Women leading the green recovery

Promoting women in entrepreneurship and STEM will help build a sustainable and equal world

Daring Circles Women4ClimateAction

by the Women's Forum for the Economy & Society

WOMEN'S FORUM
FOR THE ECONOMY & SOCIETY

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Imagining a sustainable and equal world:

An entrepreneur in 2030

Francesca Giffoni was 18 when COVID-19 closed her school, took away her two surviving grandparents and removed her long-held ambition of studying astro-physics at Stanford. Although clever and academic, waves of lockdowns meant she was left to study on her own. There was no way she could attend an overseas university and her enthusiasm began to drain. She took on more of her family's domestic chores to help her mother who was struggling to work from home in their small apartment in Cortona. In her spare time, she learned more about the climate crisis after watching Greta Thunberg give a speech at the European parliament. It was only then that she became aware that almost three quarters of the family's food came from abroad; grown in regions that had been flattened to produce massive amount of non-native crops and flown or shipped in at an enormous carbon cost; all delivered in unrecyclable plastic. Packing away the food each week ignited an idea in the young Giffoni: she would research technology-enabled approaches to farming. She would understand how local communities could produce more of their own food; investigate the advances in plant nutrition and AI enabled monitoring that could support new methods of farming; and harness data analytics to devise solutions fast. She would find a team of people with skills and experience to help her: she would become a green entrepreneur.

Fast-forward to 2030. Saccharo, Europe's largest vertical farming company, employs 4200 people across the continent. The company's innovative solutions are protected by 65 different patents and venture capital funding has allowed Giffoni to scale her localised farming solutions to become a feature of many communities. Saccharo's farms provide food to the communities immediately surrounding them with zero carbon cost thanks to electric vehicles. Each farm operates as a co-operative; ensuring fair wages, equal pay for men and women and a share in the profits for all employees. 55% of farms are run and managed by women and women form 60% of Saccharo's workforce, fully represented at every level of management. The farms are powered by solar energy and biomass taken from offtakes, and the company uses less than one-fifth of the water required in traditional farming. The company is completely carbon neutral. Saccharo's packaging can be thrown as is onto a compost heap and will be completely decomposed, returning valuable nutrients to the soil, within 60 days.

Saccharo didn't get here without help. In 2022, Giffoni took a night class in a bioengineering that had flexible class times, meaning she could still help care for her aging parents. Thanks to a private sector partnership with the school, she was able to meet women working in sustainable solutions who became mentors to her as she developed her ideas. Giffoni's pitch scored very highly in the formalised points-assignment system used by the venture capital firm that she approached, and she was able to establish a partnership with an energy firm that would provide 100% renewable energy to her farms. Having been able to access the education, support and finance that she needed in ways that worked for her, Giffoni is now celebrated as an entrepreneur that has helped shape a sustainable future.

"*Today in 2030, I am proud of the small contribution Saccharo has made to the world's progress toward our climate goals. Everywhere I look I see green solutions replacing unsustainable, carbon-intensive production. We've seen a flowering of green innovation backed by finance and the European Union's investment in STEM training for women has really paid off. I am just one of many women working in energy, in construction and engineering, in logistics and aviation – all of us creating new ways of making our world a better place.*"

Executive Summary

Promoting women in Green STEM and Entrepreneurship

Women are underrepresented and disadvantaged in many of the disciplines that will be vital to global efforts to build back from the coronavirus pandemic in ways that are sustainable and help us meet the goals of the Paris Agreement. Green STEM skills and green entrepreneurship are two such disciplines.

This is a significant risk. When women are involved, solutions are more inclusive and effective; we need women to help drive a just transition. At the same time, because green jobs and sustainable business will be the drivers of future growth, excluding women from these disciplines could reinforce existing economic and social inequalities. Many examples of women leading action in green STEM and Green entrepreneurship already exist, but they still have to overcome too many barriers. This report provides recommendations for businesses and public institutions to address this challenge.

Recommendations

Collect data on the presence and performance of women entrepreneurs.
Identifying women entrepreneurs is a vital first step to being able to design and execute programmes to support them.

Reframe what it means to be an entrepreneur for the better.
All organisations can play their part in portraying entrepreneurship and entrepreneurs in a broader and more inclusive way that appeals to a wider array of interests.

Increase the diversity of funders and decision-makers and create formalised processes to inform decisions in green investments.
Climate and green funds should take steps eliminate bias in decision making processes.

Broaden and redefine ways to invest in and support entrepreneurs.
Institutions should work to support entrepreneurs in creative ways like through strategic partnerships and collaboration.

Establish programmes to provide access to specific training, networks and markets that enable scale and sustainability.
Support all women entrepreneurs to be sustainable businesses.

Change perceptions of gender and women's roles in STEM fields.
Provide more exposure to role models and mentors that girls can relate to and aspire to be and make these women visible in society.

Emphasise the impact potential of STEM disciplines.
Do more to raise awareness of the social and environmental applications of STEM and the jobs that STEM skills can make available.

Build a pipeline for Green STEM jobs and leaders through development and education programmes.
All effort should be made to incorporate STEM into existing leadership development programmes and vice versa.

Set gender quotas and other requirements for industry and skills transitions.
Quotas and other targets are needed to ensure that important industries help push gender equality as part of their sustainability transition.

Actively promote STEM education for sustainability.
STEM education programmes should actively incorporate sustainability concepts and examples into their existing curriculums.

Introduction

Tapping into women's potential to drive the green recovery

The old dichotomy that placed economic wealth and sustainable growth at opposite ends of a continuum has long been challenged. The International Renewable Energy Agency (IRENA), for example, estimates that transforming energy systems toward renewables could boost global GDP by $98 trillion by 2050, while creating 63 million new jobs in renewables and energy efficiency[1]. We don't even have to wait long: bold climate action could create more than 65 million new jobs by 2030 - many of them in innovation, and sustainable infrastructure fields including clean energy, transit and efficient buildings which rely upon skills in science, technology, engineering and mathematics (STEM)[2].

Alongside STEM skills, disruptive disciplines like entrepreneurship will play a huge role in transforming the goods and services we consume and how we consume them. We need to rapidly find new ways to make all the world's products to ensure that they have a neutral or positive impact on our environment and our climate. These present great challenges, but also great opportunities for our economies and societies. If we pull them off, we will arrive at a new sustainable way of living that can kickstart a decade of post-pandemic growth while safeguarding our future.

Yet, with all of the promises of the transition to a green economy, many organisations leading green growth discussions fail to take into account how inclusion and gender will affect both the efficacy and end benefits of change.

This research by the Women4ClimateAction Daring Circle of the Women's Forum looks at the existing barriers and opportunities associated with women's participation in Green STEM and Green Entrepreneurship. By reviewing existing literature and practices to promote these fields, and by interviewing a wide range of stakeholders – including female green entrepreneurs, women leading in climate science, and businesses and institutions that work to support women in entering technical and sustainable fields – we highlight recommendations and solutions that address the particular challenges women face.

Definitions used in this report

Green STEM: STEM stands for Science, Technology, Engineering and Mathematics. STEM skills can be applied in a wide variety of contexts. Green STEM therefore denotes the application of these disciplines to challenges and ooportunities related to our natural environment and the climate.

Green Entrepreneurship: Green entrepreneurship is sometimes used to speak about green technological innovations (e.g., energy efficient systems). In this report, we use a broad definition of Green Entrepreneurship that incorporates concepts like ecopreneurship and sustainable entrepreneurship. Green entrepreneurship therefore also includes the creation of new products or services that are inherently sustainable and compatible with a 1.5*C world; for example, products that are zero waste or zero emissions, as well as technological and other innovations that directly address issues like carbon emissions and energy efficiency.

[1] IRENA (2018) Global Energy Transformation: A roadmap to 2050. (Accessed here)
[2] World Resources Institute (2018) New Climate Economy: Unlocking the inclusive Growth Story of the 21st Century: Accelerating Climate Action in Urgent Times

Building a sustainable and equal world

In 2019, the Women4ClimateAction Daring Circle published *A world within reach* – a scenario-planning based report that explored four possible futures according to the level of action on climate change we take and the level of access to social and economic capital for women that we achieve.

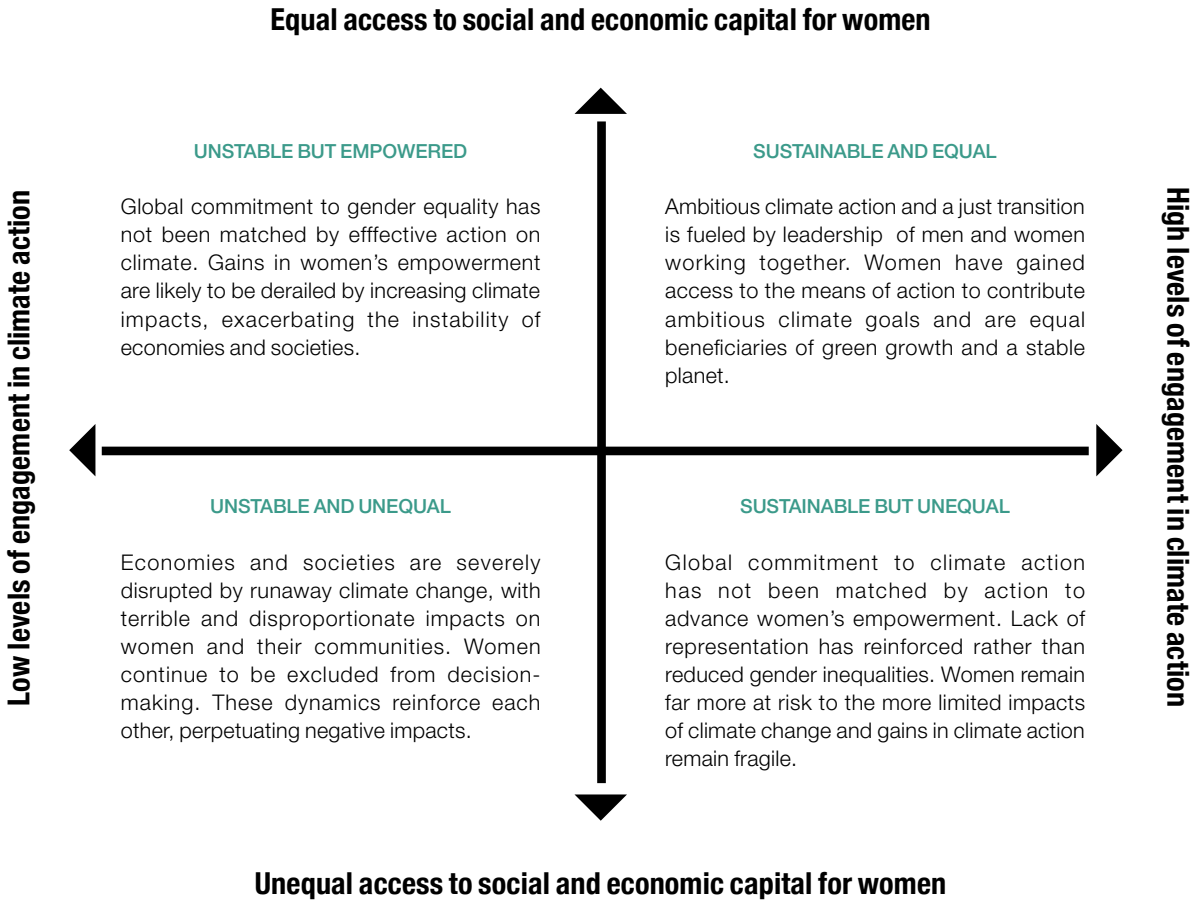
These scenarios demonstrate how positive movement along one axis is hindered or pulled back by a lack of progress along the other and that successful climate action is at risk without women's participation.

They show that a world in which women are leaders, alongside men, of businesses, governments and communities, is a world in which solutions to climate change are innovative, just and inclusive; where new innovations are harnessed to meet our current challenges, where the performance of our organisations is enhanced.

They show that a world in which women in all areas of society are able to participate in climate initiatives to the same degree as men, and access the same opportunities to take their own actions to fight climate change, is one where sustainable practices and business models scale more quickly and where benefits are shared more equally.

They show that a world in which the goals of the Paris Agreement are achieved is also a world where women can thrive – and where thriving women are the basis for a thriving planet.

FIGURE 1: FOUR POSSIBLE FUTURES



"If we expect wide-scale economic transformation to take place, we must ensure that girls, women, and other populations most vulnerable to both the negative impacts of climate change and widening economic inequality can set the pace of the innovations driving a truly sustainable and equitable alternative economy."

Christina Kwauk
Brookings Institute Fellow - Global Economy and Development
Centre for Universal Education

Drivers of change

The role of green STEM and entrepreneurship in our sustainable future.

The shift to a low-carbon economy is a $26 trillion economic opportunity and could create 65 million new jobs by 2030[3]. But, whilst businesses today are increasingly pursuing 'green growth' – that is growth that is decoupled from the depletion of natural capital and emission of greenhouse gasses – existing production methods, technologies and consumer behaviours can only go so far. Alongside these more gradual efforts, innovation and transformation will be key drivers of an acceleration towards a successful green transition.
Green STEM and Green Entrepreneurship are two disciplines through which further innovation and transformation can be realised. Innovation can help to push forward new green solutions that further decouple growth and consumption from destructive environmental impacts. It can drive new ideas, new products and business models; creating new markets, new jobs and new industries; shaping the business models and ways of operating that will become tomorrow's norm.

These disciplines will also therefore shape a broader economic context where most jobs include 'green' elements. Dedicated Green IT managers, for example, will certainly be recognised professionals in future but more broadly all roles in IT (and all other disciplines) will increasingly include tasks and responsibilities that are connected to their organisations' commitments to climate action and other elements of sustainability. The importance of STEM and entrepreneurial skillsets to our sustainable future therefore also offer us hints of how other disciplines and roles will evolve.

Profile of the future

Green IT Manager

The green IT manager is in charge of implementing good practices aimed at managing the costs and environmental impacts of digital infrastructures and harnessing digital processes for sustainability.

Profile of the future

Environmental technicians

After environmental engineers develop devices used to clean up pollution, technicians step in to put them to work. It's also typical for technicians to test, operate, and modify that equipment while analysing soil or **groundwater** samples to increase effectiveness, for example.

Profile of the future

Green Builders/Architects

Green builders and architects will have new sets of skills and understanding that help to create buildings and infrastructure that is carbon neutral, generates energy and also generates positive social goods.

[3] World Resources Institute (2018) New Climate Economy: Unlocking the inclusive Growth Story of the 21st Century: Accelerating Climate Action in Urgent Times.

Finding a fix

The climate crisis has brought science and technical skills to the fore; illustrated by the calls of figureheads like Greta Thunberg and other advocacy groups to "listen to the science". Whilst previously considered abstracted from everyday life; STEM skills can now be understood as key skills for those that want to deeply understand the pressing challenges of our time. To address these issues, too, skills like engineering will be vital.

Examples of rapidly growing businesses in green energy and emissions tracking, many of which harness technical disciplines, show us the potential of green STEM in the future. By some estimates, 75% of jobs of the future will require STEM skills and the proportion will likely be even higher amongst "green" jobs"[4]. Green STEM careers will be extremely varied, and can include roles such as solar and wind installers, climate scientists, environmental lawyers, and green design and construction professionals. As more sectors transition to low-carbon models, almost all jobs have the potential to become green, including those in the financial, IT and legal industries.

Green STEM skills are a growing concern in recruitment of leaders in organisations across all industries as they seek to transform old operating models. However. at present, only 17% of board members have dedicated ESG (Environmental, Social and Governance) skills that are increasingly important to investors and to business performance[5]. As leaders are increasingly expected to manage not only financial capital but natural capital; those that do best will be those that understand the natural world and the technological solutions that enable us to track and limit our impact upon it.

Case Study

Intel: Setting industry wide sustainable transformation goals

Intel components can be found in tens of millions of computers, smartphones and other pieces of technology across the world. The nature of their business demands that they work with a broad array of other companies and partners.

In recognition of this, in 2020, Intel has launched ambitious industry-wide goals that it is calling on other organisations to work with them to achieve. Chief amongst these goals is to create "carbon neutral computing". In Intel's goal of enabling carbon-neutral computing, the company will work with supply chain partners, PC manufacturers and customers to "create more sustainable and energy efficient PCs".

In the company's sustainability reporting, Intel shared that it increased the efficiency of its notebooks by 14 times and data centre products by 8.5 times since 2010, though that fell short of the company's goal of improving efficiency by a factor of 25.
See here.

These commitments and progress indicate the huge extent to which technological innovations and the work of engineers and designers in industries like IT will be geared towards solving sustainability challenges in the coming years.

[4] PwC (2015) A smart move: Future-proofing Australia's workforce by growing skills in science, technology, engineering and maths (STEM). (Accessed here)
[5] Board Report (2020) The Sustainability Board Report. (Accessed here)

New solutions to old problems

Entrepreneurs are focused on creating innovative solutions to intractable problems and few problems come bigger than climate change. As a result, we expect the standout businesses of tomorrow will be those that directly address climate change through the application of advanced technologies, for example by creating cost-efficient and scalable carbon capture methods or energy solutions.

Entrepreneurs are also adept at identifying and capturing new and emerging markets. As consumers demand more sustainable products, they are increasing the market for these products[6]. Seventy-three percent of global consumers say they would definitely or probably change their consumption habits to reduce their impact on the environment[7] and, for over 90% of individual product categories in the Consumer Packaged Goods market, the growth of sustainability marketed products outpaced the growth of their respective categories between 2013 and 2018[8]. Regardless of the product or service, businesses of the future will need to be inherently sustainable.

And entrepreneurship doesn't just create new products: green entrepreneurs can bring about qualitative changes in enterprise structures, strategies, and practices[9]. Large corporates have added new, 'born sustainable' brands to their portfolios through hundreds of acquisitions in recent years. "Intrapreneurship" – entrepreneurial activities that are incubated within large corporates – is driving the creation of entirely new business units and product lines. Meanwhile, sustainable entrepreneurship is transforming whole industries, across the supply chain.

> Green jobs build resilience, and the economic opportunity they provide is the largest we will see in our lifetime.
>
> **Paula McGinnell, Cyan Finance**

[6] Kronthal-Sacco, R., Van Holt, T., Atz, U., & Whelan, T. (2020). Sustainable Purchasing Patterns and Consumer Responsiveness to Sustainability Marketing Messages. *Journal of Sustainability Research*, 2(2).
[7] Neilsen (2020) A 'Natural' Rise in Sustainability Around the World — Nielsen. (Accessed here)
[8] Kronthal-Sacco, R., Van Holt, T., Atz, U., & Whelan, T. (2020). Sustainable Purchasing Patterns and Consumer Responsiveness to Sustainability Marketing Messages. Journal of Sustainability Research, 2(2).
[9] Simon Elias Bibri (2013) The Potential Catalytic Role of Green Entrepreneurship – Technological Eco–Innovations and Ecopreneurs' Acts – in the Structural Transformation to a Low–Carbon or Green Economy: A Foucauldian Discursive Approach. Lund University

> Our future economy will thrive on reusing, repairing, refurbishing, remaking and repurposing. This transformation will create new kinds of creative and purposeful jobs.

Kate Raworth
University of Oxford Environmental Change Institute

Agents of change

Why we need women's participation in green STEM and entrepreneurship

There are two key reasons why the world needs to be intentional about promoting women's participation and leadership in disciplines like Green STEM and Green Entrepreneurship.

1. More diversity = more innovation and better inclusion

Innovation and resilience are vital to overcoming this challenge of rebuilding and transforming in ways that are sustainable and green. Luckily, we know that diversity, not only of gender but of ethnic and social backgrounds, drives innovation and resilience in businesses and institutions[10]. A large-scale study of research and development teams in over 4,000 companies in Spain found that teams with more women were more likely to introduce radical new innovations into the market[11]. Another study of 7,615 firms that participated in the London Annual Business Survey found that companies run by culturally diverse teams were more likely to develop new products than homogenous leadership teams[12]. Diversity in any discipline, and at all levels, clearly supports the conditions we need to create to successfully tackle the climate crisis.

Representation of women at leadership levels is also crucial. Evidence shows that businesses with more women on their boards and in executive-level positions are more likely to proactively improve energy efficiency, invest in renewable power, and measure and reduce carbon emissions[13].

At the same time, we know that STEM skills are increasingly prevalent in the CVs of CEOs and other C-suite leaders[14]; an indicator of the increasing importance of these skills to understanding modern business. For women to be equipped to undertake the most senior roles in the C-Suite, they will need vital STEM skills: unless we diversify those studying STEM subjects at university level, we will be locking women out of those roles to the detriment of corporate performance and societal benefit.

2. More diversity = an equitable share in future growth

Ensuring that women can participate in areas of the economy that will shape our economic and societal recovery makes sure that they are also beneficiaries of that growth and have an opportunity to help shape it. At present, there is a real risk that women will not be able to take advantage of new green jobs as countries overlook gender in designing pandemic stimulus. At a corporate level too, there is a risk that efforts such as re-skilling from carbon intensive industries or new venture capital funds established to find new entrepreneurial solutions to climate change will reinforce rather than dismantle existing gender disparities.

For example, many suppliers that previously serviced the oil and gas industry are transforming to become fit-for-the-future companies; making significant investments in providing solutions for clean energy and other sustainable technologies. These investments include large-scale re-fitting and re-skilling programmes for existing workforces, as many of their existing technologies and skills are transferable to areas such as offshore wind energy. It's important to ensure women not currently working in these male-dominated sectors gain the skills necessary to help drive the next decade of recovery.

[10] McKinsey (2020) Diversity still matters. (Access here)
[11] Díaz-García, C., González-Moreno, A. and Jose Saez-Martinez, F., 2013. Gender diversity within R&D teams: Its impact on radicalness of innovation. *Innovation*, 15(2), pp.149-160.
[12] Nathan, M. and Lee, N., 2013. Cultural Diversity, Innovation, and Entrepreneurship: Firm-level Evidence from London. *Economic Geography*, 89(4), pp.367-394.
[13] Kellie A. McElhaney & Sanaz Mobasseri (2012) Women Create A Sustainable Future. UC Berkeley Haas School of Business (Accessed here)
[14] David Egan (2018) Here Is What It Takes to Become a CEO, According to 12,000 LinkedIn Profiles. LinkedIn Talent Solutions (Accessed here)

How women's participation can turbo-charge Green Entrepreneurship

It's long been proven that women are more likely to start businesses that incorporate a social or environmental purpose than men[15], whether they are formally social enterprises or for-profit companies that encompass a strong drive towards societal benefit.

The support and scaling of women-led and diverse organisations therefore represents an opportunity to support the emergence of new, greener business models, strategies and ways of operating that are also informed by the perspectives and experiences of women.

Women's participation in entrepreneurship can super-charge the recovery, whilst steering it towards more sustainable models of business. A study in 2019 by Boston Consulting Group (BCG) shows that if women and men participated equally as entrepreneurs, global GDP could rise by between 3% and 6%, boosting the global economy by $2.5 trillion to $5 trillion[16]. This helps big business too: 34% of companies that diversified their suppliers by engaging with women-owned businesses reported a positive impact on their profitability[17].

However, for the moment, we are travelling in the opposite direction, with potentially devastating impacts for women entrepreneurs: Women entrepreneurs have been hit harder by the pandemic[18], which more broadly threatens to roll back 30 years of gains in terms of economic empowerment[19]. According to WEConnect International*, around 90% of women's businesses worldwide experienced a significant reduction in revenue as a result of the crisis[20].

Women entrepreneurs have a vital role to play in developing contexts, too. Around 20% of women in Africa are entrepreneurs, with the vast majority operating as micro- and small-businesses with lower growth ambitions or potential. Even with modest scaling opportunity, these businesses are financeable and capable of higher growth given support by private sector sources of finance. Women are proven to be 15% more likely to repay their loans than male counterparts, but receive less microfinance relative to their needs[21].

The importance of STEM skills to increasing female participation in high-growth entrepreneurship is even greater: only 7% of patents for cleantech inventions filed in the UK in 2017 were by teams with at least one female[22]. Given the importance of proven, patentable, innovation to funding, a lack of STEM skills among women, also limits their access to finance[23].

Profile

Saasha Celestial-One and Tessa Clarke - OLIO

OLIO connects neighbours with each other and with local businesses so surplus food can be shared, not thrown away. This could be food nearing its sell-by date in local stores, spare home-grown vegetables, bread from your baker, or the groceries in your fridge when you go away.

OLIO was co-founded by Saasha Celestial-One and Tessa Clarke, with a vision to create millions of hyper local food sharing networks all around the world. They believe OLIO can help create a world in which nothing of value goes to waste, and every single person has enough to eat – without destroying our planet in the process.

OLIO is an example of a born sustainable business. Its primary focus is on reducing food waste, but this has additional impacts on other social and environmental needs including nutrition and climate change which are measured and reported on by the company. For example, so far, use of the app has saved 19,344,534 car miles.
Learn more at: https://olioex.com/about/

[15] Hechavarría, D. M., Terjesen, S. A., Ingram, A. E., Renko, M., Justo, R., & Elam, A. (2017). Taking care of business: the impact of culture and gender on entrepreneurs blended value creation goals. Small Business Economics, 48(1): 225–257.
[16] Shalini Unnikrishnan and Cherie Blair (2019) Want to Boost the Global Economy by $5 Trillion? Support Women as Entrepreneurs (Accessed here)
[17] Chin, K. 2017. 'The power of procurement: How to source from women-owned businesses. Corporate guide to gender-responsive procurement'. UN Women's Economic Empowerment Section for the Flagship Programming Initiative.
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[19] Kristalina Georgieva, Stefania Fabrizio, Cheng Hoon Lim, and Marina M. Tavares (2020) The COVID-19 Gender Gap. IMF Blog. (Accessed here)
* WEConnect International is a global network that connects certified women-owned businesses to qualified buyers around the world. See https://weconnectinternational.org/
[20] WEConnect International, April 2020 [https://weconnectinternational.org/en/covid]
[21] Abdullah, S., & Quayes, S. (2016). Do women borrowers augment financial performance of MFIs?. Applied Economics, 48(57), 5593-5604.
[22] Women4Climate (2019) Women in CleanTech: Gender Diversity in the London cleantech sector. (Accessed here)
[23] WeEmpower, UN Women, ILO (2020) Strengthening Support for Women Entrepreneurs in COVID-19 Response and Recovery

Why Green STEM needs women's participation to thrive

While green jobs are projected to lead to millions of new job opportunities, the current underinvestment in gender equality in the sectors that will see most of this growth means that women will not have the opportunity to contribute to the design, use, and dissemination of, for instance, clean technology and renewable energy, nor will they have equal opportunity to benefit from their growth. Currently, just 30% of the world's researchers are women and only about a quarter of STEM workers are female[24].

The design of infrastructure and other large-scale projects will have major implications for women. Already, we have seen that public transport systems are designed with the typical travel patterns of men in mind, whilst less linear travel habits of women are poorly catered for. The greater involvement of women in the design and implementation of programmes can help to ensure that new systems are fit for the whole population.

In energy, too, massive transitions towards clean energy and microgrids are in progress in many regions. Case studies demonstrate that involving women in the establishment and management of these systems can have powerful effects on their economic and social status in their communities[25].

There are clear economic benefits for the wider economy, not just for the women who directly participate in STEM-driven parts of the economy or benefit directly from new technologies. More women on boards in the energy sector can bring higher returns on both equity and investment[26], and the top 20 most gender-diverse energy utilities outperform less diverse ones[27]. More broadly, we know that education girls is one of our best tools to address climate change[28].

Beyond economic and environmental benefits, involving women in green sectors can affect norms in ways that advance women's status in their communities. In Tanzania, for example, a UN project that trained women to install and maintain solar energy panels not only economically benefitted the trainees, but also encouraged female members of village solar energy committees to more actively participate in environmental decision-making processes[29]. In Thailand, Wandee Khunchornyakong, a female solar power pioneer, has grown her firm from its inception in 1993 to a substantive company operating 36 solar farm projects across the country, with 60% of its workforce female[30].

[24] World Economic Forum (2020) 3 things to know about women in STEM. (Accessed here)
[25] Sustainable Energy for All (SEforALL) (2018) Levers of Change: How Global Trends Impact Gender Equality and Social Inclusion in Access to Sustainable Energy. (Accessed here)
[26] EY (2019) 'Could gender equality be the innovation boost utilities need? (Accessed here)
[27] EY (2019) 'Could gender equality be the innovation boost utilities need? (Accessed here)
[28] Paul Hawken (ed.) (2017) 'Drawdown—The Most Comprehensive Plan Ever Proposed to Reverse Global Warming'.
[29] UN Women (2013) Mothers lighting up homes and communities in rural Tanzania (Accessed here)
[30] OECD (2020) Empowering women as clean energy entrepreneurs. (Accessed here)

Profile

Ajaita Shah - Solar Sahelis

Ajaita Shah founded Frontier Markets in 2011. Frontier Markets is a last-mile distribution company with a mission to create 'Saral Jeevan' or an 'Easy Life' for rural customers by providing them with access to quality clean energy solutions using solar technology. Frontier Markets has built a proven and scalable model with a network of 1000 women entrepreneurs who are trained and access technology, marketing, and technical repair, to provide innovative solar solutions to sell to rural households. The women, dubbed Solar Sahelis, have generated $2 million in income through the sale of products like clean cookstoves, renewable energy appliances and solar home systems. Engie supports the Solar Saheli initiative.

As well as being a green entrepreneur herself, Ajaita's approach has been transformational for the women who have themselves become entrepreneurs through their work. Many have learned new STEM skills that enable them to service and maintain the products they introduce to communities. Their participation not only ensures that women benefit from the expansion of clean solutions but enhances the offering because of their deep understanding of local issues and needs.

"In many cases, environmental injustices impact people in unique, site-specific ways that are not easily solved by one-size-fits-all technological solutions. In light of this, entrepreneurship by marginalized communities, including women, are crucial for generating inclusive interventions that address these inequities."

Angel Hsu, Assistant Professor of Public Policy and the Environment, Ecology and Energy Program at the University of North Carolina at Chapel Hill, and Principal Investigator/Director at Data-Driven Envirolab

Recommendations to expand women's participation in green STEM and entrepreneurship

Women's participation in entrepreneurship and STEM disciplines are both issues that have received an increasing amount of attention in recent years, including at the Women's Forum via our Women4Business and Women4STEM Daring Circles. For both of these issues, there are significant challenges to overcome to come closer to equality, and significant resources and recommendations that have been produced to support this aim.

There are, however, actions that can be taken to promote women in Green Entrepreneurship and STEM specifically which build on and add nuance to these existing efforts in response to challenges that are unique to or more accentuated in these contexts. By speaking with experts, supporters, women entrepreneurs and women working in Green STEM disciplines, and reviewing existing commitments and literature, we have identified recommendations that can promote the greater participation, support and recognition of women in these disciplines.

RECOMMENDATIONS FOR GREEN ENTREPRENEURSHIP

Collect data on the presence and performance of women entrepreneurs

In many economies, reliable data on the presence and needs of women entrepreneurs are very hard to come by. Some countries prohibit the collection of gender-specific data, ironically, because of equality laws. Identifying women entrepreneurs and being able to segment and analyse that population according to industry and sustainability indicators is a vital first step to being able to design and execute programmes to support green entrepreneurship.

Governments and institutions should bear greater responsibility for collecting and making available these data, whilst independent certification bodies like WEConnect International also play an important role. In recognition of the increasing importance of sustainable business models and green industries, organisations that support women entrepreneurs should collect data on the prevalence of such businesses in the networks that they manage.

This is particularly important since a commonly cited barrier to increasing the amount of climate finance that is gender-responsive is a lack of data on the benefits of incorporating a gendered approach. Gathering data on the performance of women-led or -empowered businesses with a sustainability focus could help to build the investment case for greater action in future.

Reframe what it means to be an entrepreneur for the better

The image of the lone entrepreneurial hero appears ubiquitous in the discourse about entrepreneurship, with a focus on eccentric billionaires such as Elon Musk or Mark Zuckerberg. But this paradigm is clearly flawed. In reality, entrepreneurship is a team sport and rarely does a start-up scale without an exceptional group of people driving it.

Reframing entrepreneurship and showing the potential of collectives and of success – in short less individualistic visions of entrepreneurship – can attract more people to the practice with the kinds of perspectives we ultimately need in a green society. For example, placing greater emphasis on the fact that many businesses are started by teams of people and supported by others as they grow, and profiling entrepreneurial businesses that may use tech but operate in a wide range of sectors, can both help to widen the appeal of entrepreneurship.

Governments, educational institutions and private businesses can all play their part in portraying entrepreneurship and entrepreneurs in a broader and more inclusive way that appeals to a wider array of interests. Entrepreneurs profiled in this report are only a tiny fraction of the inspirational women who are creating opportunity by helping safeguard our environment and our planet.

Increase the diversity of funders and decision-makers and create formalised processes to inform decisions in green investments

Across all forms of finance, women entrepreneurs have less access than their male counterparts. According to research by BCG[32], investments in companies founded or cofounded by women averaged $935,000, which is less than half the average of $2.1 million invested in companies founded by male entrepreneurs. Research by the WeFi suggests that many accelerator programmes actually increase the financing gap between male and female entrepreneurs[31]. These disparities exist despite the fact that start-ups founded and cofounded by women actually performed better over time, generating 10% higher cumulative revenue over a five-year period: $730,000 for women compared with $662,000 for men[32]. Many financiers are therefore failing in achieving their basic purpose of identifying good investments and opportunities for returns because of gender bias in their decision-making and support delivery programmes.

There are many structural and normative causes to these gendered disparities. Mentorship or accelerator programmes might not offer services in an appropriate way for someone who has childcare responsibilities, for example, limiting the extent they can benefit from the programme. Bias in questions asked to women and male entrepreneurs during fund-raising are also well documented.

Dedicated climate and green funds should take the same steps that are increasingly being promoted in the wider investment and financing communities to support the elimination of bias from decision-making processes. For example, insisting that investors receive bias training, increase the number of women in financing institutions and commit to using objective measures to score applicants can all help level the playing-field.

> A lot of larger venture capital funds are run by a different generation of male-dominated investment teams who have not historically backed female entrepreneurs. This has created a circular effect – and so the problem goes on.
>
> **Mark Pearson, Founder & Managing Partner at Fuel Ventures**

Profile

Brandi DeCarli - Farm from a box

In 2009 Brandi DeCarli co-founded Farm from a Box with the aim of revolutionizing local food production and enabling communities around the world to grow their own nutritious food with clean technology. Using old shipping containers and technology developed by organisations like NASA, Farm from a Box creates a 'one-stop shop' with everything farmers need. The technologies employed make farming more efficient, more productive, more environmentally sustainable, and all in one deliverable system.

Farm from a Box has gone through an unusual journey; partnering with large corporates and development agencies and using equity crowdfunding to grow the business in lieu of traditional start-up finance, which was difficult to access. Via partnerships with development institutions, Farm from a box is now aiming to deliver their products at a far larger scale.

[31] WeFI, Village Capital and IFC (2020) Venture Capital and the Gender Financing Gap: The Role of Accelerators. (Accessed here.)
[32] Katie Abouzahr, Matt Krentz, John Harthorne, and Frances Brooks Taplett (2018) Why Women-Owned Startups Are a Better Bet. BCG.com (Accessed here).

Broaden and redefine ways to invest in and support

Disparities in access to finance for women entrepreneurs are well documented[33]. The challenge of accessing finance or adequate levels of finance can be particularly difficult in certain areas of Green Entrepreneurship that are particularly capital intensive, such as cleantech and other technological solutions. More generally, women receive less investment than their male counterparts.

In addition, specific groups of investors exhibit particular biases or tendencies that increase the difficulty for women of gaining funding. For green entrepreneurship, challenges can emerge when seeking funding from impact investors, for example, that struggle to strike a balance between supporting projects with long-term potential positive impacts and seeking market-rate returns. Amongst mainstream investors, many organisations still lack the skillsets and experience to spot potential and are still grappling with institutional bias against women entrepreneurs and diverse workforces.

Challenges in securing support from traditional sources of capital has led women green entrepreneurs to seek alternative models to support their growth. For example, partnership models which connect start-ups with large corporates that share target communities and interests have shown promise in helping entrepreneurs to grow their business whilst gaining valuable experience and connections. Elsewhere, the emergence of gender bonds such as IIX's WLB 1 and 2 and Alitheia IDF that specifically target women entrepreneurs, are providing channels of finance to female entrepreneurs.

Further work to remove bias from existing traditional finances routes like venture capital or loans, businesses and other institutions should also work to more consistently support entrepreneurs in other ways; namely through strategic partnerships and collaboration. Such models also offer great benefits to corporates themselves, too; providing new sources of innovation and access to markets via an agility that is difficult to create in a large organisation.

Case Study

London Sustainable Development Commission

The London Sustainable Development Commission has developed an action plan to increase women's leadership in cleantech entrepreneurship in London. The Commission is working with the local cleantech community and industry partners. The six key components of the plan are:

1. Connecting existing networks.
2. Working with the finance community to improve gender parity in the companies receiving financing.
3. Strengthening the existing ecosystem, amplifying activity and developing best practice.
4. Cohesive, strategic and targeted communications to inspire the next wave of female cleantech entrepreneurs.
5. Working with schools and education institutes to encourage girls and young women into the field.
6. Addressing unconscious biases and giving women the tools and skills to succeed in cleantech entrepreneurship.

Information accessed here.

Establish programmes to provide access to specific training, networks and markets that enable scale and sustainability

Particularly in developing contexts, many women entrepreneurs run micro-businesses that serve local communities. Often, these businesses are well customised to local contexts and play an important role in providing goods and income to the communities in which they operate. However, a variety of legal, economic and social factors prevent women entrepreneurs from gaining the information and finance they need, and struggle to gain access to larger markets that would enable their businesses to grow.

A number of approaches have shown promise in increasing women entrepreneur's ability to grow their businesses. One notable approach is collectivisation of women entrepreneurs into larger groups that can access new markets and negotiate better prices for their products. These collectives have additional benefits in terms of the leadership skills and social status that is gained through these formalised processes.

Targeted interventions can also promote entrepreneurship as a way of lifting women and their families out of poverty. For example, the BOMA Project[34] in the drylands of Africa, under its Rural Entrepreneurship Access Program (REAP), employs local "mentors" who identify families that are most in need. The REAP mentors then train women from those families in business skills, advise them financially, and give them seed grants to launch new businesses.

Organisations can go further and support all women entrepreneurs to be sustainable businesses. Increasingly, all businesses will be expected to be sustainable and have a net-positive or neutral effect on climate change. Increasingly, companies may be expected to be "born-sustainable", rather than retrospectively adjust business models to be so. The lower levels of access to formal training and experience that women entrepreneurs experience may create barriers to achieving this built-in sustainability, even accounting for the greater propensity of women to start more sustainability-oriented businesses.

There is also a growing number of resources that all entrepreneurs can feely access. For example, the SME Climate Hub[35], supported by We Mean Business, provides tools to small businesses and entrepreneurs to incorporate climate action into their business models.

Women4Business Daring Circle
Inclusive Sourcing Journey

The Women4Business Daring Circle seeks to provide organisations with the tools they need to make their supply chains diverse and gender inclusive.

This year, the Circle has launched the Women's Forum Inclusive Sourcing Journey, an online questionnaire custom-built by the Women4Business knowledge partner Kearney, which will objectively assess the current maturity level of respondents with regards to diversity of their supply chain. This assessment tool will generate a customised report with tailored recommendations for the best practices and specific actions organisations can take to advance their programmes and maximise impact in their supply chains.

For more information, go to:
https://www.womens-forum.com/daring-circles/#business

> In this context of emergency, it is necessary to not forget that climate change affects women disproportionally, but also that women are a key to this radical transition that has to happen fast.
>
> **Laurence Pessez, Head of Corporate Social Responsibility at BNP Paribas**

RECOMMENDATIONS FOR GREEN STEM

Change perceptions of gender and women's roles in STEM fields

The Women's Forum Barometer shows that gendered views of what types of job are suitable for men and women are still present in our societies. Other indices like the Reykjavik Index also show that women are perceived as less suited to leadership positions in certain industries, many of which require STEM skills[36].

In 2019, the Reykjavik Index found that women were seen as more suited to natural sciences than to other STEM disciplines like engineering. These findings are connected to broader social perceptions of women and their suitability to roles that deal with the natural environment, highlighting a tension where women are expected to play more of a role in protecting nature than men in some respects, but are seen as unsuitable to undertake other aspects of this responsibility.

These findings are particularly important as research shows that women's competence in STEM fields is equal to men. The only difference discovered in a recent study was that women were far less confident when rating their own performance in tasks that used STEM skills.

It is important to provide more exposure to positive role models and mentors that girls can both relate to and aspire to be, and to make these women visible in wider society to promote changes in broader societal norms. It is also important to change wider societal perceptions of the role of industries and roles that will be vital to the green economy of the future, but that are viewed less favourably now. Finally, businesses and educational institutions must work to build the confidence of women in STEM roles.

> "Changes with respect to cultural norms for gender and changes with respect to climate need to be measured in terms of generations, not in terms of an 18-month project budget. We haven't yet come up with a metric system that captures those 'micro-metrics' that show we're moving in the right direction towards a longer-term goal. We're still focusing on outputs instead of outcomes."
>
> Kaylene Alvarez, Founder of BIDUK Indonesia and Founder and Chief Executive Officer of Athena Global

[33] Barclays and The Female Founders Forum (2017) Untapped Unicorns: Scaling up female entrepreneurship (Accessed here)
[34] See: https://bomaproject.org/
[35] See: https://smeclimatehub.org/
[36] Kantar (2019) The Reykjavik Index for leadership. (Accessed here)

Emphasise the impact potential of STEM disciplines

A study by Microsoft found that 72% of girls aged 9 to 16 want to have a profession of social utility[37]. In further education, too, women are represented in higher numbers in STEM and other technical disciplines where applications have a social impact, such as medicine[38]. An opportunity therefore exists to increase women's participation in Green STEM by emphasising the social purpose of jobs that utilise these skills.

Educational institutions and governments can do much more to raise awareness of the social and environmental applications of STEM, and the kinds of jobs that STEM skills can make available. The transformation of our energy systems will be one of the most important pursuits of the coming decade if we are to achieve the emissions reduction targets of the Paris Agreement. Emphasising the importance of this mission to our shared future and framing the jobs that will be involved in terms of this social good may help to attract more women to the energy industry, which will in turn ensure that they are economic beneficiaries of a new and rapidly growing industry.

> You have to show [women] the stage after studying math or physics; the professional side. For example, the possibility of participating in the development of an electric car, or a new clean energy solution for remote communities.
>
> **Astrid Behaghel, Energy transition expert at BNP Paribas**

Case Study
World Green Building Council

Buildings emit more carbon than road, marine and aviation traffic combined. So, construction methods - from design through to the production of base materials, to the maintenance and retrofitting of old buildings - all need to be transformed in the coming decade. Though the construction industry is male dominated, amongst the global network of around 70 building councils convened by the World Green Building Council; which aims to eliminate carbon emissions by 2050, more than 50% of the CEOs are women.

Other initiatives like C40, too, have demonstrated the vital role that women leaders and scientists are playing in driving the transition to sustainable cities and infrastructure.

Cristina Gamboa, Chief Executive Officer, of World Green Building Council says:
"*To prevent further devastating climate change, we need these passionate and dynamic women to inspire people around the world to take action. They are the catalysts for change we need to cut greenhouse gases and limit the planet's rising temperature to 1.5 degrees Celsius.*"

More information here.

[37] Microsoft (2019) Closing the STEM Gap Why STEM classes and careers still lack girls and what we can do about it. (Accessed here)
[38] National Academies of Sciences, Engineering, and Medicine (2020) *Promising Practices for Addressing the Underrepresentation of Women in Science, Engineering, and Medicine: Opening Doors*. Washington, DC: The National Academies Press. https://doi.org/10.17226/25585.

Build a pipeline for Green STEM jobs and leaders through development and education programmes

Tackling climate change and other sustainability challenges demands specific skillsets but also combinations of skills. We need people who understand climate science and have the leadership skills to drive transformation in businesses and institutions. We need engineers that also understand the socio-economic drivers of access to energy. The intersectional nature of many climate related challenges as well as the change management involved in addressing them all means that we need to invest in building capable leaders now.

To ensure that the right skillsets are available in the climate fight, all effort should be made to incorporate STEM into existing leadership development programmes and vice versa. STEM skills are increasingly in demand in the C-suite, particularly amongst positions that are less likely to be occupied by women. By creating more intersectional and multi-disciplinary leadership development programmes for women, for example by including secondments in certain industries or functions, we can increase the likelihood of women reaching critical positions of power and having the right skillsets to address the climate crisis when they get there.

We need, too, to incorporate climate into the wide range of initiatives across the world that seek to increase the participation of women and girls in STEM education and STEM disciplines. To accelerate change, all these programmes need to be more intersectional; demonstrating the potential applications of STEM skills to addressing our social and environmental challenges.

Set gender quotas and other requirements for investments in industry and skills transition

Transitions in sectors like energy, construction and transportation in the coming decade will require tens of millions in investment from the private and public sectors. Happily, many skills present in these sectors can be relatively easily transferred; for example, offshore oil drilling engineers can apply many of the same skills to the installation of offshore wind and tidal energy solutions. The downside is that if transitions to new jobs don't include a determination to increase female participation, then they will prolong existing inequalities.

Efforts to decarbonise parts of our economy and reskill existing workforces are failing to take account of gender or promote women's participation in industries that have typically been male dominated. For example, CARE International reviewed nearly 350 measures and policies from the G20 countries identified as climate-relevant in the Energy Policy Tracker database. None was found to have an explicitly gender-differentiated approach or would specifically support women in the workforce[39]. Where possible, targets should be set to address the representation of women in leadership positions in transitioning industries and in the context of specific investments like re-skilling or up-skilling programmes.

> Skillsets are ultimately learnable. Knowing this, we are working on recruiting people with a wide variety of different backgrounds – both socio-economic and educational. Diverse groups of individuals bring diversity of thought, which is vital.
>
> Ravina Advani, BNP Paribas Global Banking Americas - Director Corporate Coverage - Energy and Natural Resources

Actively promote STEM Education for Sustainability

Across the world, there have been numerous calls for the integration of sustainability in STEM education in the context of broader efforts to grow the number of children (and diversity of children) in STEM education[40,42,43]. These appeals connect known trends; that 80% of the fastest growing roles in the US require STEM skills, for example, and that environmental and ecological sustainability are set to be defining features of business practice and transformation in the coming decades. Actively integrating sustainability into these programmes can help to attract new groups of people, as well as better prepare all children for a future where all jobs will be green jobs, and where many will use STEM skills.

STEM education programmes, including those supported and delivered by the private sector, should actively incorporate sustainability concepts and examples into their existing curriculums. Sustainability should in particular be included in STEM and related programmes that target underrepresented and disadvantaged groups; as innovation stemming from these groups is more likely to address the needs of the communities they come from. Achieving this integration will require re-training and upskilling of existing teachers, and adjustment of existing curriculums; meaning that governments will play a big role in achieving this. Governments can see this as a direct contribution to their climate goals, as climate education is called out in the targets of both the Paris Agreement and the UN Sustainable Development Goals.

> Every dollar of public spending has to lead to multiple impacts to enhance gender, equity and climate outcomes.
>
> Catherine McKenna, Minister of Infrastructure and Communities, Government of Canada

Women4STEM Daring Circle
STEMKEY and STEMSISTERS

The Women4STEM Daring Circle's STEMKEY initiative aims to de-mystify science, technology, engineering and mathematics - by creating a fun, cool brand around STEM, and creating a human connection between girls and women.

To start with, Women's Forum is building a new community of STEMSISTERS. We're inviting STEM women to engage with girls who care about the future and help them lead with STEM - both for their own careers, and to drive positive impact in society. Most recently, in partnership with Inspiring Girls International, we've invited our community to record short videos sharing their career stories and advice, to help support the next generation of STEM women. Your story matters, regardless of your age or experience.

Become a STEMSISTER and join the STEMSISTERS community by signing up here.

[39] Sven Harmeling, CARE International (2020) OPINION: COVID-19 recovery - A missed opportunity to fight climate change and gender inequality? Thompson Reuteurs Foundation (Accessed here)
[40] Institute of Environmental Management & Assessment (IEMA) (2016) The Corporate Sustainability Challenge: Beyond the perfect storm. (Accessed here)
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[42] Smith, C., & Watson, J. (2016). STEM education and education for sustainability (EFS): Finding common ground for a flourishing future. Australian Association for Research in Education, Melbourne

Conclusion

Women must be key actors in the disciplines that will shape our future

The pandemic has created an opportunity to “build back better” and many government stimulus programmes are already focused on making “better” mean “greener”. Women are proven early adopters of sustainable solutions, and society needs to ensure they are encouraged and equipped to participate in and help drive the green transition.

The world needs women to start and scale new entrepreneurial companies that can harness advanced technologies to leapfrog legacy methods of production; the C-suite of our largest companies needs women to regain and increase their place at the leadership table; society needs women to be as fluent in STEM as men so that they can contribute to more inclusive solutions and accelerate innovation. Green jobs will become an increasing feature in all areas of our economies, and women must be equally featured in this future.

There are obstacles: women have been disproportionately affected by COVID-19, taking on the bulk of responsibilities for home-schooling; often juggling working-from-home with keeping the home working. We mustn’t let the pandemic be a reverse gear for equality, dialling back the decades of progress. And, whilst we mustn’t allow saving our planet to join the list of responsibilities that are unfairly placed at women’s feet, we also need to be intentional in ensuring that women are equal partners and beneficiaries of a green recovery and green transition.

We must recognise that the next decade of growth will be marked by innovative solutions and substantial transformations in all areas of our societies; driven by disciplines like green STEM and green entrepreneurship. For these solutions to be sustainable, creative and resilient, they must have been forged by diverse teams, harnessing the energies and talents of women as much as men. Climate change is a social and ethical issue that demands climate justice for all: there is no equality, progress or justice without it. By tackling injustice wherever it exists, we will also tackle climate injustice.

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About the Women4ClimateAction Daring Circle

The Women4ClimateAction Daring Circle seeks to identify the levers and initiatives needed to accelerate the transition to a green economy and harness it for women's empowerment, enable women to lead actions against climate change, and address the disproportionate impact that climate change has on women.

The Daring Circle is led by BNP Paribas, in collaboration with Bouygues, Colas, Engie, L'Oréal, and Microsoft as Global Partners. The Circle is supported by KPMG as Knowledge Partner, with contributions from CARE France, ClimateSeed, Ministère de la transition écologique, OECD, SEforAll, Société pour l'encouragement de l'industrie nationale, R20; and HEC as Academic Partners.

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