34% in 2019, while over 40% of mentors were women (GEF, 2018). To ensure greater gender and youth mainstreaming in South Africa, GCIP introduced a set of tailored measures such as strategic outreach, use of special category awards, and media profiling (GEF, 2018). Similarly, in Morocco, among the 6 Prizes that reward the winners each year, one is reserved for women entrepreneurs. Notwithstanding the countries where a more adequate approach to gender dimension might be

¹ Armenia, India, Malaysia, Morocco, Pakistan, Thailand and Turkey

needed, such as India, GCIP remains committed to streamlining gender equality throughout the project, aiming to result in broader socio-economic impact.

IV. Literature Review

This chapter aims to scrutinize relevant academic literature on the challenges encountered by women entrepreneurs generally and in the cleantech sector, more specifically. Few studies have been published on the topic of women entrepreneurship in the cleantech sector. One of the leading causes of this is the absence of reliable, updated, and transparent gender-disaggregated data, as well as a lack of academic research in this area (The London Sustainable Development Commission (LSDC), 2018; OECD, 2012). These data gaps limit the understanding of women entrepreneurship in the cleantech sector and call for more research into this field.

4.1 Women entrepreneurship

Regardless of a company's registration place and the type of business activity, women entrepreneurs in all countries face similar barriers and constraints. According to the 2019-2020 Global Entrepreneurship Monitor report, in most of the countries of the world, women's Total early-stage Entrepreneurial Activity (TEA)² is smaller than that of men. For instance, in Pakistan, women represent only about 23% of the country's total TEA. Morocco also lags behind in this regard, with 33% of women TEA. In contrast, in South Africa and Thailand, women and men are more or less equally engaged in business activities, corresponding to 47% and 48% of the TEA (GEM, 2018). At the same time, it is important to take into consideration that the TEA both looks at entrepreneurship in the formal, as well as in the informal sector, with women being overrepresented in the latter (Devadas & Kim, 2020). Although no causal relationship has been established between the TEA and the challenges faced by women, it is likely that these challenges hinder women in their pursuit of entrepreneurship and hence (partly) explain these differences.

Overall, the different impediments entrepreneurs face can be divided into two categories, internal and external challenges. Internal challenges refer to company-specific obstacles (e.g. personal characteristics, knowledge, access to capital, etc.), while external include those challenges imposed by the environment in which the startup is situated (e.g., social, political, economic, technological factors) (SEDA, 2019). Both internal and external challenges are influenced by gender roles, norms, and perceptions (see figure in Appendix B1).

4.1.1 Internal challenges

Personality traits. Research shows that personality traits can influence how businesses are developed and managed (UKEssays, 2018). Positive self-perception is a necessary trait of any successful entrepreneur. Without the belief in one's competencies and knowledge, the company is doomed to fail. Hence, self-efficacy, or the confidence about one's skills and abilities to complete tasks, plays a vital role in starting and leading a profitable business (Bosma et al., 2020). While it often cannot be pointed exactly to what causes this, on average, women tend to struggle with confidence more than men, especially when it comes to starting a business (LSDC, 2018). Research across 50 countries worldwide showed that low self-confidence and fear of failure are reported to be the primary causes of fewer women starting a business than men (Bosma et al., 2020).

There are also differences in how men and women entrepreneurs, on average, perceive competition. Research shows that women are not only less prone to enter a competition, but their performance does not flourish in a competitive environment (Gneezy & Rustichini, 2004; Niederle & Vesterlund, 2007). Besides, on average, men and women entrepreneurs do not place the same value on income and do not necessarily define success in the same manner. Women entrepreneurs are more motivated by doing meaningful work than by income (Macnabb et al., 1993) and a number of them would select customer loyalty ahead of sales growth as their measure of success (Morris et al., 2006; Carranza et al., 2018).

² Rate of individuals aged 18 and 64 who are either actively starting a new business or running a business.

Role Models. The dearth of female role models is another issue affecting women’s entrepreneurial activity (SEDA, 2019; Wilson et al. 2007). Besides the fact that credible role models act like symbols for young and striving entrepreneurs to pursue their careers in entrepreneurship, they also help women shape entrepreneurial mindsets through believing in their potential (Byrne et al., 2018; Langowitz & Minniti, 2006). Since successful businesswomen are able to share their experiences with newcomers and clarify their uncertainties, women receive positive assurances that they can also set up a profitable startup (Noguera et al., 2013; Hotho and Champion 2011). Even more, not having successful examples of female entrepreneurs can act as a potential discouragement for women who want to start a company (Global Entrepreneurship Monitor, 2017). In most cases, the absence of direct contact with successful businesswomen negatively affects women’s self-trust and the ability to expand their businesses. More than that, receiving help and guidance from other entrepreneurs seems to be problematic, as most of the companies are led by men who are usually reluctant to support women-led startups (SEDA, 2019).

Networking events and information. Unfortunately, compared to their male counterparts, women tend to have limited networking opportunities and, therefore, fewer business connections. Studies have shown that networking activities play a crucial role in professional advancement, as they equip individuals with knowledge and support (Cross & Thomas, 2011; Casciaro et al., 2014). Networking can be formal and structured or informal and unstructured. Interestingly, informal settings are more important for career advancement than formal ones (Shipilov et al., 2007). As a whole, women have insufficient access to business networks and networking events, where they could create new contacts, meet like-minded peers and gather necessary information (Thakur & Walsh, 2013). Research suggests various underlying reasons for this development. The most widespread cause is identified to be women’s structural exclusion from influential networks (Forret and Daugherty, 2004). Despite the promotion of women’s rights, “old boys’ networks” are still active today. It refers to an informal environment of predominantly white, middle-aged rich men who use these men-only clubs to make deals and network with other men. Although, not necessarily explicitly, women are mostly unwelcome and excluded from such settings, since women are often prohibited from meeting with males who are not family members (Peters HE et al., 2019).

Besides the men-only clubs, contemporary research puts forward a psychological explanation for this phenomenon. Homophily or humans' tendency to connect with persons similar to themselves explains why in general, men prefer to interact and network with other men rather than with women. In other words, homophily is also the reason why women think they do not fit into the male-dominated networks that tend to be exclusive and unwelcome towards them. This perception further limits women’s chance to network effectively (Greguletz et al., 2019). Additionally, the work-life conflict caused by household responsibilities and childcare adds an extra burden on women willing to network (St-Syr., 2001; Cornet et al., 2003). In this context, low self-confidence, which leads to fears about being judged by other network members, is also identified as a hurdle for women willing to build their social capital (OECD & European Union, 2015).

Family support. Studies have shown that family support, emotional or operational, has a positive impact on entrepreneurship (Shruti, 2011). Similarly, a lack of emotional and financial support from the family can be very challenging for entrepreneurs (SEDA, 2019; Meek, 2010). Literature has demonstrated that although balancing between professional and private life is hard for both genders, it affects women even more, especially those with children (Sundaresan, 2014). Since women are still the primary caregivers in most societies, they have two full-time jobs - managing work and nurturing their family simultaneously. In addition, World Bank data for 105 countries shows a staggering imbalance when it comes to maternal versus. paternal leave. While the median number of days for maternity leave is 98 days, paternity leave is on average limited to only five days. (World Bank, 2020). Additionally, numbers vary greatly between countries, in South Africa for example, ten days of paternity leave are allowed, while in Morocco it is only three. However, it should be noted that even with the existing paternal leave, it does not necessarily mean that these days will be utilized by men, since the stigma around parental leave is still persistent in societies (Burnett et al, 2013). This certainly is an additional limiting factor to be considered, since it further pre-orders women to dedicate their time to family and care work, dampening their potential to engage in economic and/or entrepreneurial activities. Similarly, research shows that combining time-consuming entrepreneurial activities with domestic responsibilities can seriously inhibit the growth of women’s startups (Alsos et al., 2017). Moreover, business activities can disrupt family dynamics and create work-life conflict (Meek, 2010).

As some studies have highlighted, the family, personal and social life of several business women were disrupted by their entrepreneurial activities (Schindehutte et al., 2003; Lee-Gosselin & Grisé, 1990).

All the above confirms the importance of changing the perception of gender equality as solely a women's issue and the need to incentive the engagement of men in achieving gender equality. It is necessary to raise awareness that men, who are often leaders in social, political, and religious communities, carry a lot of power and responsibilities for women's position within the communities as well as their well-being. For instance, a small study for rural Pakistan, found that 91% of male-headed households would prefer ensuring education for their sons, while only 63% would do this for their daughters (Sandhu et al., 2005). Similar examples on the importance of changes in men's perceptions are found in other countries, e.g., in South Africa where one study indicates that a combination of women's economic empowerment and men's education on gender violence can have a substantial effect in ending domestic violence (Pronyk et al., 2006). These and similar examples speak directly to the necessity of educating and creating understanding among men that their behaviour and decision directly affect women and girls. Therefore, they need to stand side by side with women in efforts to achieve gender equality.

Funding. Limited access to financing and acquiring venture and equity capitals seriously impede women entrepreneurship (Henry, Foss, and Ahl 2016; Sena, Scott, and Roper, 2012). Women entrepreneurs struggle with obtaining funding, because banks generally avoid lending to small businesses (Bouzekraoui & Ferhane, 2017), especially those led by women. The reason is that local financial institutions are prejudiced and do not prioritize women as creditworthy and expect their businesses to crumble easily (Sharma, 2013). Limited credit history and inability to present collateral or security guarantees for banks (EBRD, 2018; SEDA, 2019) are other inhibiting factors for women desiring to obtain credits. This issue is even more heightened, when in return for receiving funding, women get sexually assaulted mostly by corrupt government officials (SEDA, 2019; Richardson et al., 2004). Moreover, in more traditional societies, such as Morocco, women struggle to present collateral or security guarantees for banks due to inheritance laws that deprive them of ownership (EBRD, 2018). Not only obtaining bank loans are problematic for women, but also private investments. When accessing venture capital, women are reported to be the victims of biased gendered attitudes, especially during the pitching of their ideas. As a consequence, women-led businesses are deprived of the funds necessary for growth and development (Hassan et al., 2020).

4.1.2. External challenges

Social norms and perceptions. The old societal notion of entrepreneurship being rather considered a male prerogative (Elam et al., 2019, p. 31), than a suitable career option for women (Baron et al., 2001; Baughn et al., 2006), is further limiting the fulfillment of their potential. The lack of self-confidence coupled with the feeling of being in a subordinate position, is one of the main inhibiting factors for women entrepreneurs worldwide. This phenomenon is especially acute in rural areas, where women's access to education and money-making is even more restricted. Thus, according to one study, most rural women don't believe in their potential as much as men do. As a result, "earning money is the privilege and the monopoly of masculinity" (Gray, 2001, p. 67). Moreover, in some countries, women are perceived to have the primary role of being good mothers and wives rather than entrepreneurs. For instance, many South African women and their startups are not acknowledged due to these gendered perceptions, especially by older white men, who often have biased attitudes towards them (SEDA, 2019). Such gendered perceptions are possibly even more constraining for women active in cleantech, as not all fields of employment are perceived as suitable for women (*Ibid.*).

Education. Women's representation is severely limited in STEM fields. According to the World Economic Forum (2020), less than one-third of world STEM researchers are women. The same study finds that, despite country-specific education systems, a dire global gender imbalance is also observed in STEM education, with only 5% of women choosing to study mathematics and statistics. Information and communication technologies are even less popular among women, with female students accounting for only 3% of all students globally. While these percentages are indeed low, there are significant regional differences. For instance, South-East Asia, the Arab States, and some European countries record higher portions of female students enrolled in engineering, while lower proportions are found in sub-Saharan Africa, North America and Europe (UNESCO, 2017). However, the same

study shows that this does not equate a higher number of women taking up engineering as a profession. Hence, a gap exists between women enrollment in STEM education and STEM professions. A further implication of lower levels of education, a lack of training, and fewer connections, is that women have limited access to information and new technologies, which are crucial elements for financial sustainability and longevity of their business (Sharma, 2013). Similarly, when it comes to entrepreneurial skills, while both men and women entrepreneurs experience this constraint, research shows that, comparatively, these obstacles affect women more than men (Guelich, 2018).

Spatial Mobility. Spatial mobility has also been identified as an additional barrier for women in many countries. There are two sides to this problem. First, due to scarce and unsafe public transportation, the physical mobility of women is limited. Secondly, in some countries, women are not allowed to travel outside their home in the same way as men, because of religious and societal norms or laws. Pakistan is an example of such a patriarchal society, where, due to restrictive customary, religious, and informal norms, women's economic activity is primarily limited to the 'inside' spaces of their homes, whereas 'outside' occupations, such as education or employment are not widely available to them, especially in rural areas. Even though the situation is slowly improving, as Pakistani women are increasingly allowed to work in offices, their entrepreneurship is still mostly confined to fields of employment that are already women-dominated, such as education or healthcare (Syed, 2010). Moroccan women entrepreneurs also struggle with limited mobility, especially during nighttime. This is because working late is not a norm for women, and they might get harassed by other men if they go out late (Sang, 2018). As for Thailand and South Africa, contemporary scholarship has not identified travel restrictions as troubling for women in these countries.

Markets. Accessing markets is also problematic for many entrepreneurs. According to the OECD (Fernandez & Komives 2019), catching up with the market in terms of marketing campaigns and certifications creates a financial burden for most businesspeople. Furthermore, access to international markets forms an additional challenge for many startups worldwide. This issue is even more salient for women entrepreneurs, as they encounter other barriers when entering a market. As mentioned above, in some parts of the world, women's mobility is constrained, which results in limited access to goods markets (Gammage et al., 2005).

Legal regulations. Moreover, certain countries impose gender-specific legal regulations that only limit women's businesses. In Morocco, South Africa, and Thailand women and men have the same legal rights and secure access to land and non-land assets, without legal exceptions regarding some groups of women. However, in these countries some customary, religious or traditional practices or laws discriminate against women's legal rights. In Pakistan, on the other hand, some groups of women are completely exempt from this legal right. As regards the right to open a bank account and obtain credit at a formal financial institution, there is a direct relationship between this legal regulation and the percentage of bank accounts opened by women. For instance, while in Thailand and South Africa - where women and men have the rights to open a bank account and register for credit without any legal exceptions - the percentage of women in the total number of people aged 15 years and above who have an account at a financial institution is 50.3% in the first and 51% in the latter aforementioned country. However, in Pakistan and Morocco where women's legal rights are discriminated by the customary, religious or traditional practices or laws, this percentage decreases to 29,2% in Morocco and 27% in Pakistan. (OECD, 2019).

In addition, in many countries, including Morocco, women are exempt from tax deduction, whereas men are not (World Bank, 2018). Access to public procurement is also reported to be problematic for women. According to a study conducted by ITC and Chatham House (2017), women entrepreneurs have won only 1% of government procurement and tenders worldwide. Women's limited financial resources coupled with the vagueness of documentation for bidding and inaccessibility of tender information are some reasons for their low representation in procurement (Harris River, 2017). In combination with corruption, delayed processes, and, often covert, gender or status based barriers (SEDA, 2019), this leads to women being excluded from bidding in tenders announced by the government. Therefore, some women entrepreneurs have asked for the implementation of gender quotas to ensure equal participation (Bouzekraoui & Ferhane, 2017).

While the literature on challenges women entrepreneurs face might differ across countries and continents, it unanimously states burdens borne by, in particular, women who decide to engage in entrepreneurial economic activities. Whether these challenges are characterized as internal or external, they are existing or exacerbated due to gender identity. The challenges experienced by women that become evident from the literature review include a

lack of role models, a lack of access to networks and networking events, domestic responsibilities, accessing financial capital, negative social norms and perceptions, limited access to (STEM) education, limited spatial mobility, lack of access to markets and discriminatory laws..

4.2 Women entrepreneurship in cleantech

Women are largely underrepresented in the cleantech sector, both in the workforce and in executive positions. Stereotypically, their roles are confined to administrative and human resource functions. Existing data on technology startups suggests that women's entrepreneurial activities are even more limited. According to one study, only 5% of all tech startups were owned by women in 2017 (Resources to Advance LEADS Implementation (RALI), 2019).

The majority of the literature focusing on challenges posed to cleantech startups does not distinguish between startups led by women and men and the different challenges they may face (Buchman, 2017; Bullock, 2015; InfoDev, 2014; Silverberg & Choi, 2015). Yet, based on the persistence of overall gender inequality, it is likely that they face different barriers. A study conducted by the London Sustainable Development Commission (2018) provides a good overview of the challenges women face concerning their participation in the cleantech sector. While these barriers are not specific to entrepreneurship, some potentially influence women's decisions to start a cleantech business. **Entry-level barriers** include limited knowledge about career prospects, the unappealing language in recruitment advertisements, and a lack of opportunities to experience the cleantech sector (LSDC 2018). In particular the latter might have a significant influence on limited women entrepreneurship. **Retention barriers** on the other hand, include the industry's male domination, coupled with sexism, prejudices, discrimination, and a lack of female role models, which were identified as the main reasons women left their cleantech jobs (*ibid.*). While the report identified these challenges as impediments to staying in the sector, they might equally hinder women's decision to start a cleantech business.

Financial capital. Cleantech entrepreneurs, both women and men, encounter many challenges, from which raising financial capital for cleantech ventures is the most salient. As cleantech startups need a long time to become profitable, they often rely on government support more than other types of ventures (Jensen et al., 2019). Besides that, cleantech innovation is costly and does not attract big companies which tend to concentrate on short-term gain rather than long-term growth (Gaddy et al., 2017). Unsurprisingly, women experience more obstacles to reach external equity capital, such as angel investors and venture capital, which is often instrumental in ensuring financial stability for startups (OECD, 2012). A study conducted by the Boston Consulting Group (BCG) shows that there is a persistent funding gap between women-led and men-led startups (Abouzahr et. al., 2018). The study found three explanations for this disparity; (i) women and men are asked different types of questions when pitching their ideas and the (often men) investors assume women lack technical knowledge about the product, (ii) men founders tend to oversell their ideas, while women are more conservative, and (iii) men investors tend to be less familiar with the products and services of women-led business, as these ideas are often inspired by personal experiences (*ibid.*). Although this study did not necessarily focus on cleantech startups, and the findings are limited to the North American context, other studies seem to confirm that women and men entrepreneurs are treated differently by potential investors (see for example Alsos & Ljunggren, 2016; Kanze et. al., 2018).

Contrary to raising financial capital, gender differences are less clear with regards to other challenges, such as finding consumers, navigating the regulatory landscape, and limited research and development on new products. However, coupled with the challenges women entrepreneurs encounter more generally (section 4.1), such as less access to networking events and information, and limited access to (STEM) education, we may well assume that some of the general cleantech challenges are more profound for women entrepreneurs than for men.

Finding consumers who are willing to try cleantech products is difficult, as the market for renewable energy and green technologies is quite broad, and customers have developed "green fatigue." (Bullock, 2015). The abundance of sustainability-claims on new products, combined with the promise that these products are cost saving, have made consumers skeptical and results in consumers opting for the familiar, but often less eco-friendly, products (*ibid.*). Moreover, fossil fuels are still heavily subsidized (Bridle et. al., 2019), which results in relatively higher prices

of cleantech products compared to their traditional counterparts and thus makes them less attractive to consumers. Hence, it is more difficult for newly established cleantech companies to compete against bigger and more prominent firms (Bullock, 2015).

Industry knowledge. Another challenge faced by cleantech entrepreneurs is the general lack of industry knowledge (Silverberg & Choi, 2015). As the cleantech industry is still relatively new, important factors for scaling cleantech businesses may be overlooked (Silverberg & Choi, 2015; InfoDev, 2014). This lack of industry knowledge and education may result in failure when entrepreneurs try to scale their business before the product is ready (*ibid.*). The ability to invest in research and development, however, is limited, because cleantech focuses on commodity markets which are characterized by high competition and low margins (Buchmann, 2017).

Government regulation and policy can act either as a constraint or as an enabling factor. On the one hand, government policies can help the cleantech market grow, by providing incentives for consumers to buy and use clean products (InfoDev, 2014). As indicated by the World Bank report, “Strong and consistent government regulation and clean technology policy can be key enablers for the clean technology industry and underpin early development.” (*Ibid.*, p. 33). Nonetheless, it is also important to note that these policies and regulations may change frequently, particularly in developing countries, which poses a risk to investment in cleantech startups (*ibid.*). Additionally, certain sectors are heavily regulated (Buchmann, 2017). These regulations tend to be in favor of traditional technologies, making it more difficult for clean technologies to be certified and hence to enter the market (InfoDev, 2014).

Existing literature on female entrepreneurship and the challenges they encounter is somewhat limited. Most research is focused on entrepreneurship in the informal sector and is bound to a few countries. The literature on female entrepreneurship in the cleantech sector is even scarcer. Hence, this paper aims to fill this gap in contemporary scholarship by focusing on women's struggle in the cleantech sector. Although many of the barriers in this industry will likely overlap with the general entrepreneurship challenges explored above, it is expected that a closer look at the cleantech sector will reveal some unique differences too. Establishing an overview of which challenges are encountered is a crucial first step. However, it is equally important to indicate which factors are helping women to thrive. Accordingly, these factors are included in this research.

V. Results

In this section, the main results from interviews with both the national project coordinators, as well as the entrepreneurs are summarized.

5.1 Coordinator interviews

The interviews with the national project coordinators shed light on challenges experienced by cleantech entrepreneurs in Morocco, Pakistan, South Africa, and Thailand. The project coordinators highlighted the following challenges: In **Morocco**, the biggest difficulty for startup entrepreneurs is building up a customer network and finding a skilled workforce. Similarly, in **Pakistan**, startups encounter challenges related to accessing required markets, reaching customers, and obtaining financial means. In **South Africa**, funding, commercialization, and certification of products were reported to be the most problematic for cleantech entrepreneurs. In **Thailand**, women face challenges regarding conservative views about their role in society, which also influences their access to education, networking, and information.

The prevalence of traditional cultural norms and gender roles are evident across all four countries, which results in gender-specific challenges faced by women entrepreneurs. Notably, project coordinators from Morocco and South Africa indicated that rural women are especially disadvantaged and encounter more barriers in terms of accessing information and education than women from urban areas. In Thailand too, traditional gender roles are still common, which was summarized by the national project coordinator as follows: “The leader is a man who works for the prosperity of his family, while women, or wives, is [sic] the follower.” According to the same expert, however, recently mindsets have shifted, and women taking the leadership role has become more socially accepted. As she put it, the success of a startup is no longer related to gender, but rather to passion and performance,

including skills, knowledge, and funding. The programme coordinator from Pakistan noted similar shifts, and said that more and more women are allowed to participate beyond the traditional “women” sectors, such as healthcare and education. This has resulted in women being increasingly engaged in the cleantech sector.

Concerning Morocco, women face additional culture-related challenges, such as limited mobility in certain neighborhoods due to the risk of being harassed (programme coordinator Morocco, 2020). The national project coordinator added that Moroccan women have insufficient access to loans, because the national inheritance law deprives women of their parental legacy, which is one of the primary reasons for women having less capital than men. Another distinctive hurdle mentioned by the South African project coordinator was the lack of access to networks for women. Such networks are crucial in finding investors. In Pakistan, a lack of relevant government policies, which include gender mainstreaming and the provision of incentives to encourage women more to engage in the cleantech sector, was reported by the project coordinator to be an additional obstacle for women entrepreneurs.

5.2 Entrepreneur interviews

The main challenges mentioned by respondents fall into four categories; funding, professional environment, specificities of the cleantech sector, and Covid-19. Challenges specific to each category are presented in the following subsections.

5.2.1 Funding

All women respondents indicated that they experience(d) challenges regarding funding their businesses. However, not all of them indicated the same number, nor the same types of challenges (see Appendix C1 for an overview of challenges and frequencies).

“Startups are seen as high risk profiles from a bank perspective. Banks here in Morocco tend to invest in projects that have already been established.”

Male respondent from Morocco

Financial institutions. Five women entrepreneurs explicitly mentioned that it was (almost) impossible for them to apply for loans at traditional financial institutions, such as banks. The other half did not specifically comment on this, but they did indicate that they received their funding through other channels. Respondents said that startups are generally perceived as highly risking undertakings and applying for a loan often requires sufficiently convincing collateral. An additional barrier, according to two Thai respondents, is that banks are often unfamiliar with social entrepreneurship, which may result in a lack of motivation to fund them. Hence, most startups do not meet the requirements imposed by credit institutions. This was confirmed by women entrepreneurs from South Africa and Thailand and a male entrepreneur from Morocco. While this is certainly not a barrier only experienced by women, research has shown that, as was also mentioned by the programme coordinator from South Africa, women may lack access to collateral due to discriminatory laws. Our respondents, however, did not confirm that this was the case for them.

Special programmes. Since accessing funding through traditional channels is difficult or even impossible for cleantech startups, many turn to private investors and initiatives specifically designed to support entrepreneurs. Eight women entrepreneurs said they have received money through public and/or private initiatives. GCIP is one example of this, which provides a small financial prize in some countries for those that win the accelerator competition. Three women entrepreneurs said this was valuable, as the prize they won helped them kick-start their business and develop a prototype. Furthermore, both women from Thailand as well as from Morocco brought up that the programme helped them achieve legitimacy for their company, which, in turn, attracted new investors and boosted banks’ trust in them. Additionally, other programmes, such as from US Aid in Pakistan, the Technology Innovation Agency in South Africa, and the National Innovation Agency in Thailand, helped entrepreneurs access joint venture capital or offered small grants for innovative projects. However, as mentioned by one woman entrepreneur from Morocco, competitions only offer small prizes. Thus, additional funding is required.

Private investment. Women entrepreneurs from all countries said that it is difficult to find (reliable) investors. Reasons that were mentioned partly overlap with a barrier also present when applying for loans; startups are

perceived as risky and, additionally, as not the best investment opportunities for those looking for ‘quick returns’. Yet, investment is crucial, as one Thai entrepreneur indicated, because financial capital is needed to develop a prototype. Contrary to sourcing funding through banks and special programmes, being a woman proves to be a disadvantage when dealing with investors, notably in South Africa and Morocco. In order to secure investment, entrepreneurs noted that creating legitimacy for the company is important. However, this is complicated by gendered perceptions and traditional views on gender. Three women entrepreneurs said that potential investors often ask for such high shares of the company in exchange for funding, that the money was simply not worth it. One South African and one Moroccan entrepreneur linked this directly to their gender, noting that male investors seem to think of it as an opportunity to exploit women. Additionally, women entrepreneurs from South Africa indicated that they experienced sexual harassment while reaching out to investors. Although South African law prohibits sexual harassment in employment and so-called ‘corruption hotlines’ exist, this rarely prevents this from happening.

“They see you as a woman, and when you approach them, they have the feeling they can exploit you. Many times we say no to investors because we felt and saw that many of them are trying to exploit us.”

Female respondent from South Africa

5.2.2 Professional environment

The second category in which many challenges have been mentioned is within the professional environment. Contrary to the other respondents, women entrepreneurs from Thailand acknowledged that it is difficult to access funding, but they also said that this did not immediately pose a barrier for them personally. However, they - like the other respondents - experience significant challenges within their professional environment (See Appendix C2 for an overview of challenges and frequencies).

“They usually allow women in office-based jobs, but people don’t really want women to be an entrepreneur. Especially within the cleantech sector it’s really hard.”

Male entrepreneur from Pakistan

Gendered perceptions. Gendered perceptions form a challenge in all four countries. Eight women entrepreneurs said that traditional cultural norms and gender stereotypes make their work more difficult, as they constantly need to fight these biases. Women entrepreneurs from Pakistan, South Africa and Morocco noted that leading a business is perceived as unsuitable for women. This is reflected in persistent ideas that women cannot simultaneously focus on their family and business (Morocco), and by men rejecting to do business with women (Morocco and South Africa). According to Moroccan and South African entrepreneurs, male clients sometimes refuse to speak with them, or indicate that they prefer to do business with another man. Similar situations were experienced during business meetings. As one South African entrepreneur mentioned, she often has to bring a male team member to such meetings, as the men on the other side refuse to talk with her. However, negative social attitudes do not only come from men. It was also noted that women feel judged by other women for their decisions (Morocco). According to two Thai entrepreneurs, women are sometimes perceived as unable to learn the skills necessary for working in the cleantech sector. Nonetheless, the interview with a Moroccan man entrepreneur also showed that not all men have biases towards women. As was indicated by this entrepreneur and also by Moroccan women entrepreneurs, perceptions among younger generations seem to be shifting into a positive direction.

“[Women] are more honest, more serious than men, and I would love to have women in my team for these reasons. And they are as hardworking as men.”

Male entrepreneur from Morocco

Government support and policies. Governments can play a pivotal role in creating an environment that fosters innovation and entrepreneurship. Entrepreneurs from all four countries acknowledged that their government has been implementing policies to support entrepreneurs and the cleantech sector, but so far the policies have been limited. This was confirmed both by women and men respondents. Moreover, policies in South Africa and Morocco take gender equality into account, but this does not always translate into smooth practice. As stated by the South African entrepreneurs, companies that offer accelerator programmes approach women-led businesses to comply with regulations, but, in the end, do not follow through on their promises. One Thai respondent also indicated that government policies are not always effective in practice. The Thai government has implemented rules concerning sustainability, such as the prohibition of burning residual products to curb air pollution. However, these rules are not always upheld by farmers. This is unfortunate, as the Thai entrepreneur could use these waste products as a resource for new products. Hence, she would benefit from raised awareness among farmers about sustainable ways to comply with government regulations. Other limitations included a lack of understanding among government officials on innovation (South Africa) and a lack of government policies to support women entrepreneurs (Thailand).

Special programmes. All entrepreneurs noted the importance of programmes that support startups. These programs include accelerators, such as GCIP (see 5.4 for benefits of GCIP), but also incubators. As noted by two women entrepreneurs from Thailand, such programmes provide necessary training and help to grow networks. Perhaps even more important, participants are treated equally, regardless of their gender. However, entrepreneurs also pointed out that only few programmes exist (Thailand), and that most programmes provide similar training (Morocco and Thailand). Entrepreneurs said that such programmes are usually most relevant in the initial phases of the startup, but are not helpful when it comes to the later stages, such as commercialization (Morocco). Additionally, only a few programmes are focused specifically on cleantech (Thailand). More diversification between programmes could be a solution to this, as more experienced entrepreneurs found themselves stuck in programmes that taught them skills they already possess.

Team. Another challenge was found concerning establishing a team. Respondents from Morocco and Thailand noted that assembling the right team was challenging, yet crucial for developing their startup. The latter was also confirmed by the woman entrepreneur from Pakistan. Main difficulties arise concerning not having the financial means to pay employees a decent salary (Morocco), and conflicting interests, e.g. different perspectives on the future of the company (Thailand). As noted by the Moroccan programme coordinator, finding a skilled workforce is difficult, and this was also confirmed by the male Moroccan entrepreneur. Additionally, the man entrepreneur from Morocco indicated that he found it difficult to establish a diverse team. According to him, it was difficult to find women who wanted to work with him, because many job-related tasks involve visiting construction sites and travelling to rural areas, which Moroccan women seem to be unwilling to do. On the other hand, women entrepreneurs from Morocco and Thailand did not report any difficulties regarding this and emphasized that they give preference to women and young people when hiring or establishing business relationships.

Networks and networking events. Networks are crucial if entrepreneurs want to be successful. This was confirmed by all respondents, who indicated that their network provided them with information on cleantech, networking events, business opportunities, and guidance. Also, five women entrepreneurs and both men entrepreneurs said that networking events are crucial since this is a place where they can approach potential investors and partners. Seven women respondents did not report considerable difficulties with establishing their network but emphasized that it was mainly through the GCIP that they could do this. Two women respondents (Morocco and Thailand) indicated that women face more barriers in building their network and that men seem to prefer to support other men instead of their female counterparts. Furthermore, women entrepreneurs from all four

countries mentioned that having specific networking groups for women would help them, but these are currently not widely present. As indicated by two respondents (Pakistan and South Africa), women have different needs and questions, and women networks could provide a safe space to talk about these comfortably.

Information. Seven women entrepreneurs did not encounter any difficulties with accessing information. Information is provided by the government (Pakistan and Thailand), available through the GCIP (Morocco and Thailand), networks (Morocco and Thailand), or online (Morocco, Thailand). However, South African women entrepreneurs encounter more difficulties accessing relevant information, which is possibly related to the fact that they have less access to networks and networking events.

5.2.3 Specificities of the cleantech sector

While many challenges the respondents face are connected to entrepreneurship more broadly, we have also found barriers specific to the clean technology sector. Additionally, some of the challenges intersect. For example, finance-related challenges are more pressing within the cleantech sector, as research and development of prototypes and the production of the final product requires high initial investment. Hence, access to funding is crucial for cleantech startups.

Furthermore, governments play a crucial role in supporting cleantech. On the one hand, cleantech startups require more time to scale and to become profitable than other businesses (Jensen et al., 2019). Governments can create an enabling environment by offering certain benefits, such as tax exemptions and subsidies. On the other hand, promoting the use of cleantech products through government policies helps startups survive, as it makes their product more affordable and hence attractive to customers. (See Appendix C3 for an overview of challenges and frequencies).

Education. Only one woman respondent said not to have completed a STEM-related education, but without labelling it as a challenge. However, all other respondents had completed education in this field. Women entrepreneurs from all four countries agreed that their education helped them with their startup, enabling them to understand different technologies better and apply them. Moreover, some women indicated that they resumed their studies when they realized its necessity for developing their entrepreneurial activities or started a new study to gain the knowledge needed. Furthermore, some women entrepreneurs had followed classes on social entrepreneurship or business administration which was also mentioned as being useful for their careers (Pakistan, Morocco, and Thailand). At the same time, however, women entrepreneurs indicated that they were in the minority during their studies, especially those in South Africa. The latter suggests that access to (STEM) education is still restricted for women while having solid (technical) knowledge was depicted as crucial by the respondents.

Male-domination. The presence of women is not only lacking in education but also within the cleantech sector, as indicated by both women and men entrepreneurs from all countries. On the one hand, this was not seen as an additional challenge by one woman entrepreneur from Pakistan and all women entrepreneurs from Thailand. Nonetheless, other women entrepreneurs did perceive it as a challenge to have only few other women in cleantech. The reasons partly overlap with those already discussed within the categories of ‘funding’ and ‘professional environment’, including stereotypical ideas about gender norms and roles and not being taken seriously as business leaders. Additionally, women entrepreneurs said that they missed female role models, that it is more difficult for women to find a mentor, and that they missed out on business opportunities because men tend to favor working with other men. Moreover, one Moroccan woman said that she knew women entrepreneurs who decided to leave the sector because of gender-related challenges. Women entrepreneurs from South Africa mentioned that they struggled to set up supply chains because men refused to engage in business with them, which was only solved until someone from within their network could help them. The additional barriers faced by women within the cleantech sector was acknowledged by both men entrepreneurs. The respondent from Morocco connected this to cultural norms but noted that this is especially prevalent within older generations. According to the same respondent, this mentality has been changing recently, and more and more women enter the cleantech sector.

5.2.4 Covid-19

As expected, the Covid-19 pandemic created new challenges for entrepreneurs. However, for some entrepreneurs, the crisis led to new opportunities, ranging from new product creation to collaboration with other startups.

Challenges. Strict lockdowns across the world posed significant obstacles to cleantech entrepreneurs. Operation sites were shut down in Pakistan and Morocco, and (international) shipment of products was seriously disturbed for entrepreneurs in Thailand and Morocco. The latter resulted in a disruption of supply chains and decreased sales for Moroccan and Thai women entrepreneurs. Moreover, two Thai entrepreneurs said that big orders had been canceled due to the dire financial situation their clients find themselves in. Both South African women entrepreneurs pointed out that they missed out on much-needed government subsidies, which were redistributed toward the health sector. Moreover, they claimed that so-called relief funds that were made available for businesses, were practically inaccessible for women. According to one South African entrepreneur, women apply for these funds but do not receive them, while men do.

“In Pakistan, all the businesses are shut down and there are no financial allowances for the business community. My additional job as a teacher is what helps me survive now.”

Opportunities. Despite the challenges that the current pandemic brings with it, it has also brought new opportunities. Six women entrepreneurs pointed out that they have also had positive developments linked to the unprecedented situation imposed by the crisis. Interestingly, those entrepreneurs that did not have a direct financial benefit still mentioned some silver linings. According to two women entrepreneurs (Morocco and Thailand), the crisis helped their personal and professional development, as unexpected situations ask for resilience and provide an opportunity to reassess taken paths. Furthermore, two women entrepreneurs from Thailand decided to join forces and collaborate on producing new products for which there was now an increased demand, such as sustainable face masks. On the other hand, neither of the men entrepreneurs indicated any benefits experienced from the pandemic’s unprecedented situation. Also, the resilience and innovative mindset of GCIP alumni became evident in an article published by UNIDO (Burrell 2020). Potentially, the post-pandemic world will give rise to even more opportunities for clean technology businesses, as “calls for green stimulus and technology, science and innovation-driven solutions [are] growing louder.” (Ibidem.)

5.3 GCIP benefits and other enabling factors

GCIP. All entrepreneurs named their GCIP participation as paramount for the advancement of their startup. Half of the women participants noted GCIP’s focus on providing equal opportunities and women empowerment as the main benefit. Furthermore, learning about business- and marketing strategies, gaining knowledge on how to develop the product, and networking opportunities, were listed among the top benefits. For instance, participation in the programme allowed entrepreneurs to connect with fellow businesspeople, domestically and internationally, as well as to find potential clients and investors. The financial prize that winners of the accelerator competition win was mentioned by two women entrepreneurs as an advantage.

Other enabling factors. Literature suggests that domestic responsibilities are among the most pressing constraints for women in pursuing a professional career. Although having to take care of their family while also working for their startup was reported by both one Moroccan, as well as one Pakistani female respondent as a constraint, the other interviewees did not share this view. On the contrary, the support of friends and family played a major role in setting up the company for eight respondents. Albeit some initial hesitation of some family members and friends because of not viewing entrepreneurship as a viable career choice, they all supported the female entrepreneurs eventually. As indicated by several women entrepreneurs, families expect them to pursue a career with more certainty, because this is what mostly happens when someone has completed higher education. Nonetheless, once these entrepreneurs showed the positive results of their businesses, all the families were on board. In some cases, such as in Thailand, the female entrepreneurs even got their families involved in their business, thus creating new

employment opportunities. Creating job prospects, specifically for other women, was also mentioned by one Moroccan entrepreneur.

Apart from the support entrepreneurs receive from their environment, personal characteristics were raised as an important factor for success. Within this category, respondents stressed the importance of having an entrepreneurial mindset, which includes having problem-solving skills, being persistent, motivated, and passionate, and the willingness to take risks. As discussed above, to enable entrepreneurship in the cleantech sector, conducive government policies, cleantech accelerators and incubators, and access to networks are also essential.

VI. Discussion

Many of the challenges found in the desk research were, as expected, confirmed by the primary data. These include (i) limited access to funding, (ii) negative social attitudes and gender stereotyping, and (iii) male-domination of the cleantech sector. Although some of these barriers exist both for men and women, the primary data verified that gender acts as an exacerbating factor in many cases. Despite the similarities, our primary data uncovered further barriers specific for women entrepreneurs and the cleantech sector on the one hand, and contradicts the secondary data on the other (see Appendix D1 for an overview).

Personal characteristics. Personality traits influence the development and management of businesses (UKEssays, 2018). Some research argues that these traits differ between men and women and use this as an explanation for gender differences in entrepreneurship (Baron et al., 2001; Baughn et al., 2006; Bosma et al., 2020; Elam et al., 2019; LSDC, 2018). According to these studies, women tend to feel less self-confident and perceive themselves as inferior to their male counterparts, which limits their success. In contrast, our findings highlight that women entrepreneurs interviewed were well aware of their capabilities and skills. According to them, the problem lies within their environment, which does not acknowledge their competency and perceives them as unequal. Moreover, respondents highlighted the characteristics that help them thrive as women entrepreneurs, such as having the right mindset and being passionate and motivated. However, these traits have been identified as essential for succeeding in entrepreneurship for both men and women. A possible explanation for this difference is that our respondents were successful alumni of the GCIP accelerator, which trained and supported entrepreneurs equally, notwithstanding their gender. Therefore, we can assume that women entrepreneurs interviewed were in better conditions because they participated in the programme than their colleagues trying to set up companies independently. Moreover, personal characteristics can also change based on one's life experiences and external environment. People tend to gain more confidence once they become successful and achieve their goals. Hence, this can be the case with our women respondents, who have already set up a successful business and have positive prospects for further growth of their startups.

Family support. A second significant difference that was found relates to family life and includes both support from family and women's domestic responsibilities. Based on the desk research, it was expected that entrepreneurs would experience a lack of support from their immediate environment and that this would be an impeding factor for their success. Moreover, combining domestic responsibilities with leading a startup was anticipated as the main barrier for women (SEDA, 2019; Meek, 2010; Sundaresan, 2014). Nevertheless, our primary data demonstrated that the family turned out to be a great source of support and showed an understanding that women spent the most time on the business. While some family members showed some initial reservations concerning entrepreneurship, these vanished when women entrepreneurs proved their success. This difference may be related to the change in social norms, especially in Pakistan and Thailand, and to the fact that entrepreneurship is becoming a more accepted form of making a living. Also, the majority of women interviewed received higher education, for which family support is usually also needed. It is also worth noting that the background of our respondents matters too. As we only interviewed successful alumni of the GCIP, who clearly would not have come this far without family support, those with different experiences were potentially not in the sample group.

Networks and networking events. Desk research showed that networks, and connected to them, networking events, are more difficult for women to access (Thakur & Walsh, 2013). Literature suggests that reasons can be found in the fact that women are structurally excluded from such networks. As these networks tend to be dominated by men (Forret and Daugherty, 2004), women face psychological barriers to enter (Greguletz et al., 2019). On the other hand, our primary data suggest that the women entrepreneurs managed to establish a broad network, which allowed them to attend networking events. The latter enabled them to access information and business opportunities and provided them with connections to investors. This difference between primary and secondary data may arise from the fact that the women in our sample group all participated in the GCIP. As noted, this accelerator has been crucial for most of them to establish a network. Nonetheless, women entrepreneurs confirmed that networks are still largely male-dominated and that it would be helpful to connect more with other women.

Accelerators. Primary data indicated that entrepreneurs noticed a lack of accelerators as a limiting factor. This finding was less expected, as it had not come up in the desk research. Perhaps this is due to the fact that all respondents from our sample group took part in GCIP and thus are well aware of the benefits such programmes bring. Moreover, respondents highlighted that more guidance is needed for their companies after finishing the GCIP. Reaching the stage of commercialization is, for instance, where many cleantech entrepreneurs struggle and need longer assistance from their GCIP mentors.

Team. The challenges experienced in assembling the right team were not found in the desk research either. Entrepreneurs, both women and men, pointed out that it was difficult to find people with the right skills and motivation. This seems to be especially prevalent within the cleantech sector. First, some of the more technical aspects require a high level of education. Second, cleantech startups need more time to become profitable, as compared to startups in other sectors. Thus, it takes time for a startup to generate enough revenue to be able to pay (potential) employees.

Government support and policies. Lastly, our primary data highlighted the need for adequate government policies. On the one hand, this concerns policies that support women and entrepreneurship. As women entrepreneurs noted, policies are needed to prevent gender discrimination (South Africa), and could be important to motivate more women to engage in cleantech. Concerning the latter, policies could help alleviate negative perceptions surrounding entrepreneurship. Regarding policies related to cleantech, as respondents indicated, this is needed because there is still little awareness about the importance of products and services that are environmentally friendly. From a financial perspective, cleantech products may not always be the preferred option for consumers, as they tend to be more expensive than traditional products. Incentives from the government to buy cleantech products could help boost sales and hence, profits of cleantech startups.

VII. Conclusion and Policy Recommendations

Clean technologies are at the forefront of the ongoing fourth industrial revolution, which has the potential to transform the world into a better place. Cleantech promotes more sustainable and inclusive development and helps to build back better in times of crisis. However, the full capacity of the cleantech industry is hindered due to the exclusion of women from this field. Clean technologies have been traditionally regarded as a male prerogative, and even today, women encounter many difficulties when starting their business in this industry. For this reason, the present paper has sought to shed light on the challenges faced by the female cleantech entrepreneurs, and explored the opportunities to solve them. By focusing on women and men GCIP alumni from Morocco, Pakistan, and Thailand the aim of this study was to uncover challenges specific to gender, entrepreneurship, and cleantech.

Overall, our findings highlighted that women cleantech entrepreneurs experience various challenges. A **lack of funding** and a **limiting and discouraging professional environment** were identified as the most pressing obstacles. The majority of female respondents struggled to obtain bank loans and private capital due to different reasons, which vary from country to country. The Bank's unfamiliarity with social entrepreneurship and their perception of startups as risky undertakings, along with women's barriers to presenting collateral, were the primary reasons for banks rejecting credit demands from women entrepreneurs. On the other hand, women entrepreneurs

also struggle to access private capital as investors are after short-term financial gains, which cleantech products cannot easily guarantee. **Traditional views and gendered perceptions** present additional obstacles for women in this regard. **Sexual harassment**, which was observed in South Africa, further demonstrates the harsh conditions women entrepreneurs face. **Challenges found in the professional environment** were reported to be connected to **gender norms**, the **absence of female role models and women networks**, the **shortage of adequate government policies** supporting women entrepreneurs, and the **difficulty to assemble a team**.

The findings also suggested that difficulties concerning the cleantech sector were no less profound. However, the evidence we found is not uniform across all countries. For instance, accessing relevant, business related, information, posed a barrier for South African, Pakistani, and Thai interviewees, while Moroccan respondents did not find this problematic. By the same token, the male-domination of the cleantech sector was perceived as a barrier for South African, Pakistani, and Moroccan entrepreneurs, but not by Thai respondents. On top of these challenges, all entrepreneurs pointed out the negative impact of the Covid-19 crisis on their businesses, but also mentioned opportunities brought by the pandemic.

Besides the challenges, our research has also recognized opportunities to increase women's representation in cleantech entrepreneurship and overcome the barriers identified. Thus, based on the findings of the study, we would recommend:

1. **Government and international organizations** to implement gender-responsive approaches across all policy-making levels as well as to stimulate the tracking of gender-disaggregated data. Without accurate data, it is impossible to make informed, evidence-based policy decisions.
2. **Governments, international organizations, civil society organizations, and academia** to further raise awareness among women and men, girls and boys about gender stereotyping and biases. Stereotypical ideas about different genders are not innate but rather stem from social norms, upbringing, and education and have a significant impact on an individual's career choice and success. It exceptionally affects women in STEM fields, which are still mainly dominated by men. To solve this issue, governments and (international) organizations should focus more on creating gender-responsive education and debunking gender stereotypes through various campaigns and initiatives.
3. **Governments, international organizations, the private and financial sectors** to invest in accelerator programmes, mentoring, networking and coaching, to help women cleantech entrepreneurs succeed. Incubators and accelerators such as GCIP are essential for the survival and further development of cleantech start-ups, especially in the initial development phases. They provide necessary training and information for entrepreneurs. Also, they enable better access to networks and funding.
4. **Governments** to develop and implement policies that encourage women to pursue a professional career in clean technology. More women are needed in the sector to ensure a more gender-balanced environment. It will help combat challenges like a lack of role models for women, male-dominated networks and can contribute to changing gendered perceptions.

VIII. Bibliography

- Abouzahr, K., Krentz, M., Harthorne J. & Taplett, F. B. (2018). *Why Women-Owned Startups Are a Better Bet*. Boston Consulting Group. Retrieved January 31, 2021, from <https://www.bcg.com/publications/2018/why-women-owned-startups-are-better-bet#:~:text=Yet%20businesses%20founded%20by%20women,better%20investments%20for%20financial%20backers>
- Alsos, G. A., Ljunggren, E., Carter, S. & Jørstad, M. O. (2017). Women, Family and Entrepreneurship: Strategies for Managing Work-life Balance Challenges. *Academy of Management Annual Meeting Proceedings*. Available at <https://doi.org/10.5465/ambpp.2016.16079abstract>
- Alsos G. A., & Ljunggren E. (2016). The role of gender in entrepreneur–investor relationships: A signaling theory approach. *Entrepreneurship Theory and Practice*, 41: 567–590.
- Baron, R., G. Markman & A. Hirza (2001). Perceptions of Women and Men as Entrepreneurs: Evidence for Differential Effects of Attributional Augmenting. *Journal of Applied Psychology* 86(5), 923–929.
- Baughn, C., Chua, B. L., & Neupert, K. E. (2006). The normative context for women’s participation in entrepreneurship: a multicountry study. *Entrepreneurship Theory and Practice*, 30(5), 687–708.
- Bosma, N., Hill, S., Ionescu-Somers A., Kelly, D., Levie J. and Tarnawa, A. (2020). *2019-2020 Global Report*. Global Entrepreneurship Monitor.
- Bouzekraoui, H. and Ferhane, D. (2017). An Exploratory Study of Women’s Entrepreneurship in Morocco. *Journal of Entrepreneurship: Research & Practice*, Vol. 2017, doi: 10.5171/2017.869458
- Bridle, R., Sharma, S., Mostafa M. & Geddes, A. (2019). *Fossil Fuel to Clean Energy Subsidy Swaps: How to pay for an energy revolution*. GSI Report. International Institute for Sustainable Development (IISD). Available at <https://www.iisd.org/system/files/publications/fossil-fuel-clean-energy-subsidy-swap.pdf>
- Buchmann, M. (2017). *Cleantech startups: German utilities bridging the valley of death?* Energy Efficiency. Retrieved January 31, 2020, from <https://ee-ip.org/article/cleantech-startups-german-utilities-bridging-the-valley-of-death-1082>
- Bullock, G. (2015). *Challenges facing startups (and resources to overcome them)*. Center for Entrepreneurial Innovation. Retrieved January 10, 2021, from: <https://www.ceigateway.com/blog/cleantech-startup-challenges>
- Burnett, S. B., Gatrell, C. J., Copper, C. L. & Sparrow, P. (2013). “Fathers at work: A ghost in the organizational machine”, in *Gender, Work and Organization*, Vol. 20, No. 6, Nov. 2013, pp. 632–646.
- Business at OECD. (2020). *Making the Green Recovery Work for Jobs, Income and Growth*. Retrieved November 26, 2020, from <http://biac.org/wp-content/uploads/2020/09/KM-ENV-2020-09-FIN-Contributions-to-OECD-Ministerial-Council-Roundtable-of-Environment-Ministers-1.pdf>

Byrne, J., Fattoum, S. & Diaz Garcia, M.C. (2019). Role Models and Women Entrepreneurs: Entrepreneurial Superwoman Has Her Say. *Journal of Small Business Management*, 57:1, 154-184, DOI: 10.1111/jsbm.12426

Carranza, E., Dhakal, C. & Love, I.. (2018). “Female Entrepreneurs: How and Why are they Different?” World Bank, Washington, DC. License: *Creative Commons Attribution CC BY 3.0 IGO*

Casciaro, T., Gino, F. & Kouchaki, M. (2014) .The contaminating effects of building instrumental ties: How networking can make us feel dirty. *Administrative Science Quarterly* 54(4):705–735.

Cornet, A. & Constantinidis, C. (2004). Entreprendre au féminin: une réalité multiple et des attentes différenciées. *Revue française de gestion*, 30151, 191-204.

Cross, R. & Thomas, R. (2011). A smarter way to network. *Harvard Business Review* 89(7/8):149–153.

Devadas, S., and Kim, Y. U. (2020). *Exploring the Potential of Gender Parity to Promote Economic Growth*. Research and Policy Brief, No. 39. World Bank, Washington, DC.

EBRD. (2018). *Banking for women in Morocco: An overlooked business Opportunity*.

Elam, A. B., Brush, C. G., Greene, P.G., Baumer, B., Dean, M. and Heavow, R. (2019). 2018/2019 Women’s Entrepreneurship Report. *Global Entrepreneurship Monitor*. Global Entrepreneurship Research Association, London Business School. London.

European Institute for Gender Equality. (2019). *Gender Analysis*. Retrieved November 26, 2020, from <https://eige.europa.eu/gender-mainstreaming/methods-tools/gender-analysis>

GEF (2018). Evaluation of the GEF-UNIDO Global Cleantech Innovation Programme. Retrieved from https://www.thegef.org/sites/default/files/council-meeting-documents/EN_GEF.ME_C.55.inf_03_GEF-UNIDO_Cleantech_program_evaluation_2018.pdf

Fernandez, C., & Komives, P. (2019, September 1). Barriers to Entrepreneurship: Views from Support Organizations. Retrieved November 26, 2020, from <https://www.genglobal.org/research/barriers-entrepreneurship-views-support-organizations>

Forret, M. L. & Dougherty T. W. (2004). Networking behaviors and career outcomes: Differences for men and women? *Journal of Organizational Behavior* 25(3): 419–437.

Gaddy, B.E., Sivaram, V., Jones, T. B. & Wayman, L.(2017). Venture Capital and Cleantech: The wrong model for energy innovation. *Energy Policy*, Volume 102, Pages 385-395, ISSN 0301-4215, <https://doi.org/10.1016/j.enpol.2016.12.035>

Gammage , S., Diamond, N. & Packman, M. (2005). Enhancing Women’s Access to Markets: An Overview of Donor Programs and Best Practices. *USAID*.

Global Entrepreneurship Monitor (GEM). (2018). *Entrepreneurial Behaviour and Attitudes Thailand*. Retrieved December 17, 2020, from <https://www.gemconsortium.org/economy-profiles/thailand-2>

Global Entrepreneurship Monitor. (2017). *Global Report 2016/17*. Global Entrepreneurship Research Association.

Gneezy, U., and Rustichini, A. (2004). Gender and Competition at Young Age. *American Economic Review Papers and Proceedings* 94(2): 377-381.

Gray, K. R. (2001). Women entrepreneurs in Morocco: A preliminary investigation. *The Journal of North African Studies*, 6(4), 64-74. doi:10.1080/13629380108718451

Greguletz, E., Diehl M. R. & Kreutzer, K. (2019). Why women build less effective networks than men: The role of structural exclusion and personal hesitation. *Human Relations*. 72(7):1234-1261. doi:10.1177/0018726718804303

Guelich, U. (2018). *Thailand Report: 2017-2018*. Global Entrepreneurship Monitor

Henry, C., Foss, L. & Ahl, H. (2016). Gender and Entrepreneurship Research: A Review of Methodological Approaches. *International Small Business Journal* 34 (3): 217–241. doi:10.1177/0266242614549779

Harris Rimmer., S. (2017). Gender-smart Procurement Policies for Driving Change. Chatham House. Global Economy and Finance Department. Available at: <https://www.chathamhouse.org/sites/default/files/publications/research/Gender-smart%20Procurement%20-%202020.12.2017.pdf>

Hassan, K., Varadan M. & Zeisberger, C. (2020). How the VC Pitch Process Is Failing Female Entrepreneurs. *Harvard Business Review*. Retrieved January 16, 202, from <https://hbr.org/2020/01/how-the-vc-pitch-process-is-failing-female-entrepreneurs>

Hotho, S., & Champion, K. (2011). Small businesses in the new creative industries: innovation as a people management challenge. *Management Decision*, 49(1), 29–54.

InfoDev. (2014). *Building Competitive Green Industries: The Climate and Clean Technology Opportunity for Developing Countries*. Washington, DC: World Bank. License: Creative Commons Attribution CC BY 3.0. Available at <https://www.infodev.org/infodev-files/green-industries.pdf>

IRENA. (2019). *Call to Action in Response to COVID-19: Renewable Energy is a Clean Part of the Solution*. Abu Dhabi. Retrieved November 26, 2020, from <https://www.irena.org/publications/2019/Jan/Renewable-Energy-A-Gender-Perspective#:~:text=Renewable%20energy%20employs%20about%2032,in%20the%20energy%20sector%20overall.&text=Building%20on%20a%20ground%2Dbreaking,talents%20to%20be%20fully%20utilised>

Jensen, F., Löf, H. & Andreas, S. (2019). New ventures in Cleantech: Opportunities, capabilities and innovation outcomes. *Business Strategy and the Environment* 29(1).

Kanze, D., Huang, L., Conley M. A. & E. Higgins, T. (2018). We Ask Men to Win and Women Not to Lose: Closing the Gender Gap in Startup Funding. *AMJ*, 61, 586–614, <https://doi.org/10.5465/amj.2016.1215>

Kuckartz, U. (2019). Qualitative Text Analysis: A Systematic Approach. In: Kaiser G., Presmeg N. (eds) *Compendium for Early Career Researchers in Mathematics Education*. ICME-13 Monographs. Springer, Cham. https://doi.org/10.1007/978-3-030-15636-7_8

Langowitz, N., & Minniti, M. (2007). The entrepreneurial propensity of women. *Entrepreneurship Theory and Practice*, 31, 341–364.

Lee-Gosselin, H. & Grisé, J. (1990). Are women owner-managers challenging our definitions of entrepreneurship? An in-depth survey. *Journal of Business Ethics*9 (4-5):423 - 433.

MacNabb, A., J. McCoy, P. Weinreich, and Northover, M. (1993). Using Identity Structure Analysis (ISA) to Investigate Female Entrepreneurship. *Entrepreneurship and Regional Development*5(4): 301-313.

Miranda, L. (2020, June 08). 'Historic and unprecedented': Women have been hit hardest by coronavirus layoffs. Retrieved November 26, 2020, from <https://www.nbcnews.com/business/business-news/women-hit-hardest-coronavirus-layoffs-are-we-heading-she-cession-n1226256>

Macmillan Dictionary. (2017). Hepeat. In *Macmillan Dictionary*. Retrieved November 28, 2020, from <https://www.macmillandictionary.com/dictionary/british/hepeat#:~:text=DEFINITIONS1-,1,was%20successfully%20hepeated%20by%20Walter.>

Madzivhandila, T. S. and Dlamini, M. S. (2015). *Woman and youth owned enterprises in South Africa: Assessing the needs, opportunities and challenges*. SAAPAM 4th Annual Conference Proceedings - Limpopo Chapter 2015. SEDA. Retrieved November 26, 2020, from <http://www.seda.org.za/Publications/Publications/Woman%20and%20Youth%20Owned%20Enterprises%20in%20South%20Africa%20-%20Assessing%20The%20Needs,%20Opportunities%20and%20Challenges.pdf>

Meek, W.R. (2010). The role of family member support in entrepreneurial entry, continuance, and exit: An autoethnography. In Stewart, A., Lumpkin, G.T. and Katz, J.A. (Ed.) *Entrepreneurship and Family Business (Advances in Entrepreneurship, Firm Emergence and Growth*, Vol. 12), Emerald Group Publishing Limited, Bingley, pp. 87-111. [https://doi.org/10.1108/S1074-7540\(2010\)0000012006](https://doi.org/10.1108/S1074-7540(2010)0000012006)

Morris, M., Miyasaki, N., Watters, C. & S. Coombes. (2006). “The Dilemma of Growth: Understanding Venture Size Choices of Women Entrepreneurs.” *Journal of Small Business Management* 44(2): 221-244.

Naude, W. (2011). *Entrepreneurs and Economic Development*. *United Nations University*. Retrieved July 11, 2020, from <https://unu.edu/publications/articles/are-entrepreneurial-societies-also-happier.html>

Niederle, M., and Vesterlund, L. (2007). Do Women Shy Away From Competition? Do Men Compete Too Much? *Quarterly Journal of Economics*122(3): 1067-110

Noguera, M., Alvarez, C. & Urbano, D. (2013). Socio-cultural factors and female entrepreneurship. *Int Entrep Manag J* 9, 183–197. <https://doi.org/10.1007/s11365-013-0251-x>

OECD. (2012). *Gender Equality in Education, Employment and Entrepreneurship: Final Report to the MCM 2012*

OECD & European Union. (2015). *Policy Brief on Expanding Networks for Inclusive Entrepreneurship: Entrepreneurial Activities in Europe*.

OECD. (2019). *Gender, Institutions, and Development Database*.

Pernick, R., & Wilder, C. (2007). *The clean tech revolution: The next big growth and investment opportunity*. New York: HarperCollins e-books.

Peters HE, Irvin-Erickson Y, Adelstein S, Malik A, Derrick-Mills T, Valido A, Esplage D. (2019). *Qualitative evidence on barriers to and facilitators of women’s participation in higher or growing productivity and male-dominated labour market sectors in low- and middle-income countries*. London: EPPI Centre, Social Science

Research Unit, UCL Institute of Education, University College London. Retrieved from https://www.urban.org/sites/default/files/publication/100371/qualitative_evidence_systematic_review_0.pdf

Pronyk, P., Hargreaves, J., Kin, J., Morison, L., Phetla, G., Watts, C., Busza, J. & Porter, J. (2006). Effect of a Structural Intervention for the Prevention of Intimate-Partner Violence and HIV in Rural South Africa: A Cluster Randomized Trial. *The Lancet* 368, pp. 1973-83

Resources to Advance LEDS Implementation (RALI). (2019). *Women in the Clean Energy Transition*. Retrieved Kanuar 10, 2021, from <https://www.climatelinks.org/resources/webinar-women-clean-energy-innovation>

Richardson, P., Howarth, R. & Finnegan, G. (2004). The Challenges of Growing Small Businesses: Insights from Women Entrepreneurs in Africa. *SEED working paper* No. 47. Series on Women's Entrepreneurship Development and Gender Equality — WEDGE.

Sandhu, T., Chaudhry, A., Akbar, N., Ahmad, I., 2005. Effect of Socio-Economic Factors on the Female Education in Rural Areas of Faisalabad (Pakistan). *Journal of Agriculture and social Sciences* 41-42, pp. 1813-2235

Sang, R. (2018, August 01). Moroccan Female Entrepreneurs Tackle Misconceptions, Challenges Head On. Retrieved November 26, 2020, from <https://www.morocoworldnews.com/2018/08/251573/female-entrepreneurs-tackle-misconceptions/>

Schindehutte, M., Morris, M., and Brennan, C. (2003). Entrepreneurs and Motherhood: Impacts on Their Children in South Africa and the United States. *Journal of Small Business Management*, 41(1), 94–107. <https://doi.org/10.1111/1540-627X.00069>

SEDA. (2019). *Women and Youth Owned SMMes. The status, needs, challenges, and opportunities in South Africa*. Integrated Report.

Sena, V., Scott, J. & Roper, S. (2012). Gender, Borrowing Patterns and Self-employment: Some Evidence for England. *Small Business Economics* 38 (4): 467–480. [10.1007/s11187-010-9272-9](https://doi.org/10.1007/s11187-010-9272-9)

Sharma, Y. (2013). Women Entrepreneur In India. *IOSR Journal of Business and Management* 15, no. 3, 09–14. <https://doi.org/10.9790/487x-1530914>.

Shipilov, A., Labianca, G., Kalysh, V. & Kalysh, Y. (2007). Career-related network building behaviors, range social capital, and career outcomes. *Academy of Management Proceedings* 1: 1–6.

Shruti, Lathwal. (2011). Women Entrepreneurs In India. *International Journal of Research in IT & Management*, Volume 1, Issue 3 (July, 2011), <http://www.mairec.org>

Silverberg & Choi. (2015). *Innovating in a New Market: Challenges for Cleantech*. Harvard University. Retrieved January 10, 2021, from <http://sitn.hms.harvard.edu/flash/2015/innovating-in-a-new-market-challenges-for-cleantech/>

St-syr. (2002). L'entrepreneuriat du secteur manufacturier quebecois : caracteristiques et acces au financement, 6eme cifpme, hec-montreal.

Sundaresan, S. (2014). Work-Life Balance – Implications for Working Women. *OIDA International Journal of Sustainable Development*, Vol. 7, No. 7, pp. 93-102, Available at: <https://ssrn.com/abstract=2505439>

Syed, J. (2010). Pakistan. In S. L. Fielden & M.J. Davidson (eds.), *International Research Handbook on Successful Women Entrepreneurs*. Cheltenham, UK: Edward Elgar Publishing. doi: <https://doi.org/10.4337/9781849806695.00006>

Thakur, A. and Walsh J. (2013). Characteristics of Thai Women Entrepreneurs: A Case Study of SMEs Operating in Lampang Municipality Area. *Journal of Social and Developmental Sciences*, Vol. 4, No. 4, 174-181.

The London Sustainable Development Commission. (2018). *Women in Cleantech: Is Cleantech Entrepreneurship missing out on the Diversity Dividend?*(pp. 1-68, Rep.)

Ugaz Estrada, C., Dolun, M., Schuber, K & Schmidt, N. (2020). *Industries post-Covid-19: A gender-responsive approach to global economic recovery*. Industrial Analytics Platforms. Retrieved January 16, 2021, from <https://iap.unido.org/articles/industries-post-covid-19-gender-responsive-approach-global-economic-recovery>

UKEssays. (2018). Entrepreneurs personal characteristics and influence on business. Retrieved November 25, 2020, from <https://www.ukessays.com/essays/business/entrepreneurs-personal-characteristics-and-influence-on-business-business-essay.php?vref=1>

UN. (n.d.). *Goal 9: Build Resilient Infrastructure, Promote Inclusive and Sustainable Industrialization and Foster Innovation*

UN. (n.d.). *United Nations Sustainable Development – 17 Goals to Transform Our World*. Retrieved November 25, 2020, from <https://www.un.org/sustainabledevelopment/>

UNESCO (2017). *Cracking the code: Girls' and women's education in science, technology, engineering and mathematics (STEM)*

UNIDO. (2018). *Global Cleantech Innovation Programme for SMEs and Startups*. Available at: <https://www.unido.org/sites/default/files/files/2017-12/GCIP-Brochure.pdf>

USAID & IUCN. (2014). *Women at the Forefront of the Clean Energy Future*. A White Paper. Initiative Gender Equality for Climate Change Opportunities (GECCO).

Wilson, F., Kickul, J. and Marlino, D. (2007). Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: implications for entrepreneurship education. *Entrepreneurship Theory and Practice*, Vol. 31 No. 3, pp. 387-406.

World Bank. (2018). *Women, Business, and the Law*. Retrieved January 20, 2021, from <https://openknowledge.worldbank.org/handle/10986/29498>

World Bank, (2020). *Gender Data Portal*. Retrieved January 20, 2021, from <https://www.worldbank.org/en/data/datatopics/gender>

World Economic Forum. (2019). *Global Gender Gap Report 2020*. Retrieved from http://www3.weforum.org/docs/WEF_GGGR_2020.pdf

APPENDIX

Appendix A: Methodology

A1: List of questions interviews national programme coordinators

1. Could you tell us more about the GCIP programme and its aim?
2. How do participants benefit from the programme? Do you think women and men benefit from it differently
3. According to your experience, what are the key challenges women entrepreneurs in the cleantech sector face?
4. Which challenges do entrepreneurs in the clean tech sector face when starting a business?
5. What were some of the programmes' initiatives to draw more female-led entrepreneurs to apply for the programme?
6. What role do (local) government policies play for enhancing women entrepreneurship and therefore gender equality?
7. What are other initiatives necessary to enhance participation of women entrepreneurs in the cleantech sector?
8. How can the cleantech sector contribute to the development of rural areas?
9. What are the expected changes in the women led startups in the cleantech sector as a result of Covid-19?

A2: List of question interviews GCIP alumni

1. When and why did you join the GCIP programme?
2. What were some of the biggest takeaways (in terms of benefits) from the programme?
3. If you could change something about the programme, what would it be?
4. Were you engaged in the cleantech sector before starting your own business?
5. Have you experienced any barriers/challenges to get funding for your business?
6. Is there sufficient access to information about financing a business / about how to get funding?
7. Do you receive or have you received any additional funding – apart from GCIP (e.g. local organizations / institutions)? If yes, how did you find out about this opportunity?
8. Do you feel that you have ever been treated differently than others when it came to getting funding? Why (not)?
9. How do you achieve legitimacy for your company?
10. Was it easy to set up your company in terms of the legal process?
11. Are there policies to raise awareness of entrepreneurship as a career option for women in place? Would that be something useful for you?
12. Are you aware of any other programmes, such as GCIP, that help entrepreneurs launching their business?
13. Are you aware of any government policies that stimulate and support new entrepreneurs?
14. Did you complete any specific education related to the cleantech sector and / or to start a business?
1. Did you have the opportunity to access information about cleantech entrepreneurship through e.g. business related training, workshops, events, and networks?
2. Do you think having a lack of business experience could be a challenge for women to enter entrepreneurship?
3. What is it like to work in a male-dominated field?
4. Did you feel supported by your environment - your family, friends, colleagues - when making this decision?
18. Is it common in your environment that women engage in (cleantech) entrepreneurship?
19. How do you combine your work with your family life?
20. Have you ever experienced different treatment based on your gender?

21. Do you have access to a sufficient network?
22. What are, in your opinion, the key factors enabling entrepreneurs in the cleantech sector?
23. What are, in your opinion, the key factors limiting entrepreneurs in the cleantech sector?
24. How has Covid-19 influenced your business? Have you encountered any additional challenges?
25. Are there any aspects which specifically limit women when it comes to entrepreneurship in the cleantech sector that have not been mentioned in this interview yet?

A3: Table of main- and subcategories

Table 1. Overview of main- and subcategories (based on primary data)

| Category | Frequency (total number challenge was mentioned) |
|---------------------------------|--|
| R&D | |
| Time and capital intensive | 2 |
| Location | |
| Rural area | 4 |
| Funding | |
| Gender | 10 |
| Financial institutions | |
| Difficult to get a loan | 7 |
| Legitimacy | |
| Social entrepreneurship | 2 |
| Creating legitimacy for company | 8 |
| Investors | |
| Finding (reliable) investors | 14 |

| | |
|------------------------------------|----|
| Having investors | 2 |
| Funding through special programmes | 12 |
| Market | |
| Not having access to market | 4 |
| Reaching customers | 2 |
| Having access to market | 6 |
| Covid-19 | |
| Less growth | 4 |
| Funding | 3 |
| Lockdown | 6 |
| New opportunities | 8 |
| Cleantech | |
| Business experience | |
| No prior experience | 2 |
| Prior experience | 5 |
| Access to education | |
| Not completed relevant education | 3 |
| Completed relevant education | 10 |
| Male-domination | |
| Lack of women | 8 |

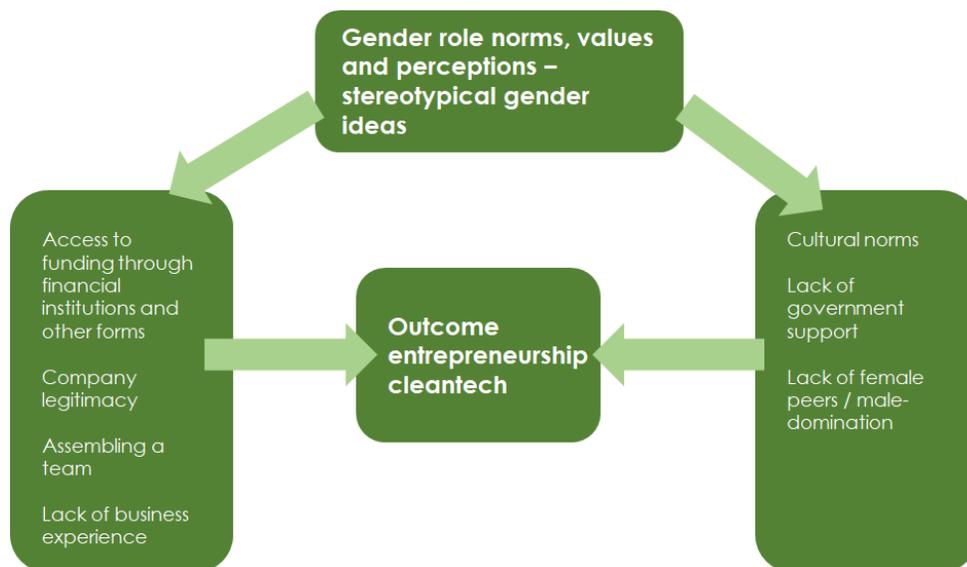
| | |
|---|----|
| Male-domination is not a limiting factor | 5 |
| Limited business opportunities for women | 6 |
| Less access to sector for women | 3 |
| Personal characteristics | |
| Mindset | |
| Entrepreneurial mindset | 8 |
| Religion | |
| Religious beliefs | 3 |
| Soft skills | |
| Having soft skills | 1 |
| Legal procedures | |
| Easy | 6 |
| Difficult | 1 |
| Personal environment | |
| Domestic responsibilities women | 4 |
| Friends/family | |
| Entrepreneurship not seems as a 'good' profession | 2 |
| Support from friends/family | 12 |
| Professional environment | |
| Incubators/accelerators (not GCIP) | |

| | |
|------------------------------------|----|
| Helpful | 4 |
| Not helpful | 6 |
| Government support | |
| Limiting / lack of support | 9 |
| Enabling government policies | 9 |
| Team | |
| Having a good team | 3 |
| Assembling a team | 4 |
| Perceptions | |
| Gendered perceptions | 4 |
| gendered perceptions | 16 |
| Negativity | 2 |
| Access to network | |
| Women networks | 4 |
| Being supported by network | 8 |
| Having access to networking events | 5 |
| Having a network | 12 |
| Information | |
| Difficult to access information | 6 |
| Access to information | 8 |

Appendix B: Literature review

B1: Figure of internal and external challenges

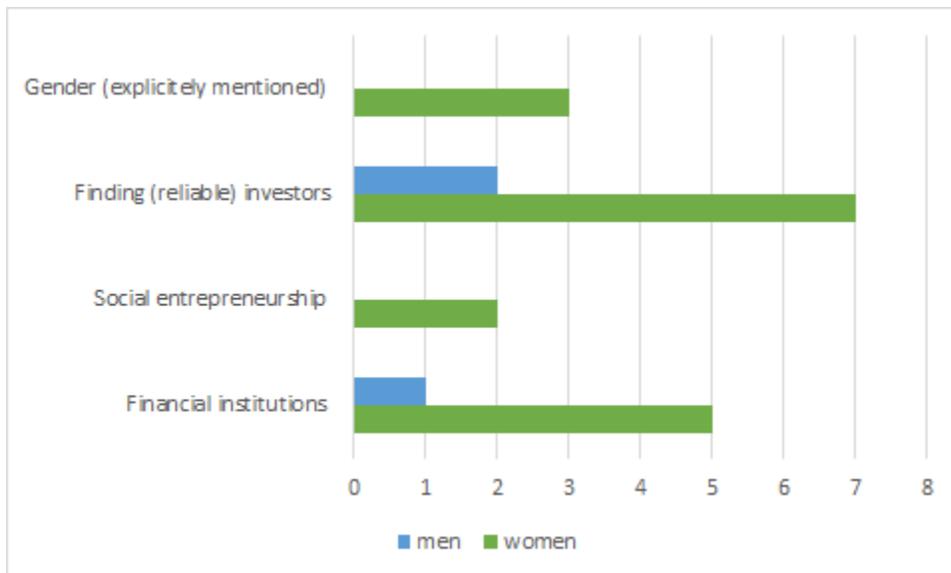
Figure 1. Internal and external challenges (Loosely based on *Woman and youth owned enterprises in South Africa: Assessing the needs, opportunities and challenges* by Madzivhandila and Dlamini, 2015 and *Women and Youth Owned SMMEs. The status, needs, challenges, and opportunities in South Africa*, integrated report by SEDA, 2019.)



Appendix C: Results

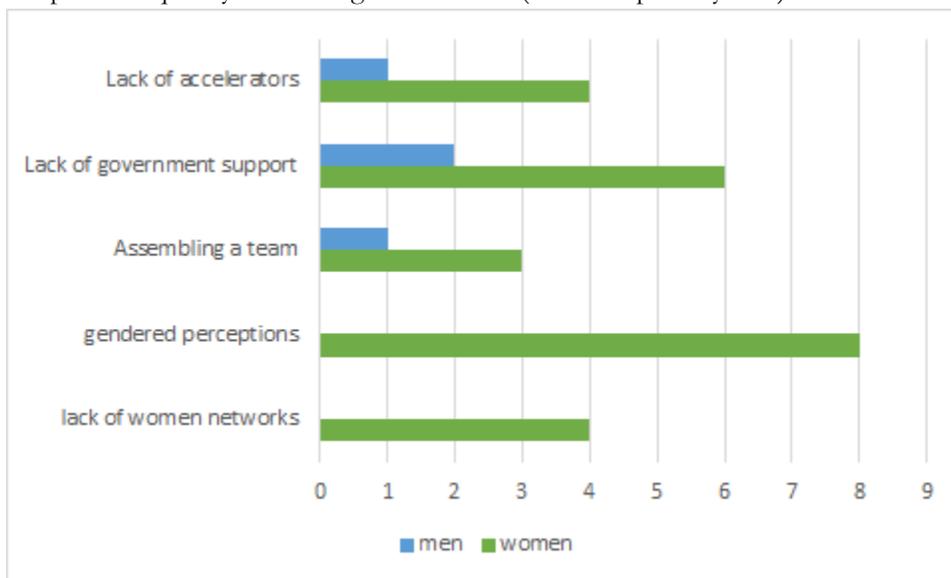
C1: Graph of challenges related to funding

Graph 1. Frequency of challenge mentioned (based on primary data).



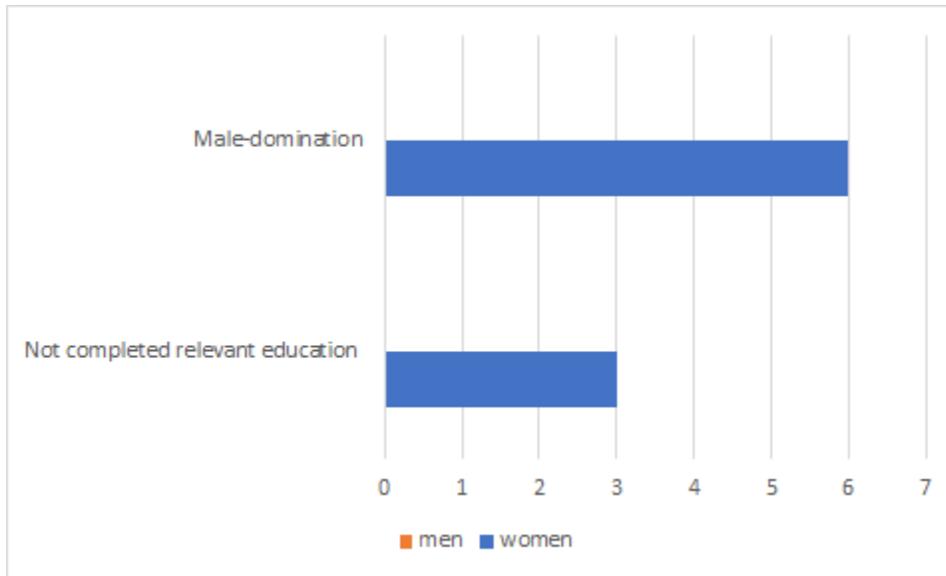
C2: Graph of challenges related to professional environment

Graph 2. Frequency of challenge mentioned (based on primary data).



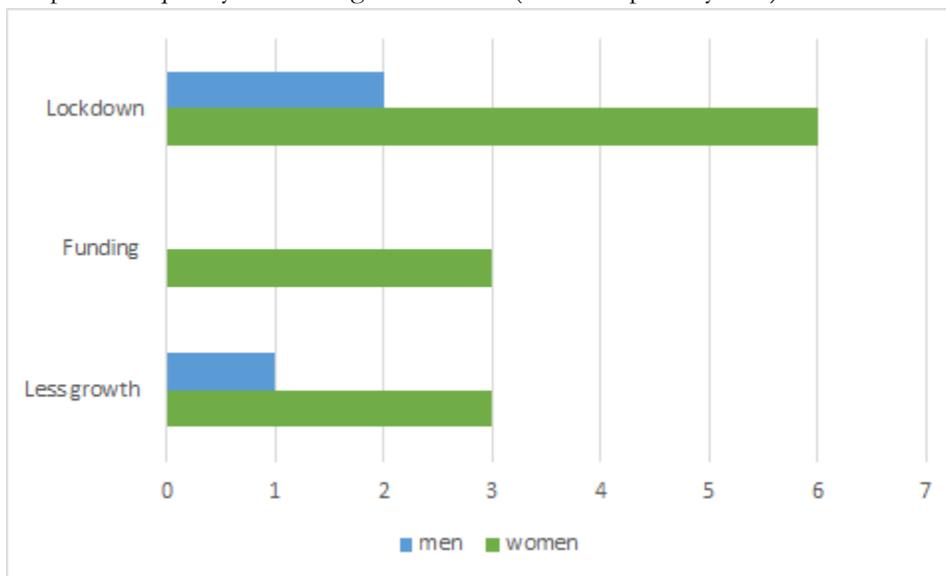
C3: Graph of challenges related to cleantech

Graph 3. Frequency of challenge mentioned (based on primary data).



C4: Graph of challenges related to Covid-19

Graph 4. Frequency of challenge mentioned (based on primary data).



Appendix D: Discussion

D1: Table of comparison between primary and secondary data

Table 2. Comparison between primary data ‘national project coordinators’ and ‘entrepreneurs’ and secondary data ‘literature’. (based on desk research and primary data)

When a challenge was mentioned, this is indicated with ‘+’; when a challenge was not mentioned, this is indicated with ‘-’.

| Challenge | Literature | Experts | Entrepreneurs |
|--|-------------------|----------------|----------------------|
| Negative gendered perceptions | + | + | + |
| Lack of government support and policies to promote (women) entrepreneurship and cleantech innovation | + | + | + |
| Discriminatory government policies | + | + | + |
| Lack of incubators and/or accelerators | - | - | + |
| Competitions less accessible for women | + | - | - |
| Assembling a team | - | + | + |
| Lack of access to networks and networking events for women | + | + | + |
| Lack of (access to) information | + | + | + |
| Lack of mentors and/or female role models for women | + | - | + |
| Lack of access to education for women | + | + | + |
| Lack of knowledge | - | + | + |
| Lack of access to loans | + | + | + |
| Lack of (reliable) investors | + | + | + |

| | | | |
|--|---|---|---|
| Social entrepreneurship not seen as viable career path | - | - | + |
| Sexual harassment | + | + | + |
| Lack of prior business experience | - | - | + |
| Cleantech sector is male-dominated | + | - | + |
| R&D is capital and time intensive | + | - | + |
| Lack of access to (international) markets | + | + | + |
| Difficult legal procedures for starting a company | - | - | + |
| Domestic responsibilities | + | + | - |
| Personal characteristics | + | - | - |
| Rural location | + | + | + |
| Lack of family support | + | - | - |
| Limited spatial mobility | + | + | + |