CHRISTINA KWAUK AND OLIVIA CASEY

B | **Center for Universal Education** at BROOKINGS

A new green learning agenda

Approaches to quality education for climate action

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Acknowledgements

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Glossary

Climate action includes individual, collective, personal, and political efforts that help to mitigate against climate change and its underlying technical and social drivers, and/or strengthen the adaptive and transformative capacities of our human, natural, and socio-ecological systems.

Climate empowerment is the practical, political, and personal process to understanding the complexities of the systemic drivers of climate change. These include historic and contemporary systems of oppression over marginalized groups; the capacity to exercise power to disrupt and transform unjust and unsustainable systems and vested interests; and the increased access to resources and opportunities for individual, collective, personal, and political action in response to and in anticipation of climate change and its impacts.

Ecological literacy is knowledge not only about the environment and climate change, but also about the interconnected and interdependent socio-ecological systems through which humans are connected to each other and to the planet. This includes an understanding of gender, power, patriarchy, and colonialism, and how these can extend to our (extractive and destructive, or regenerative and sustainable) human interactions with the natural world.

Feminist planetary consciousness is an awareness of the interconnectivity of humanity's challenges and the state of the planet—that power and patriarchy, as well as colonialism and racism, impact both human and natural systems.

Green economy broadly signifies a greener, low-carbon version of our present high-carbon economy.

Green jobs include any job that contributes to the well-being and flourishment of present and future generations; upholds human rights, including women's rights and the rights of indigenous populations and peoples of color; and supports the regeneration of the natural world, its resources, and its socio-ecological systems on which our human economies rely. Green jobs center, nurture, and develop our individual and collective capacity to care for others and the environment and to educate ourselves and others about the unsustainability of the status quo.

Green life skills are the generic capacities or cross-cutting skills that—together with greater knowledge of climate change, environmental issues, and pro-environmental attitudes—constitute sustainability competencies that enhance one's ability to solve practical problems, make decisions, and behave in greener, more sustainable ways.

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Green skills include the specific, generic, and transformative capacities needed to contribute to a socially-, economically-, and environmentally-just human society that cares for the human and non-human world and reduces the impact of human activity on others. Specific capacities include those needed to thrive in green jobs (e.g., skills from caring to coding). Generic capacities include cross-cutting "life skills" or "socioemotional skills" that contribute to greener ways of thinking, being, and doing (e.g., problem-solving, critical thinking, teamwork, coping with uncertainty, and empathy). Transformative capacities include those needed to disrupt and change both the individual behaviors and structural factors that exacerbate the climate crisis (e.g., the ability to recognize and redress unequal relations of power).

Opportunity structures are the policies, institutions, social networks, social norms, and gender expectations that constrain or enable the translation of green skills into empowered climate action. They can be characterized by "structural inertia" or can be charged with momentum.

Political agency enables individuals to engage in systems change, including with social, cultural, and political institutions and structures for transformative ends. Political agency fluctuates over time and in different circumstances. It is not something that someone possesses, but rather achieves. It is not only individual, but also relational, depending on whether others recognize one's agency, as well as the degree of agency achieved by others.

Sustainability competencies are a combination of knowledge, skills, and attitudes that constitute what one can do, in greener, more sustainable ways. This includes knowledge about climate change and its solutions, knowledge about gender and power, knowledge about local environmental and social issues, etc. (what one knows); cognitive, interpersonal, and intrapersonal skills, including green skills for greener outcomes (what one has); and pro-environmental, pro-equality, and pro-justice attitudes (what one believes and values).

Transformative capacity is the capacity of individuals and society to transform individual and collective consciousness, social institutions, and economic systems toward planetary boundaries in balance with the carrying capacity of the earth. It aims for the regenerative potential of all life, human and natural. This is both in contrast and complementary to the concept of adaptive capacity, which is the capacity of human systems to adjust to climate change, to moderate its impacts, to cope with its consequences, and to leverage its opportunities.

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Executive summary

As countries work to "build back better" from COVID-19, the education sector has a once in a lifetime opportunity to build back differently. Unprecedented school disruptions have laid bare how existing inequalities within our education systems, including those structured along the intersections of gender and poverty, are exacerbated in times of crisis. Yet COVID-19 school disruptions are only a sample of what is to come as extreme weather events and zoonotic disease transfer become a more regular occurrence in the context of ecological collapse and climate breakdown.

To leverage our present moment of disruption for good, the education community must begin to see how building back "better" from COVID-19 is intertwined with both the road to achieving the Paris Agreement's 1.5°C target—the upper limit to global temperature rise necessary to minimize the impact on people and ecosystems—and the road to achieving greater gender equality in and through education. The values that drive the domination and exploitation of the natural world, which fuel climate change and increase humanity's vulnerability to zoonotic disease transfer, are the same values that drive the oppression, exploitation, and violence against vulnerable groups, especially girls and women.

> A post-COVID-19 vision must aim to radically transform the underlying economic systems of inequity and social structures of inequality that are at the root of our present suite of socioecological crises.

A post-COVID-19 vision must aim to radically transform the underlying economic systems of inequity and social structures of inequality that are at the root of our present suite of socioecological crises. While the vision must be determined from the bottom up, this paper attempts to define how we might get there.

Specifically, this paper presents a heuristic intended to provide climate and education decisionmakers with: 1) a framework for conceptualizing the green skills needed to catalyze both technical and social transformation (see Figure 1) and 2) a tool for considering three approaches to quality education for climate action (see Figure 2). Depending on the context, certain approaches may be more feasible than others, although all three approaches should

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be pursued. Taken together, the framework presents a "new green learning agenda" in which each approach helps to solve a different aspect of the climate crisis in the spirit of the Paris Agreement—that is, through the lens of justice, equity, and fairness. As such, this framework offers proposals to ensure the needs and experiences of those often most vulnerable to the impacts of climate change and social inequity, especially girls and women, are prioritized.

Figure 1. A green skills framework

Skills for Green Jobs

Skills aimed at fulfilling the requirements of green jobs and supporting the transition to a low-carbon green economy

SPECIFIC CAPACITIES

Business skills
Data analysis
Engineering
Entrepreneurship
Environmental and ecosystem management
Environmental knowledge and awareness
Finance skills
ICT skills
Innovation skills
Marketing skills
Project management
Research skills
Sales skills
Science skills
Technological skills
(Gender empowerment skills)

Green Life Skills

Cross-cutting skills that serve both technical, instrumental, and adaptive, transformative ends

GENERIC CAPACITIES

Adaptability
Collaboration
Collaborative thinking
Communication
Coping with emotions
Coping with uncertainty
Creativity
Critical thinking and reasoning
Decisionmaking
Empathy
Flexibility
Growth mindset
Higher order thinking skills
Interpersonal competence
Leadership
Negotiation
Networking
Open-mindedness
Participatory skills
Problem-solving
Resilience
Strategic thinking
Teamwork

Skills for a Green Transformation

Adaptive skills aimed at transforming unjust social and economic structures

TRANSFORMATIVE CAPACITIES

Ability to analyze unequal systems of power
Coalition building
Collective action
Disruptive vs. normative thinking
Environmental stewardship
Future and anticipatory thinking
Integrative thinking
Interdisciplinary and multidisciplinary thinking
Interrelational thinking
Political agency, activism
Reflexivity
Respecting diverse viewpoints
Solidarity
Systems Thinking
Trans-cultural, trans-spatial, trans-temporal mindsets
Valuing traditional and indigenous knowledge
Working within complexity

INSTRUMENTAL

TRANSFORMATIVE

Figure 2. A green skills heuristic for climate action

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Problem frame for the climate crisis	Technical challenge	Adaptive challenge	
Source of the problem	CO_2	Unsustainable individual behaviors	Unjust social and economic systems
Vision of the solution	Just transition to green economy	Sustainable, pro-environment behaviors	Sustainable, equitable systems
Education objective	Specific capacities	Generic capacities	Transformative capacities
Green skills framework	Green jobs	Green life skills	Green transformation
Green learning agenda	Gender-transformative green TVET	Critical climate change education	Transformative learning for climate action

The three approaches in a new green learning agenda

Approach 1 ensures technical education and training aimed at building specific capacities, or "skills for green jobs," can achieve a just transition to a green economy through a gender-transformative approach. It expands our conceptualization of green skills beyond STEM skills to also include gender-empowerment skills like the ability to read, decode, and act upon one's social environment. It argues that if girls and women are already excluded from the present brown economy, they will be at the fringes of a green economy without deliberate efforts to make green technical and vocational education and training initiatives more gender inclusive and gender transformative.

Approach 2 ensures that building "green life skills" translates into long-standing, pro-environmental behaviors by focusing on a critical, intersectional,

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and justice-oriented agenda in climate climate change education (CCE) and education for sustainable development (ESD). It conceptualizes green skills as the cognitive and socioemotional skills that can be "worn" like a pair of green glasses, helping individuals make greener decisions and engage in greener behaviors in a wide variety of contexts. It argues that if girls' experiences are added to the "shade" of the green-tinted lenses, the resulting behaviors can be more gender empowering.

Approach 3, perhaps the most radical and important of the three, focuses on developing "skills for green transformation" by transforming mindsets and confronting the underlying structures of inequality and systems of oppression that sustain climate vulnerability. It positions green skills like disruptive thinking and political agency as core pieces of a larger framework of change that includes attention to the opportunity structures that enable or inhibit individual and collective climate action. It argues that through the development of girls' (and boys') feminist planetary conscious and the active disruption of gender inequality, education can seed the social transformation needed to achieve the 1.5°C target.

To adopt these approaches, a strong policy environment is imperative, as is the political will among state and nonstate actors to break with the status quo and build resilience and adaptive capacity to an unsustainable system. Education has an important transformative role to play in seeding the mindset changes needed to replace unjust and unsustainable social and economic systems. But the education sector cannot do this alone. This paper suggests several policy entry points for decisionmakers and civil society to better leverage national and subnational opportunities for: capacity building and awareness, policy coherence and coordination, international collaboration, and financing local and grassroots efforts at scale.

Capacity building and awareness raising

Recognizing that green learning advocates are likely to engage decisionmakers and stakeholders with varying levels of climate knowledge, it would be prudent to:
- Build capacity and raise awareness on issues of gender, education, and climate justice.
- Raise awareness and understanding across the current and future teacher workforce of the anthropogenic drivers of climate change, the

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difference between low-impact and high-impact climate solutions, and the intersections between climate change and climate justice.

- Co-develop with educators a teacher training program and teacher leadership development program on gender-transformative education for climate action.

Policy coherence and coordination

Recognizing that there is a wide landscape of relevant international, national, and subnational policy, a coherent approach to education for climate action across these policy frameworks can enable downstream efforts at resource mobilization and implementation. To foster such coordination:

- Reference all three green learning agendas in climate and education policies, including Nationally Determined Contributions, National Climate Change Learning Strategies, National Action for Climate Empowerment Strategies, and national green economy or low-emissions strategies.
- Align monitoring mechanisms for Sustainable Development Goals 4.7, 12.8, and 13.3 and Action for Climate Empowerment implementation to a more radical vision of education for climate action.
- Build a dashboard to monitor country provision of and coherence in national and/or sub-national approaches to quality education for climate action.

International collaboration

Recognizing that a new green learning agenda should not be the responsibility of a few countries but of all countries, efforts must be made to:

- Lean in on the Paris framework for equity, justice, and fairness to call on developed countries to make good on their responsibility to support developing countries fulfill their Nationally Determined Contribution targets.
- Leverage bilateral mechanisms, like feminist foreign policy, for more transformative multi-solving collaborations between countries.
- Build a transnational social movement and multisectoral coalitions of support for green, feminist transformation.

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Financing local and grassroots efforts at scale

Recognizing that financing is key among the challenges to accelerating progress toward climate action, barriers to unlocking climate financing must be removed, including a lack of data for diagnostics and decisionmaking. Two important first steps are to:

- Develop a costing tool to determine the financing needed to implement the three approaches to a new green learning agenda.
- Push green financing mechanisms, as well as the OECD Development Assistance Committee, to develop a series of green learning agendas and/or action for climate empowerment markers to monitor climate financing toward quality, gender-transformative education for climate action.

At a practical level, this paper presents a heuristic for countries to determine the best entry points for orienting their education systems toward climate action and achieving a green, feminist transformation. It also provides the evidence and rationale for doing so, as well as concrete recommendations that will enable the pursuit of this agenda. At a conceptual level, this paper aims to help decisionmakers understand that they should not stop at education reform, but to identify pathways to transform education as we currently know it. We should not settle with doing education as we know it better, but rather to push ourselves to see how education can be done differently.

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Indroduction

The year 2020 was supposed to be an important year for the climate crisis. Ahead of the 26th Conference of the Parties Meeting in Glasgow, signatory parties to the Paris Agreement should have submitted their updated Nationally Determined Contributions (NDCs)—or their national strategies to reduce greenhouse gas emissions. Together, these NDCs would have served to guide our collective course of action for the next five years, helping countries steer toward their carbon reduction commitments by 2030, the goal of net-zero carbon emissions by 2050, and the target of limiting global temperature rise to 1.5° Celsius by 2100.

Instead, the year 2020 brought the global economy to an unexpected decline as countries around the world responded to the COVID-19 pandemic. While the pandemic is a public health crisis, it leaves no facet of social and economic life untouched. In an attempt to slow the spread of the novel coronavirus, over 100 countries implemented some variation of a country-wide lockdown.[1] At the peak of this economic slow down, over 190 countries shut down schools, affecting nearly 1.6 billion students (over 90 percent of learners, globally).[2]

As a result of these and other measures to "flatten the curve," the sudden shift to online and distance learning exposed deeply embedded inequalities within the global education system, as well as the micro- and macro-socioeconomic and gendered structures that perpetuate these inequities. For example, while on average 90 percent of students in high-income countries have access to online learning, only 25 percent have access in low-income countries.[3] And among those in low-income countries, data suggest that girls may have even less access than boys due to persisting gender norms and practices that limit girls' access to technology and the internet. Lessons from Ebola-related school closures in 2014-2015 suggest that 20 million more girls may be at risk of not returning to school when they reopen.[4]

Instead of achieving clarity in 2020 about the path toward net-zero emissions, the year brought about unprecedented economic uncertainty, social unrest,

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1. https://www.bbc.com/news/world-52103747
2. https://en.unesco.org/covid19/educationresponse
3. Vegas, 2020.
4. Malala Fund, 2020.

and the disruption of routine life. Yet, just as the zoonotic nature of the novel coronavirus brought to light how the destruction of wildlife habitats increase our risk of exposure to new and deadly infectious diseases, the global economic shutdown as a result of COVID-19 illustrated just how closely our human activity is tied to the destruction and restoration of the planet. Climate scientists have documented how the temporary shutdown of economic activity was quickly followed by significant drops in air and water pollutants around the world.[5] The global response to the pandemic also demonstrated that rapid behavioral change at scale is possible, and that a similar approach could be applied to the climate crisis.

Problems *in* education and problems *of* education

Human society sits at a crossroads, hurtled into an unprecedented state of uncertainty caused by the COVID-19 pandemic and climate change. Discussions of building back better education systems must start not only from a position of responding to the inequalities and inequities laid bare by worldwide school closures, but also from the position that education as we currently know it is part of the problem.

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As countries shift from pandemic response to recovery, decisionmakers have begun searching for ways to leverage this moment of disruption to start anew. In the context of education, stakeholders like civil society, activists, and researchers have worked hard to ensure that the public health and economic crises spurred by the pandemic do not divert much needed financial resources away from the education sector. Meanwhile, girls' education actors have worked hard to ensure hard-won gains in gender equality in education are not rolled back as governments turn their attention to the learning loss of millions of girls and boys.

But aside from ensuring education—and gender equality in education— remains a priority for countries, stakeholders must also ensure that these discussions are not limited to "doing things better." Such conformative change

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5. European Environment Agency, 2020; Muhammed, Long, and Salman, 2020; O'Sullivan, 2020; Stone, 2020.

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focuses on maintaining the same systems and structures that have led to our present condition; such change is about achieving greater efficiency and effectiveness—solving problems in education. At the same time, we must not limit discussions to "doing better things," or reformative change that merely grants equal access and opportunity to previously disenfranchised populations into an existing system. Instead, COVID-19 and the mounting climate crisis are urgent calls to push decisionmakers to "see things differently," to confront long-time problems of education and to commit to the difficult transformative change that can significantly alter not only the system itself, but its underlying purpose and its values.[6] To illuminate this point, consider that addressing gender inequality in education as a "problem in education" leads decisionmakers and education stakeholders to focus

> By seeing things differently, stakeholders can see that the values and beliefs that justify the exploitation and abuse of girls and women are rooted in the same values and beliefs that justify the exploitation and abuse of the environment and the non-human world.

on things like improving teacher training in gender-responsive pedagogy, improving textbooks by eliminating gender bias, improving school facilities by ensuring there are separate bathrooms and running water for menstruating girls and female teachers, and so on.

All of these are important, but without framing gender inequality in education as a "problem of education," we ignore the underlying challenge: that education systems perpetuate the exploitation of girls and women by not confronting harmful social norms and structures that position girls as lesser than boys, as not having the right to education, or in the words of Indian education champion Urvashi Sahni, as not fully human.[7] By seeing things differently, stakeholders can see that the values and beliefs that justify the exploitation and abuse of girls and women are rooted in the same values and beliefs that justify the exploitation and abuse of the environment and the non-human world: mainly, exclusion and domination. We cannot achieve sustainable, gender-equal societies or reverse course toward climate breakdown without acknowledging and addressing these connections. But,

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6. Orr, 2004; Sterling, 2010.
7. Sahni, 2017.

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by transforming the purpose of education to create more gender-equitable societies—and by actively teaching gender equality and principles of equity, justice, and fairness—we can simultaneously address the underlying values, ethics, structures, and relations of power to create socially, economically, and environmentally sustainable societies.

While problems *in* education (e.g., unequal access, quality of teaching and learning, validity and utility of assessments, etc.) need to be addressed, attending simultaneously to problems of education (e.g., its purpose) will help strengthen society's transformative capacity. That is, its capacity to transform both individuals and society in a deliberate way that is conscious of planetary boundaries, in balance with the carrying capacity of the earth, and aims for the flourishment of all life, human and non-human.[8]

The climate crisis: A technical *and* adaptive challenge

How we frame the climate crisis also matters in this discussion. This is especially the case when it comes to defining quality education for climate action, and identifying the knowledge, skills, and attitudes for climate empowerment.[9]

For example, climate change is a technical challenge. Due to human activity over the last century, the earth's atmosphere now contains more greenhouse gases than it can naturally absorb, trapping heat and causing average temperatures around the world to rise. With the problem focused on greenhouse gases, especially carbon dioxide, the solution that follows is to decrease the amount of greenhouse gases in the earth's atmosphere by both removing existing emissions and mitigating against further emissions. One of the social adaptations needed is a transition from high-carbon economies—those that are dependent on the burning of fossil fuels—to low- or carbon-neutral economies, herein called a "green economy," that

8. Ziervogel, Cowen, and Ziniades, 2016; see also Orr, 2004; Schumaker, 1997; Sterling, 2010.

9. There are few definitions of climate empowerment in the literature. Despite climate empowerment being the focus of Article 6 (Action for Climate Empowerment) of the United Nations Framework Convention on Climate Change (UNFCCC), the UNFCCC does not clearly define this term either. For the purposes of this paper, a working definition of climate empowerment is the transformative process of understanding the complexities of the systemic drivers of climate change—including historic, and contemporary systems of oppression over marginalized groups; the capacity to exercise power and to transform these unjust and unsustainable systems and vested interests; and the increased access to resources and opportunities for individual, collective, personal, and political action in response to and in anticipation of climate change and its impacts.

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are fueled on low-carbon or renewable energy that create minimal to no net outputs of carbon.[10] The implications for the education sector then is to build a workforce with the specific capacities to support such a transition.

But climate change is also a sociological problem, or an adaptive challenge, which requires new ways of being in the world. Again, how one frames the source of this adaptive challenge shifts the role of education and the definition of quality education. For instance, if the source of this adaptive challenge is conceptualized as unsustainable behaviors at the individual level (including one's consumption patterns, energy use, and lifestyle decisions, etc.), the role of education is to shift the individual's generic capacities toward more sustainable behaviors. This might include improving the individual's awareness of the problem and knowledge of the solutions. However, if the source of this adaptive challenge is conceptualized as unjust social and economic systems (including an uncritical stance on neoliberal models of economic growth, development and trade policies that perpetuate environmental racism and carbon colonialism, and policies that exclude the full participation of girls and women in public life), the role of education is to develop the transformative capacity of individuals and society to seed broader systems change for both social and climate justice.

Each of these conceptualizations of the climate crisis is valid. It is both technical and social, both behavioral and systemic. And just as there is no single solution to climate change, there is no single educational solution to building our adaptive capacity to climate change or our transformative capacity to systems change. Rather, we must deploy a range of visions of quality education for climate action.

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10. There is no settled consensus on what a green economy entails. Some definitions of green economy include not only aspects of environmental sustainability, but also values such as social inclusion, equity, poverty alleviation, and human well-being. For instance, one of the most widely cited definitions of the green economy concept comes from the United Nations Environment Programme's 2011 report "Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication," which defines green economy as: "one that results in improved human well-being and social equity, while significantly reducing environmental risk and ecological scarcities. In its simplest expression, a green economy can be thought of as one which is low carbon, resource efficient, and socially inclusive." (p.1). By contrast, certain definitions of green economy do not include social dimensions—instead highlighting only economic and environmental concerns. For example, the Platform on Advancing Green Human Capital (2017) defines the green economy as "an economic system that is efficient in its use of natural resources, characterized by limited polluting and resource intensive activities, flourishing activities aiming at environmental preservation, and environmentally responsible business practices" (p.5). The green economy concept is complicated by the fact that it has been invoked around a nexus of intersecting economic, social, and environmental concepts. Depending on the specific institutional actor advancing the term, greater weight and attention is placed on the economic, ecological, and social dimensions associated with the concept. For the purposes of this paper, we use green economy as a general term to broadly signify a greener, low-carbon version of our present high-carbon economy.

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A green skills continuum

Inherent in the framing of the climate crisis and the corresponding education response is a conceptualization of the kinds of skills that are desirable. In recent years, the concept of "green skills" has garnered growing attention among global actors focused on sustainable development. The European Centre for the Development of Vocational Training (CEDEFOP) defines green skills as "the knowledge, abilities, values, and attitudes needed to live in, develop and support a society which reduces the impact of human activity on the environment."[11] At the same time, green skills have been recognized by country-level actors as a crucial ingredient to a successful transition from fossil fuel-driven economies to green economies. Not only do these skills carry the key to unlocking renewable industries, but also the potential to promote equity and social inclusion under an alternative version of sustainable economic growth.

> Not only do these skills carry the key to unlocking renewable industries, but also the potential to promote equity and social inclusion under an alternative version of sustainable economic growth.

For instance, structural changes involved in a transition to a green economy, if managed correctly, are understood to have a great deal of potential to alleviate global poverty, by promoting inclusive economic empowerment for low-income communities worldwide.[12] As economies become greener, increased investments in preserving the earth's natural capital can bolster the livelihoods of rural poor individuals and communities, particularly indigenous peoples and girls and women, who often depend directly on utilizing natural capital.[13] In other words, the economic and social benefits of a green economy are often understood to be deeply entwined: The green economy has the potential to confer social benefits through uplifting the livelihoods of economically marginalized communities. Therefore, due to their presumed environmental, economic, and social benefits, green skills have been advanced as a promising tool for addressing several interrelated global challenges at once.

However, as momentum builds around the importance of green skills development, there remains ambiguity about how green skills are defined and then operationalized in learning approaches. Various development

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11. Cedefop, 2010.
12. UNEP, UNCTAD, and UN-OHRLLS, 2011.
13. UNEP, 2011.

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institutions, multilateral agencies, and green sector stakeholders define and invoke the concept of green skills in distinct ways. This paper, which synthesizes a diverse body of literature on green skills (see Appendix A), finds that green skills can be understood as broadly coalescing around two distinct but overlapping paradigms (see Figure 1).[14] One paradigm understands green skills through a technical lens as the specific capacities needed to thrive in green jobs to transition to a low-carbon green economy. These might include technical skills like engineering, environmental management, as well as specific workplace skills like project management or marketing. The other paradigm conceptualizes green skills through a much broader sociological lens, attending to the transformative capacities needed to disrupt and transform both the individual behaviors and structural factors that exacerbate the climate crisis. This includes the ability to analyze unequal systems of power, reflexivity, and political agency.

Shared between these two paradigms is a set of generic capacities, like critical thinking, adaptability, open-mindedness, and empathy, that can serve both technical and transformative ends depending on how they are taught and applied. Because these generic capacities can be used as a means to materializing different "green" ends, this third paradigm of skills can be viewed generally as cross-cutting skills to enhance one's ability to solve practical problems in greener ways. This could mean addressing sustainability problems or environmental challenges with green technical solutions or green behavioral change. We refer to this paradigm as "green life skills" due to its high degree of overlap with the broader sets of skills commonly referred to in the education sphere as "life skills."[15]

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14. It is important to acknowledge the critique that the literature is dominated by "laundry lists" of skills rather than conceptualizations of interlinked knowledge, skills, and attitudes. As a result of such skills-in-isolation, learning frameworks are unlikely to view green skills systematically and holistically (Wiek, Withycombe, and Redman, 2011). Another inherent challenge with developing a green skills framework is that many of the approaches to green skills place emphasize the high degree of complexity underlying environmental crises. Due to the multifaceted nature of climate change, its impacts, and its solutions, it is far from clear which specific tasks and corresponding skills are precisely needed to advance sustainable transformations. In effect, the list of skills in Figure 1 could be added to in perpetuity.
15. The World Health Organization defines life skills as the "abilities for adaptive and positive behavior, that enable individuals to deal effectively with the demands and challenges of everyday life" (WHO, 1994. p.1).

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Figure 1. A green skills framework[16]

Skills for Green Jobs

Skills aimed at fulfilling the requirements of green jobs and supporting the transition to a low-carbon green economy

SPECIFIC CAPACITIES

Business skills
Data analysis
Engineering
Entrepreneurship
Environmental and ecosystem management
Environmental knowledge and awareness
Finance skills
ICT skills
Innovation skills
Marketing skills
Project management
Research skills
Sales skills
Science skills
Technological skills
(Gender empowerment skills)

Green Life Skills

Cross-cutting skills that serve both technical, instrumental, and adaptive, transformative ends

GENERIC CAPACITIES

Adaptability
Collaboration
Collaborative thinking
Communication
Coping with emotions
Coping with uncertainty
Creativity
Critical thinking and reasoning
Decisionmaking
Empathy
Flexibility
Growth mindset
Higher order thinking skills
Interpersonal competence
Leadership
Negotiation
Networking
Open-mindedness
Participatory skills
Problem-solving
Resilience
Strategic thinking
Teamwork

Skills for a Green Transformation

Adaptive skills aimed at transforming unjust social and economic structures

TRANSFORMATIVE CAPACITIES

Ability to analyze unequal systems of power
Coalition building
Collective action
Disruptive vs. normative thinking
Environmental stewardship
Future and anticipatory thinking
Integrative thinking
Interdisciplinary and multidisciplinary thinking
Interrelational thinking
Political agency, activism
Reflexivity
Respecting diverse viewpoints
Solidarity
Systems Thinking
Trans-cultural, trans-spatial, trans-temporal mindsets
Valuing traditional and indigenous knowledge
Working within complexity

INSTRUMENTAL

TRANSFORMATIVE

16. While several green skills frameworks exist (for example, see Lotz-Sisitka, 2018; Rosenberg, Visser, and Cobban, 2015; Staufer, Zahrer, and Lechner,2015; PAGE 2016; ProEnviro, 2008), we categorized skills into these three approaches based upon our review of green skills literature, as well as key informant interviews. This diagram is not intended to serve as an entirely exhaustive list of all skills, but rather aims to highlight several of the most frequently cited skills associated with each approach to education. Notably, this misses out on the "green skills" associated with traditional and indigenous knowledges and practices. In addition, due to the overlapping nature of the three approaches, none of the above groupings of skills should be seen as entirely separate or mutually exclusive from the other categories. Instead, these approaches illuminate a green skills spectrum, coalescing around three distinct approaches to education and the instrumental or transformative ends to which they aim. They all, however, hold the possibility to transform individuals and society. For example, specific capacities can be transformative in the outcomes they enable, and transformative capacities can be used for violent, destructive ends as in the case of radicalization. As will be developed later in this paper, gender empowerment skills are included within specific capacities (or Approach 1) since we will argue that gender-transformative TVET and educational opportunities are needed to ensure girls and women are included in the transition to the green economy.

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As will be discussed in more depth later, how we frame the climate problem informs the solution we conjure, the green skills we conceptualize as important, and the educational approach to develop those skills. Each of these approaches is needed, and each constitutes an important dimension of quality education. Each also has potential to impact efforts at achieving gender equality in and through education in different ways, of which decisionmakers must be aware and for which positive outcomes must be intentionally designed.

For too long the education sector has floundered in its coordination of systems wide climate action. This has had an overall impact on the awareness of non-education sectors like waste management or transportation on how best to leverage the transformative potential of education. For instance, an analysis of 160 NDCs found that if education were referenced, it missed the mark when it came to setting a national level strategy for education for climate empowerment.[17] And out of the eight UN CC:Learn countries that have a National Climate Change Learning Strategy publicly available at the time of writing, only one country references issues of fairness, and two reference the concept of justice. None raise issues of power when it comes to teaching about climate change, none reference the need for systems change, and none discuss skills in the context of taking action for climate justice. An opportunity to align climate change learning and climate justice has been missed, but it is not too late to reverse course.[18]

> What we need is a holistic framework for decisionmakers, especially those outside the education sector, to better understand what their policy options are.

If we take the challenge of building back better from COVID-19 as a once in a lifetime opportunity to build back differently and to tackle the problems of education in the context of climate crisis, what we need is a holistic framework for decisionmakers, especially those outside the education sector, to better understand what their policy options are: not only what quality education approach aligns with their framing of the problem, but also, and more importantly, what dimension(s) of the problem their chosen educational

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17. Kwauk, Cooke, Hara, and Pegram, 2019.
18. These countries include Benin, Dominican Republic, Ethiopia, Ghana, Indonesia, Malawi, and Uganda, as well as a regional Central American strategy. Burkina Faso's strategy was not available on the internet. For additional UN CC:Learn project countries, see https://www.uncclearn.org/country-projects.

approach does not solve and to where they must work to chart a direct course. From such an understanding, we can seed policy discussions around how to do things differently.

Overview of the paper

This paper introduces a green skills heuristic (Figure 2) to inform decisionmakers on the range of education pathways to transform human social and economic systems to address the climate crisis. This is particularly important as countries attempt to strengthen their Action for Climate Empowerment (ACE) strategies with regard to education and training in their updated NDCs, and as efforts to develop National ACE Strategies or National Climate Change Learning Strategies continue.

Figure 2. A green skills heuristic for climate action

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	Technical challenge	Adaptive challenge	
Problem frame for the climate crisis	Technical challenge	Adaptive challenge	
Source of the problem	CO_2	Unsustainable individual behaviors	Unjust social and economic systems
Vision of the solution	Just transition to green economy	Sustainable, pro-environment behaviors	Sustainable, equitable systems
Education objective	Specific capacities	Generic capacities	Transformative capacities
Green skills framework	Green jobs	Green life skills	Green transformation
Green learning agenda	Gender-transformative green TVET	Critical climate change education	Transformative learning for climate action

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This heuristic is meant to be a starting point for education transformation, both at the systems level and in content. Taken together, however, the green learning agendas presented here would comprise a framework for a broader "new green learning agenda." Indeed, this paper proposes that decisionmakers adopt all three green learning agendas lest governments risk further fragmentation of what needs to be a holistic and comprehensive education response. But this paper also recognizes that countries are at different stages of climate change acceptance, have varying levels of resources at hand,

> This paper proposes that decisionmakers adopt all three green learning agendas lest governments risk further fragmentation of what needs to be a holistic and comprehensive education response.

and may have a cadre of policymakers who themselves may not all be convinced of the local and global realities of climate change—or of the anthropogenic causes of climate change. In order to set decisionmakers up to win the long game of transformative social change in the short term, this new green learning agenda could be implemented progressively over time as political will and resources are mobilized. As such, the paper aims to provide decisionmakers and stakeholders with a heuristic tool and a set of recommendations for leveraging key opportunities and mechanisms available in the current education and climate policy landscape, with an eye toward pursuing all approaches in the near term.

The heuristic and discussion that follow synthesizes a critical feminist analysis of literature from a desk review of a wide number of academic disciplines, including environmental and climate change education, environmental psychology, green economics, organizational development, and transformative learning, among others (see Appendix A for an overview of the literature review methodology). The heuristic is also informed by a text analysis of relevant policy documents, including National Climate Change Strategies, curricular frameworks, as well as 24 interviews with stakeholders from green industries, green movements, government ministries, nongovernmental organizations, and multilateral organizations (see Appendix B).

In addition, this paper uses girls' education and issues of gender inequality in education as a litmus test for determining the transformative potential of each of the three green learning agendas. We know that countries where harmful gender norms, gender insensitive learning environments, and gender

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discriminatory education policies are present are also countries with low levels of climate resilience and high levels of vulnerability to climate-related disasters.[19] Denying girls their right to a quality education and from living equal, dignified lives of their own choosing is intricately tied to girls' and women's heightened experience of protracted climate emergencies, and their higher rates of mortality during weather-related disasters, as well as higher rates of sexual assault and sex trafficking following a disaster.[20] Yet we know that the education and empowerment of girls are a critical starting point for addressing the deeper structural inequalities and opportunity gaps that increased her and her communities' vulnerability to climate change in the first place.[21]

> A gender-blind approach to education for climate action risks undercutting the very goal of climate empowerment. Placing a special emphasis on girls—as well as other marginalized communities like people with disabilities, indigenous peoples, LGBTQI people, minorities, and refugees and displaced people— helps ensure strategies are equitable, empowering, and transformative.

Furthermore, policy discussions of the green economy call on the development of industries that require education in technical fields of study from which girls have typically been excluded because of their gender. And climate change education curriculum and education for sustainable development approaches have largely ignored issues of gender inequality.[22] Such a gender-blind approach to education for climate action risks undercutting the very goal of climate empowerment. Placing a special emphasis on girls—as well as other marginalized communities like people with disabilities, indigenous peoples, LGBTQI people, minorities, and refugees and displaced people—helps ensure strategies are equitable, empowering, and transformative.

Finally, while this paper uses the term "new" green learning agenda, it is important to note that each of the agendas represented in this heuristic are not new on their own accord. Critical scholars and radical educators have been arguing for transformative learning (Approach 3) since the

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19. Kwauk and Braga, 2017.
20. Fothergill and Squier, 2018; Lim, 2017; Lim and Namasivayam, 2017; Neumayer and Plumper, 2007; On-wutuebe, 2019; Plan International, 2011; Shooshtari, et al., 2018.
21. Kwauk and Braga, 2017.
22. In an analysis of 40 climate change education curricula focused on issues of social and climate justice, only one included a module on gender (Kwauk and Wyss, 2020).

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1970s, if not for centuries.[23] UNESCO has been promoting education for sustainable development (Approach 2) since the 1990s. And organizations such as the International Labor Organization (ILO), the European Centre for the Development of Vocational Training (CEDEFOP), the United Nations Institute for Training and Research, and UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training have been at the helm of greening TVET institutions (Approach 1) for more than a decade. What is new is the proposal to harmonize these learning agendas under a more transformative vision of social, economic, gender, and environmental sustainability. In doing so, even the most transmissive of agendas is repurposed for a more transgressive and transformative outcome to confront the problem of education.[24] Taken together as a policy package rather than a menu of options, these approaches will help create the education necessary for social equity, gender equality, and environmental sustainability—conditions that even the Intergovernmental Panel on Climate Change recognize are prerequisites to achieving the 1.5°C target.[25]

23. Freire, 1972 (2000); Mezirow, 1997.
24. Jickling and Wals, 2008; Lotz-Sisitka, et al., 2015.
25. IPCC, 2018.

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A New Green Learning Agenda Framework

Education has long been conceptualized as a tool for addressing sustainability issues. Historically, there have been four distinct periods that have evoked the role of education in alleviating economic and environmental crises. The first, beginning in the late nineteenth century, can be described as "nature conservation education," which was centered around "(re)connecting people with nature." Second, emerging in the 1960s, was "environmental education" that was focused on "developing ecological literacy and changing environmental behaviors and lifestyles." Third, marked by the 1992 Earth Summit, was "sustainability education," which began to merge discussions around economic development and environmental sustainability with the goal of enhancing "citizen engagement and capacity building for sustainable development." Finally, spearheaded largely by the era of the Sustainable Development Goals, the latest phase of "environmental and sustainability education," which includes UNESCO's push for education for sustainable development (ESD), attempts to rethink "humanity's place in the world and global citizenship."[26]

One could argue that 2020 called for a revitalized role for education. This was enabled by growing public awareness of the climate crisis thanks in large part to the activism of youth groups and student-led strikes for climate around the world. The need for a revitalized role is also borne out of growing public awareness that the window for transformative change grows smaller and smaller by the year. As political will catches up to public awareness, this paper proposes a new green learning agenda framework that will help decisionmakers and stakeholders align the education system for such a revitalized role. In particular, this framework helps to orient the education system toward the goal of seeding the rapid and radical transformation of our social and economic systems, as well as the individual mindsets needed for widescale climate action.

The sections that follow dive into each of the three green learning agendas as they define quality education for both climate action and climate empowerment. Each section lays out how the framing of the climate crisis lends itself to a particular approach to education and to a particular set of targeted skills and competencies. Each section also provides an overview of

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26. Wals and Benavot, 2017, p. 406.

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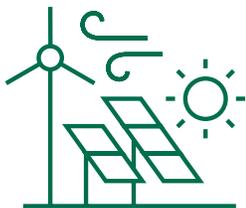
some of the approach's key shortcomings—what aspects of the education for climate action and climate empowerment problem it cannot address, and therefore why complementary education approaches must be pursued simultaneously. Each section also discusses how the approach can be more transformative for people and the planet. Read together, these approaches illustrate why the broader transformation of our education systems for climate action is imperative to the survival and flourishing of human society.

Approach 1. Developing specific capacities

Problem frame for the climate crisis	Source of the problem	Vision of the solution	Education objective	Green skills framework	Green learning agenda
Technical challenge	CO_2	Just transition to green economy	Specific capacities	Green jobs	Gender-transformative green TVET
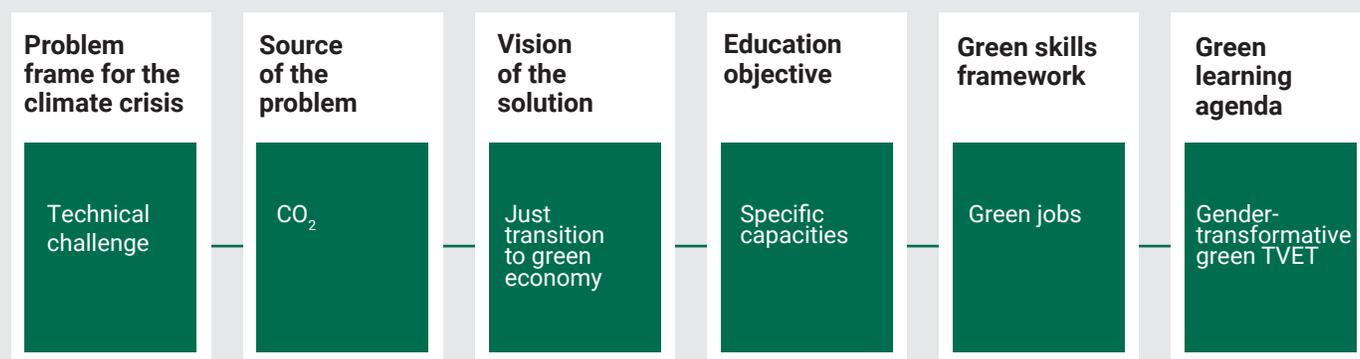
As mentioned earlier, the climate crisis is most often discussed in terms of carbon emissions: There is too much carbon dioxide in the earth's atmosphere, and human activity threatens to increase these levels further. The solution is then to draw down levels of carbon while mitigating against further emissions. Countries and climate financing mechanisms have responded to this problem-solution by focusing on the development of renewable energy technologies and other green industries to help transition national economies to a low-carbon, energy-efficient version.

To get there, countries have responded by promoting workforce development and training initiatives to build a green labor force—one that is equipped with the specific capacities to meet the evolving skills requirements needed to help bring to fruition the green industries, green workplaces, and green innovations for such a transition. Given the need to develop these industries rapidly, training efforts have been targeted largely at late adolescents to adults transitioning into or already in the labor force through TVET institutions and through "up-skilling" and "re-skilling" programs (e.g., technical training

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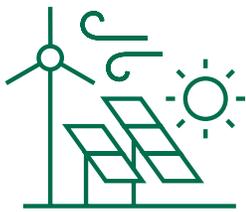
for former coal miners to become wind turbine technicians in the U.S.).[27]
Indeed, in recent years, calls for greening TVET have risen to prominence
within sustainable development agendas as decisionmakers work to direct
resources toward filling the green skills gap quickly.[28] As a result, this
approach to quality education for climate action and climate empowerment
is heavily tied to workforce outcomes (albeit, in traditionally male-dominated
sectors), and frames skills from a highly technical lens.

A technical framing of green skills: Skills for green jobs

Within the landscape of international development institutions, multilateral
agencies, policymakers, and governments attending to green skills, many
have converged upon a paradigm of green skills conceptualized as "skills for
green jobs." In particular, the ILO has played a central role in advancing the
concept of skills for green jobs, arguing for the importance of identifying the
job skills needed in a green economy and aligning policies to support such
skills development.[29] Several other conceptualizations of green skills within
this paradigm are similarly oriented toward occupational and labor-market
concepts. One frequently cited definition of green skills comes from the 2009
Australian Green Skills Agreement, which defines green skills as "skills for
sustainability which are related to the technical skills, knowledge, values,
and attitudes needed in the workforce to develop and support sustainable
social, economic, and environmental outcomes in business, industry, and
the community."[30] The Platform on Advancing Green Human Capital defines
green skills as "the professional knowledge, abilities, values, and attitudes
needed in the transition to the green economy."[31] While this focus on skills
for green jobs has indeed gained traction among key stakeholders and
practitioners, critics have also illuminated several shortcomings to this
approach, which will be discussed further below.

Within this paradigm, green skills are understood to encompass a narrow
breadth of skills that are needed to succeed in a green workplace context.[32]
These skills are narrow in the sense that they are conceptualized as green
sector occupation-specific skills, but they reflect a breadth of technical skills

27. https://www.vice.com/en/article/vbzp39/these-former-coal-workers-are-training-to-be-wind-technicians.
28. UNEVOC, 2013, 2017; Majumdar, 2011; Cedefop, 2012b.
29. ILO, 2019.
30. Council of Australian Governments, 2009, p. 2.
31. Platform for Advancing Green Human Capital, 2017, p.5.
32. Strietska-Ilina, et al., 2011.

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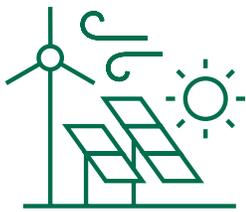
required across a wide range of industries, especially key green sectors such as renewable energy, manufacturing, transportation, construction, agriculture, forestry, water and waste management, and tourism. Such sectors require technical expertise in areas spanning from science, conservation, engineering, and research and development to the design, production, installation, operation, and maintenance of green technologies, products, and processes. Since much of the green economic transition is driven by the shift to new green technologies, many of the technical skills required in green jobs are associated with the fields of science, technology, engineering, and mathematics (STEM), leading often to the conflation of green skills and STEM skills in this paradigm.[33]

But in addition to green skills of a technical nature, green jobs also require non-technical skills, commonly referred to in this paradigm as core green skills, that are generally transferable across job contexts and needed for success in the workplace. These skills include environmental awareness, entrepreneurship, business skills, sales and marketing skills, customer service skills, innovation, leadership, problem-solving, analytical thinking, communication skills, and the ability to work in teams.[34] Many of such core green skills are associated with the field of positive psychology, which continues to gain traction within business and workplace settings.[35]

Notably, this paradigm emphasizes that green skills should dynamically mirror and respond to changes in labor market demands associated with green structural economic adjustments. This market-centered understanding also necessitates that the relevance and salience of green skills are not only dependent on the sector of employment, but also on the country context and local labor market dynamics.[36] Therefore, successfully identifying green skills requirements and delivering transformative learning opportunities will require extensive coordination among local stakeholders across multiple levels and sectors.[37] International organizations such as the Global Green Growth Institute are contributing to an emerging body of research to identify and forecast the demand for particular green skills and green jobs across a variety of contexts.[38]

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33. Cf. Smith and Watson, 2019.
34. ILO, 2019.
35. O'Brien, 2012.
36. OECD and CEDEFOP, 2014.
37. ILO, 2013, p. 5.
38. GGGI, 2019.
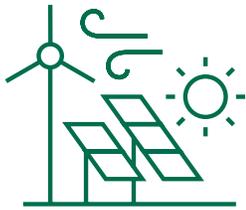
Shortfalls to transformation

While a focus on developing specific capacities or green skills for green jobs appears to be a straightforward path to easy wins for people and the planet, this approach on its own and as it is currently conceived does not guarantee the degree of socioeconomic transformation required for economic development to remain within planetary boundaries. Indeed, this labor-market oriented conceptualization of green skills may be quite pervasive and influential among stakeholders and policymakers, yet it has not escaped criticism. There are several major shortfalls to transformation that decisionmakers must bear in mind and seek to address when pursuing this particular green learning agenda.

A green growth agenda fails to disrupt underlying systems of unsustainability.
Within a skills for green jobs paradigm, it is often uncritically assumed that green jobs and the green economy can fuel economic growth in a manner that ultimately will become disentangled from environmental harm.[39] However, critics of green growth theory argue that there is little evidence to suggest such decoupling is possible.[40] Moreover, they posit that so long as a green economy is organized around an unquestioned commitment to unfettered economic growth, any green

> A green growth agenda fails to disrupt the underlying social inequities within an unbalanced economic order.

learning agenda will fail to transform underlying systems of consumption and production driving up carbon emissions.[41] While it is important for both skills and jobs to become greener, a singular focus on economic growth limits the positive impact a green workforce can have on the environment. That is, green skills and greener work do not necessarily reconcile the problem of overconsumption.

These economic shortfalls are accompanied by and closely related to social limitations to a green growth agenda. Namely, such an agenda fails to disrupt the underlying social inequities within an unbalanced economic order. For instance, discourse on the green economy and green jobs rarely explicitly attend to the need to address environmental racism and the disproportionate

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39. See Aksi! for Gender, Social, and Ecological Justice (2020) for an example of how a geothermal project in Indonesia negatively impacted the lives and livelihoods of women in nearby rural villages.
40. Hickel and Kallis, 2020; Hickel, 2020.
41. Dhara and Singh, forthcoming.
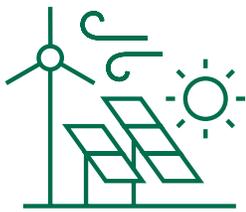
levels of environmental harms faced by girls and women, indigenous people, and people of color. Critics have argued that green growth discourse is often invested in neoliberal, technocratic, and economistic ideologies, which reproduce unequal systems of power across multiple groups defined by gender, racial, and economic status.[42] Admittedly, organizations such as the ILO and CEDEFOP have widely advocated to ensure green jobs are equitable, inclusive, and decent with fair wages, adequate working conditions, workers' rights, and social protections—underscored by the concept of a "just transition."

Despite these positive aims, discourses surrounding the skills for a green jobs paradigm typically fail to recognize and advocate for a need to disrupt broader, transnational global economic and social inequities. For instance, global actors concerned with skills for green jobs rarely attend to the significant economic power imbalances which exist between the Global North and Global South as a result of colonialism, economic imperialism, and capitalist exploitation and extraction. This is a vital point to contend with: economies within the Global South will struggle to become "green" if they continue to be subjected to patterns of unsustainable consumption at the hands of more powerful economic actors associated with the Global North.[43] Therefore, critics argue that the transition to the green economy risks creating a new, violent system of carbon colonialism where carbon emissions are merely offshored from the Global North to the Global South.[44]

> Economies within the Global South will struggle to become "green" if they continue to be subjected to patterns of unsustainable consumption at the hands of more powerful economic actors associated with the Global North.

Persisting gender gaps in green skills stifle women's path to green jobs. The heavy emphasis on technical skills rooted in STEM fields means that girls and women are inadvertently excluded by and from a "skills for green jobs" approach. Gender gaps in STEM can be observed across the entire spectrum of educational levels, including even in early childhood education. Such gender disparities in STEM widen in lower-secondary school, when students begin to specialize in fields of study and girls' participation in STEM-related fields observably drop off.[45] By the point of higher education, there exist even starker gender gaps, with girls globally representing 35 percent of students

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42. Brown, et al., 2014.
43. Interview, June 24, 2020.
44. Hickel & Kallis, 2020; Eberle, Münstermann, and Siebeneck, 2019; Lyons, Richards, and Westoby, 2014.
45. UNESCO, 2017; UNESCO-UNEVOC, 2020.

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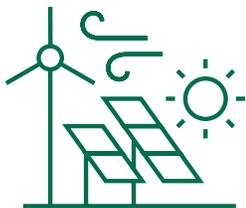
enrolled in STEM-related fields of study. Certain STEM areas of study face particularly large gender disparities. For instance, according to data across 115 countries from 2014-2016, women comprise only 27 percent and 28 percent of total higher education student enrollment in the fields of information and communication technologies and engineering, manufacturing, and construction, respectively.[46]

These gender gaps continue to widen even further for women who make it into green sector industries and careers.[47] For example, Figure 3 visualizes the gender gap in science researchers as of 2017 across the globe. And studies show that gender gaps are most pronounced in women's underrepresentation in leadership and technical roles. Although there are more women in renewable energy jobs (32 percent) than fossil fuel jobs (22 percent), women make up 45 percent of administrative roles in the renewable energy sector, compared to 28 percent in STEM-related roles and 12 percent of leadership roles—the latter of which are also higher paying.[48]

Figure 3. The gender gap in science

Notes:
Data in this map are based on headcounts (HC), except for Congo, India and Israel which are based on full-time equivalents (FTE). Data for China are based on total R&D personnel instead of researchers. Data for Brazil are based on estimations.
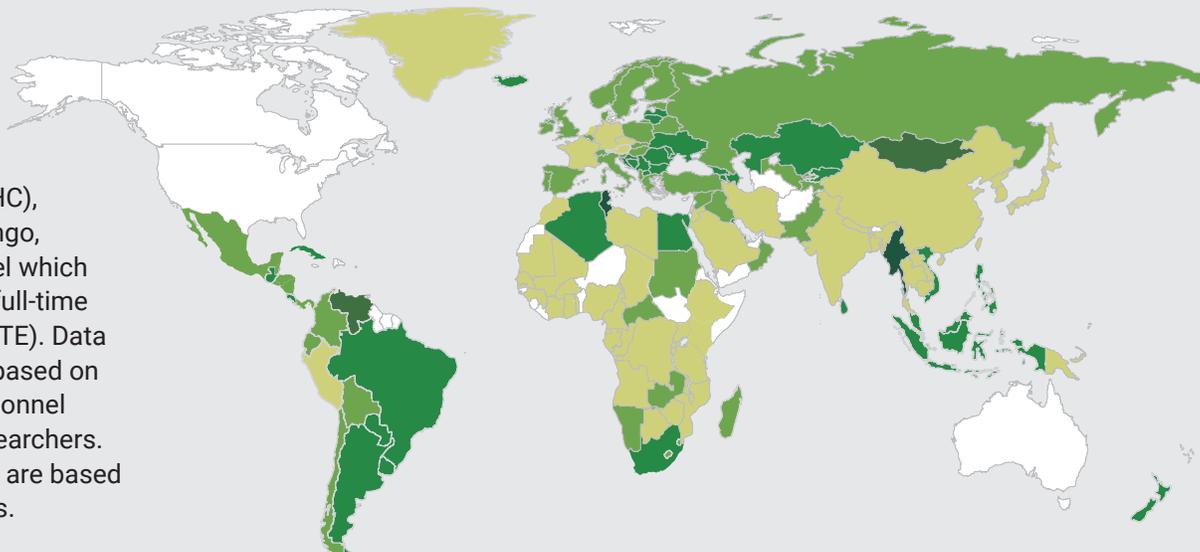
Source: UNESCO Institute for Statistics, June 2019.

70.1%-100%   55.1%-70%   45.1%-55%   30.1%-45%   0%-30%   No data

46. UIS, 2016.
47. UNESCO, 2017, p.23.
48. Allison, McCrory, and Oxnevad, 2019; IRENA, 2019.

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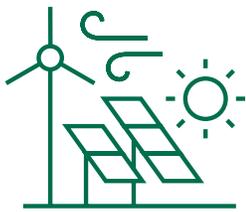
It is estimated that most green job growth and job creation will occur in sectors that are currently male-dominated, with most occurring within the mid-skill level occupations.[49] Unless sufficient action and policies are able to disrupt these gender gaps—specifically, efforts to ensure girls and women have opportunities to gain relevant skills required by these new green jobs—it is likely these gaps will persist if not worsen. It goes without saying that if we want to see women contribute to and thrive in a green economy, we must address barriers to girls' and women's access to and retention in green skills learning opportunities (including from primary through secondary education).

Yet, access to green learning is only part of the problem. In a global survey of gender and renewable energy, researchers found that while 71 percent of respondents ranked increasing access to training and skills development programs as the number one priority for getting more women in green jobs, a lack of skills was the least ranked barrier for women's engagement in green jobs (ranked by 34 percent of respondents as a top three barrier).[51] Instead, cultural and social norms were reported as the most common barrier (72 percent), followed by a lack of gender-sensitive policies (49 percent), and a lack of gender-sensitive training opportunities (41 percent) (see Figure 4). This suggests that efforts to realize a just transition to a green economy will fall short if efforts focus solely on strengthening girls' and women's green skills without addressing the structural barriers to her full participation in green jobs.

Figure 4. Barriers to women's participation in renewable energy jobs

Barrier	Percent
Cultural and social norms	72%
Lack of gender-sensitive policies	49%
Lack of gender-sensitive training	41%
Inequity in ownership of assets	41%
Lack of metorship opportunities	37%
Lack of skills	34%
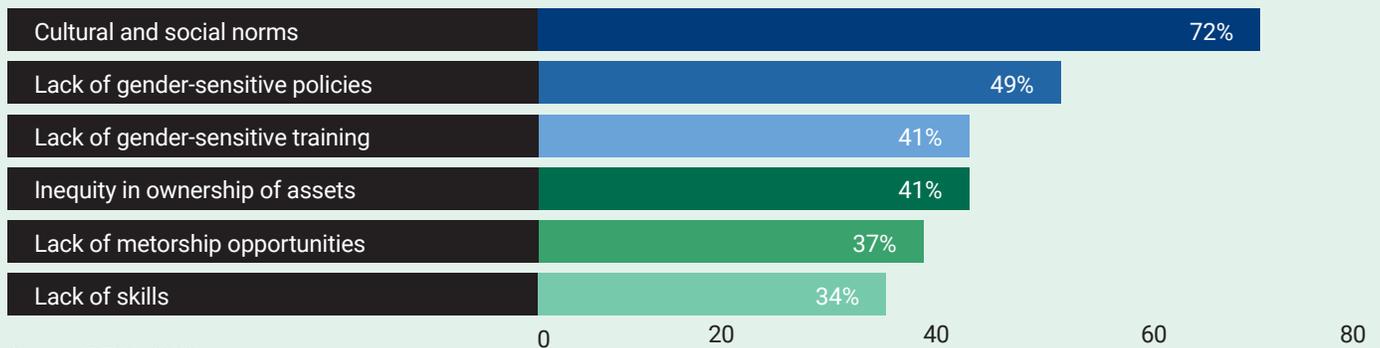
Source: IRENA, 2019.

Note: Respondents were asked to select thee barriers to women's engagement in deploying renewables to expand energy access. The percentages represent the share of respondents who selected a specific measure as one of their top three.

49. ILO, 2019, p.24
50. Ibid.
51. IRENA, 2019. Indeed, research on girls' STEM performance in secondary schools demonstrates that girls perform similarly to or better than boys in science in the majority of countries. See Stoet and Geary, 2018.

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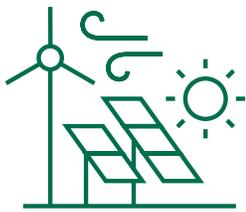
The green economy fails to take into account women's green labor. While women are undoubtedly excluded from green jobs and marginalized within green sectors, the green labor that girls and women presently perform goes unrecognized in discussions of the green economy. Gender stereotypes and gender norms render their green labor invisible and undervalued, and as a result constrains their ability to participate fully and effectively in what decisionmakers have defined as green jobs.

To illustrate, women comprise a significant portion of the world's agricultural labor force, ranging from around 20 percent of the agricultural labor force in Latin America to 50 percent across Eastern Asia and sub-Saharan Africa.[52] However, these reported statistics may underestimate women's participation in the sector, as women are "less likely than men to define their activities as work" and "less likely to report themselves as being engaged in agriculture."[53] And although the agricultural sector is often highlighted as a key sector in need of greening to promote sustainable development and climate resilience, female farmers face gendered challenges gaining equal access to a host of productive resources like extension services, technology, tools, financing, and even the rights to land.[54] Similarly, while women comprise only 15 percent of the total workforce in harvesting fish—primarily due to gendered constraints on women's mobility—they comprise over 90 percent of the workforce in fish processing, meaning that their employment comprises close to half if not the majority of the overall fisheries sector.[55] Nonetheless, gendered barriers and norms constrain women's opportunities to participate effectively, gain additional skills, and advance to higher-paid occupations and positions. In 2018, women held only 10 percent of directorships of the top 67 seafood companies around the world.[56] Given the centrality of healthy land and ocean ecosystems to sustainable food systems, overlooking women's labor in these sectors risks

> Gender stereotypes and gender norms render women's green labor invisible and undervalued, and as a result constrains their ability to participate fully and effectively in what decisionmakers have defined as green jobs.

52. FAO, 2011.
53. FAO, 2011. p.10.
54. UN Women, UNDP, UNEP, and World Bank, 2015.
55. Siles, et al., 2019.
56. Briceno-Lagos and Monfort, 2018; Siles, et al., 2019.

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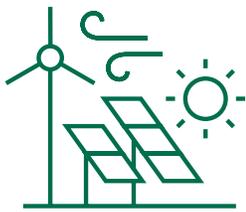
undercutting efforts to reduce our carbon footprint and achieve a greener economic model.

Such examples illustrate how crucial it is for the "skills for green jobs" paradigm to recognize, contest, and disrupt the gendered barriers, challenges, and hierarchies inherent in green industries. But it is equally important to acknowledge the vital contributions of women's unpaid green labor in the already low-carbon economy, including care work (e.g., childcare, education, and health) and community development.[57] Such green labor improves people's well-being and quality of life, informs current and next generations of the centrality of regenerative behaviors on the ability of future generations to thrive on this planet, and serves an essential first response during and after climate-related emergencies. If we are to transition to a gender-equitable green economy, all sectors—especially those that have been ignored because they are deemed women's work—must be the target of green investment.

> Women's unpaid green labor in care work and community development improves people's well-being and quality of life, informs current and next generations of the centrality of regenerative behaviors on the ability of future generations to thrive on this planet, and serves an essential first response during and after climate-related emergencies.

A predominant focus on technical change translates into a limited scope for impact. Research on systems change and processes of social transformation suggest that the runway for impact of technical approaches to change, like skills for green jobs, are quite narrow compared to the runway of structural approaches or approaches that change one's worldview.[58] Yet, the very qualities that make this technical approach to greening the workforce highly desirable for solving the problem of transitioning to a low-carbon or zero-carbon economy (i.e., their outcomes are observable, trackable, and measurable) are, in effect, the very things that make it ineffective at addressing root causes and negative feedback loops.

Figure 5 illustrates how practical (or conformative and reformative) change has a small lever of impact on our ability to achieve the Paris Agreement's

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57. Mukoni, Mudaly, and Moletsane, 2018; Novello and Carlock, 2019.
58. Meadows, 1999; O'Brien, 2018; Sterling, 2010.

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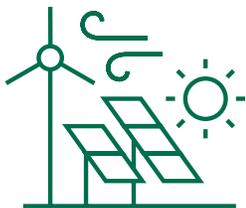
1.5°C target. For more impactful change, epistemological shifts in individual and collective consciousness (personal transformation), as well as disruption to the status quo through changes in policy, institutions, and processes (political transformation), are required.[59] Later on in this paper, Approach 3 presents a paradigm that focuses heavily on these latter dimensions. This shortcoming of Approach 1, however, does not mean that technical, or practical, approaches are not useful or needed; rather it demonstrates how transformation must ultimately occur across multiple spheres and dimensions.

Figure 5. The three spheres of transformation

The three spheres depict the dynamic relationships between the practical, political and personal dimensions of transformation. They draw attention to the importance of the political and personal spheres in generating the conditions for practical transformations that contribute to the 1.5°C target.
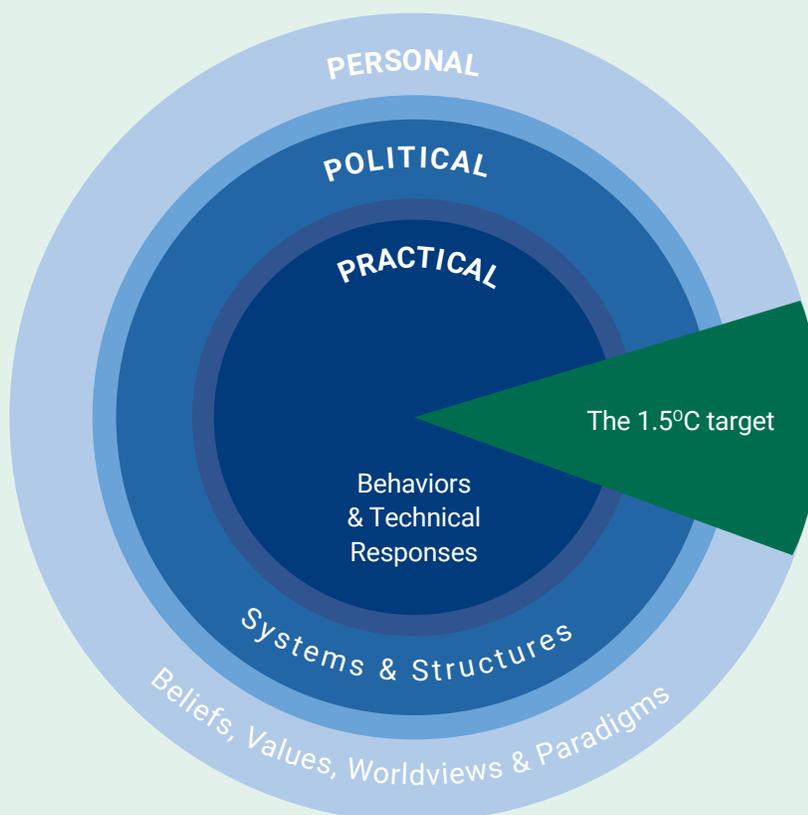
Current Opinion in Environmental Sustainability

Source: O'Brien, 2018.

PERSONAL

POLITICAL

PRACTICAL

The 1.5°C target

Behaviors & Technical Responses

Systems & Structures

Beliefs, Values, Worldviews & Paradigms

59. O'Brien, 2018.
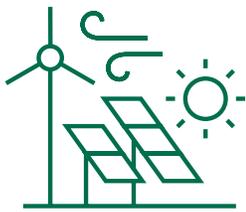
Importantly, the dynamic and context-dependent nature of a "skills for green jobs" paradigm makes this technical approach to green skills more challenging to implement at scale, further limiting its scope for impact. For instance, specific capacities may lead to transformative outcomes for women (or men) in one context but not in another, making it difficult to identify targeted skills for training programs. This approach also places great importance on anticipating and forecasting green skills needs, adapting to shifting economic demands, and preventing green skills shortages, mismatches, bottlenecks, or gaps.[60] As a result, TVET institutions and other formal education and training programs must continuously refresh their targets and design, lest programs become quickly outdated or irrelevant. Unfortunately, across most sectors, there exists very limited data on current and anticipated green skills gaps, let alone green skills data disaggregated by gender.[61] This lack of data poses a major challenge to effectively solve for and eliminate skills gaps in a just-in-time manner and in a sustained manner for both short- and long-term transformation.

For decisionmakers who see their entry point to a green learning agenda centered around a technical orientation, it is imperative that they actively address existing gender (data) gaps in green skills, as well as gendered blind spots defining the boundaries of the green economy and the skills required. Efforts must also be made to center gender in green jobs to ensure measures and policies are in place that make the transition to a green economy equitable, inclusive, and transformative.

Centering gender in green jobs

As described above, it is important to recognize the interlocking nature of the many forms of oppression that not only harm people in certain marginalized identity groups, but are also tied to the ecological destruction of the planet. Centering gender in green jobs can serve as an important entry point to breaking deeply connected linkages between the exploitation of people and planet.

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60. Strietska-Ilina et al, 2011; ILO, 2013, 2015; Research Base, 2014; PAGHC, 2017; UNEP, 2011; UNESCO-UN-EVOC, 2017.
61. This is with the exception of specific efforts like the Green Skills South Africa initiative which conducted several major sector-specific green skills analyses for the South African context. See for example, Cobban and Visser, 2017; PAGE, 2016; Rosenberg, 2015; Rosenberg, et al., 2016.
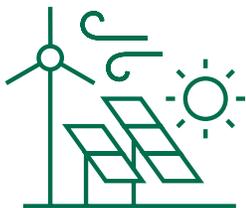
To center gender in green jobs:

1. Direct efforts at making TVET more gender transformative. TVET institutions—which are often focused on providing a narrow set of technical skills and specific capacities—must be supported in addressing the root causes of gender-based inequities. This includes but is not limited to the patriarchal gender norms, policies, and practices that have segregated girls out of STEM and other related technical fields of training and work. This means openly challenging how the nature of work and its required skills and capacities are conceived, pushing for fuller integration of gender analysis in the process of forecasting, designing, and delivery. Within the "skills for green jobs" paradigm, TVET is often highlighted as an essential avenue for upskilling and reskilling workers to meet the demands of a new green economy. While there are rampant calls for greening TVET—which has emerged as a key focal point for stakeholders interested in the green economy—there has been insufficient attention on reforming TVET to become more gender transformative in an effort to ensure the manifestation of a greener economy is equitable and just.

Importantly, it is also vital for gender-transformative TVET to instill in learners the critical awareness of the intersectional nature of women and girls' experiences across their diverse lived realities. As women and girls are not a monolithic category, gender-transformative TVET must provide the critical capacities to understand how gender oppression intersects with other forms of exclusion and violence more broadly, including along racial, ethnic, economic, and other axes of difference—and how these socially constructed hierarchies are also tied to, and enable broader extractive and exploitative economic systems that perpetuate environmental destruction.[62]

2. Prioritize care in definitions of green jobs. Decisionmakers and stakeholders of green economic models must acknowledge the gender normative assumptions behind the strategy of adding women into a male-dominated green economy. For a green economy to achieve systems change for people and the planet, we must begin to recognize that the dominant definition of green jobs (e.g., "jobs that reduce the environmental impact of enterprises and economic sectors, ultimately

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62. Kaijser and Kronwell, 2014.

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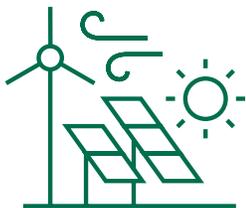
to levels that are sustainable"[63]) does not center gender equality. While many conceptualizations of green jobs do incorporate some notion of a commitment to social protection, fair wages, inclusion, and decent workers' protections, stakeholders within the "skills for green jobs" paradigm generally do not go far enough to explicitly name existing power imbalances and forms of oppression and marginalization inherent within economic systems—across gender lines and beyond—nor commit to disrupting these structures.

Therefore, as others have argued, we instead propose that green jobs should be reframed to include any job that contributes to the well-being and flourishment of present and future generations; upholds human rights, including women's rights and the rights of indigenous populations and peoples of color; and supports the regeneration of the natural world, its resources, and its interdependent socio-ecological systems on which our human economies rely.[64] Adopting this definition would expand our attention on green jobs to those that center, nurture, and develop our individual and collective capacity to care for others and the environment and to educate ourselves and others about the unsustainability of the status quo. Such work is essential not only for a climate-empowered workforce and a climate resilient society, but also for catalyzing the social transformations necessary for the survival of humanity. But beyond valuing female-dominated industries in the green economy, the aim of a gender-transformative TVET would be to break down the gender norms that have traditionally defined care work for women and STEM work for men.

3. **Target green skills from caring to coding to construction.** This means TVET institutions must problematize the breadth of technical skills presently conceptualized for green jobs, beginning with this paradigm's aforementioned conflation of green skills with STEM skills.[65] Such a narrow view reproduces the idea that climate change is a technical

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63. ILO, 2019, p. 201. Note that this text also subsequently cites that green jobs also must: "[meet] the criteria for decent work–adequate wages, safe conditions, workers' rights, social dialogue and social protection." Similar to the above footnote on the concept of the green economy, the green jobs concept is complicated by the fact that it has been invoked around a nexus of intersecting economic, social, and environmental concepts. Depending on the stakeholder advancing the term, the social, economic, and environmental aspects of the concept are highlighted to various degrees.
64. Novello and Carlock, 2019.
65. UNESCO's new Education for Sustainable Development (ESD) for 2030 Framework provides an example of such conflation. Although, it should also be recognized that UNESCO deliberately distinguishes between a green skills agenda and broader ESD learning goals. See UN, 2019.

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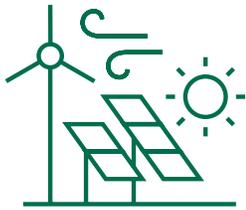
problem requiring a technical education that can enable society to fix its way through the climate crisis through technological innovation. In effect, such "techno-optimism" and "ecopreneurialism" allow us to do things better (or "greener") without challenging or disrupting our present unsustainable way of life.[66] Instead, we must begin to see green skills as a broader set of sustainability competencies that help not only to make all jobs green, but also address unsustainable behaviors.

This also means the "skills for green jobs" framework and the institutions that promote it must expand its "core green skills" to include the gender empowerment skills and competencies where the field of girls' life skills education has focused. This includes developing girls' and boys' ability to read, decode, negotiate, and act upon their social environment in empowering ways; the ability to build partnerships and coalitions, solidarity, and reciprocity; and the ability to self-advocate and to advocate for others.[67] Self-awareness and emotional intelligence, as well as critical perspectives on resistance and power, are also crucial for building girls' sense of autonomy and agency. Conceiving green skills in such a way will help decisionmakers focused on green jobs to prioritize the achievement of gender equality alongside the reduction of carbon emissions.

4. Create a supportive ecosystem for girls and women in the green economy. This means efforts must extend beyond TVET to creating a pipeline for girls to green jobs starting from early childhood education. Evidence illustrates that most "girls in STEM" efforts are directed at secondary school adolescent girls, likely to address the period in a girl's life when negative gender stereotypes about math appear to have the most impact on girls' interests in STEM.[68] But apart from addressing the leaky STEM pipeline from secondary to tertiary institutions, researchers have demonstrated that these gaps begin even earlier, suggesting approaches across the girl's lifetime are needed.[69] Therefore, gender-transformative interventions must be integrated not only within the sphere of TVET, but also across the education ecosystem of formal, non-formal, and informal learning settings to reach both girls and women

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66. Smith and Watson, 2019.
67. Kwauk and Braga, 2016; Kwauk, forthcoming; DeJaeghere, Pellowski Wiger, and Wangsness Willemsen, 2016.
68. Prendes-Espinosa, García-Tudela, and Solano-Fernández, 2020.
69. Master, et al., 2017; Sullivan, 2019.

alike, at as wide of a scale as possible, across varying age ranges and geographies of privilege. Additionally, to help support girls and young women transition into green jobs, develop careers in green sectors, and assume leadership positions in green industries, education efforts must also build in mentorship opportunities for girls and women. A study on the gender gap in the renewable energy sector in the United States and Canada found that while education and training are critical for equipping women with the qualifications needed to compete in the industry, mentoring and professional networking are critical for women's professional advancement and career success in these industries.[70]

Taken together, investing in gender-transformative TVET and education—as well as the creation of strong mentoring and networking systems for advancing women's careers in green jobs—can overcome some of the shortfalls to transformation that are characteristic of Approach 1. In particular, its attention to the disruption of a gendered status quo can serve as a powerful entry point to a chain of social, economic, and environmental transformations necessary for creating the conditions for a just transition to a greener economy, as well as the mitigation of carbon emissions (see Figure 6).

Figure 6. Theory of change from investing in the development of specific capacities through gender-transformative TVET

| Gender-transformative green TVET, including efforts to increase girls' and boys' participation in non-traditional fields | → | Development of specific capabilities (skills for green jobs), including gender empowerment skills | → | Mentorship of women and men to participate equally in an expanded field of green jobs, including education and health care | → | Growth of renewable and sustainable industries; just transition to green economy | → | Mitigation of CO_2 emissions |

70. Allison, McCrory, and Oxnevad, 2019.

Approach 2. Developing generic capacities

Problem frame for the climate crisis	Source of the problem	Vision of the solution	Education objective	Green skills framework	Green learning agenda
Adaptive challenge	Unsustainable individual behaviors	Sustainable, pro-environment behaviors	Generic capabilities	Green life skills	Critical climate change education
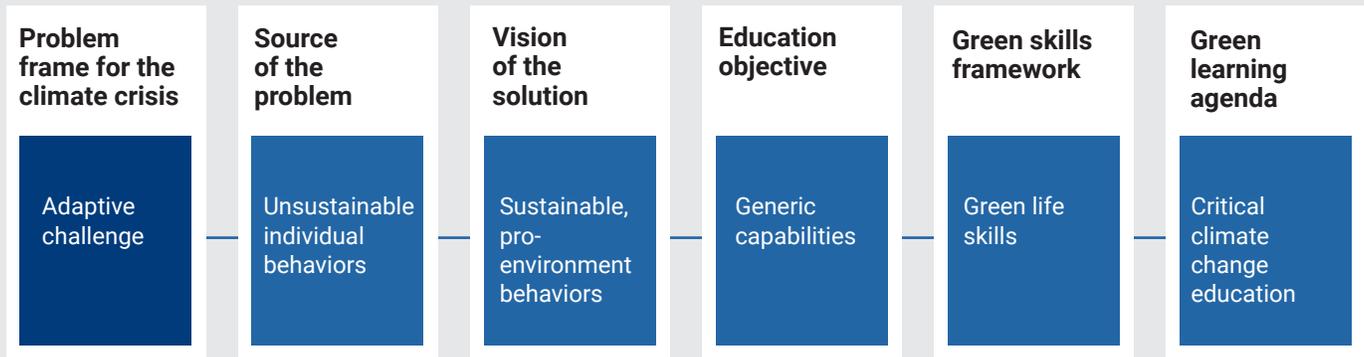
In contrast to the "skills for green jobs" paradigm, Approach 2 shifts the framing of the climate crisis to an adaptive challenge that requires better (greener) ways of thinking and being in the world. This approach is founded upon the assumption that the root of the climate crisis is in the unsustainability of widespread individual behaviors and actions (e.g., consumption patterns, recycling behaviors, energy usage, transportation use, and food choices, etc.). Focused more on the individual as the agent of change, the education solution within the logic of Approach 2 is to teach learners about climate change and its solutions, as well as the skills and attitudes that will empower them to adapt more sustainable behaviors and practices through greener problem-solving. The overarching goal here is for education to seed behavioral transformation that is better for the environment and can contribute to more sustainable development.

To achieve the envisioned green behavioral change, Approach 2 focuses on instilling generic capacities in individuals that will promote sustainable behaviors and actions across a variety of contexts in life. To do this, some education systems around the world have begun to integrate CCE and/or ESD into the K-16 curriculum, with a particular emphasis on tertiary (higher education institutions) and lower through upper secondary (junior and senior high school).[71] Indeed, even the 2030 Sustainable Development Agenda has incorporated CCE and ESD within the aspirations of the Sustainable

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71. Although the authors recognizes that CCE and ESD are distinct forms of education with their own political histories and academic critiques, for the purposes of this paper, CCE and ESD will be used interchangeably to refer to current educational trends that attempt to teach learners to live differently with and within the more-than-human world.

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Development Goals (SDG 4.7, 12.8, and 13.3). In practice—and where practiced—CCE and ESD often translate into efforts ranging from school gardens and school recycling programs, to a designated subject unit on climate science and climate solutions, to the incorporation of climate change into multiple subjects across the curriculum. Education stakeholders like UNESCO have attempted to deepen learners' engagement with climate change beyond knowledge of the facts by emphasizing the development of key skills and competencies that enable climate action.

A sociological framing of green skills: Green life skills

For the purposes of this heuristic, we refer to the above framing of green skills as "green life skills" due to the great degree of overlap with the broader sets of skills commonly referred to in the girls' education sphere as life skills.[72] Notably, life skills—green and non-green—are often described as being widely applicable across a variety of contexts, and are often referred to as overlapping, cross-cutting, or transversal skills due to their widespread applicability.

This sociological orientation to green skills contrasts with—yet simultaneously builds upon—the technical one taken by Approach 1. It draws from 21st century skills discussions about a breadth of skills, including cognitive skills like critical thinking; socioemotional, affective, and interpersonal skills like empathy and collaboration; and beliefs like a growth mindset. All together and in conjunction with greater knowledge of climate change and environmental issues, these skills are building blocks for greener problem-solving, greener decisionmaking, and greener ways of behaving and being in the world. They are expected to not only build learners' green "lenses" through which to view the world, but also to result in the individual's increased climate resilience and adaptive capacity through greener behaviors.

While "green life skills" may be general in nature and broad in scope, they are often invoked alongside the intended aims of promoting well defined, practical individual behavioral changes and green outcomes that are observable, measurable, and trackable.[73] But like life skills, we do not fully understand

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72. The World Health Organization defines life skills as the "abilities for adaptive and positive behavior, that enable individuals to deal effectively with the demands and challenges of everyday life" (WHO, 1994, p.1).
73. O'Brien, 2018.

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how green life skills work (or, frankly, what they really are). That is, we don't really know how they lead to more pro-environmental outcomes, nor do we know which (combination of) green life skills lead to specific pro-environmental behaviors, consistently.[74] Nonetheless, we know that they are important. For example, a study looking at the five-year impact of an intensive CCE program at San Jose State University in the U.S. found that it reduced individual carbon emissions by

> Like life skills, we do not fully understand how green life skills work (or, frankly, what they really are). Nonetheless, we know that they are important.

2.86 tons per year—or roughly the equivalent of not driving a car about 7,000 miles in a year.[75] The study estimates that if just 16 percent of secondary students in upper-middle- and high-income countries were to receive such CCE, the amount of carbon prevented from entering the earth's atmosphere would be approximately 18.8 GT between 2020 and 2050—a better outcome than three-quarters of the top climate solutions available to us today.[76] Quantifiable metrics like these urge us to continue focusing on developing green life skills.

But, again like life skills, Approach 2 often frames education as an instrumental means to an end (i.e., to change behavior, to build resilience in the individual, and to strengthen the individual's capacity to navigate an uncertain and ambiguous world in a more empowered way.) As the subsequent discussion illuminates, this limits its potential for long-term transformative change.

Shortfalls to transformation

Education systems are not attending to green life skills. Similar to the significant gaps in the distribution of skills for green jobs, there exist significant gaps in the provision and thus realization of green life skills. This is in part due to the fact that many education systems have not yet taken up their role in actively attending to climate issues, let alone implementing quality CCE.[77] To illustrate, only two countries in the world (Italy and Mexico) have

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74. There exists a significant body of research examining the linkages between sustainable behaviors and psychological dimensions, "including psychological tendencies (attitudes, motives, beliefs, norms, values), human capacities (knowledge, skills, aptitudes) and psychological consequences (well-being, happiness)" (Tapia-Fonllem, Corral-Verdugo, Fraijo-Sing, and Durón-Ramos, 2013, p.712). Much of this research has helped to shed light on and investigate the persistent gaps between environmental knowledge and pro-environmental action, as well as demonstrate the need for frameworks that attend to the several complex factors which prevent or enable sustainable behaviors (Kollmuss and Agyeman, 2002).
75. Cordero, Centeno, and Todd, 2020.
76. Ibid.
77. Mochizuki and Bryan, 2015, p.4; Kwauk, 2020.

national mandates to teach climate change education throughout their formal education system, and less than a dozen countries have finalized a National Climate Change Learning Strategy.[78] For the rest of the world, the quality and scope of integration of CCE or ESD varies greatly across countries and even within countries.

The generic nature of green life skills makes it an "empty vessel." This means that, on the one hand, life skills may be easily co-opted by neoliberal logics that "bend" radical agendas of education for climate action back toward the status quo (a conformative agenda).[79] On the other hand, these skills are malleable such that they have the potential to be utilized by more critical, intersectional agendas for more justice-oriented outcomes (a reformative agenda). Despite the potential of green life skills to serve both instrumental and transformative ends, in practice, they are often framed to fulfill an instrumental function. Similar to Approach 1, stakeholders pursuing Approach 2 often view green skills as a means to an end: "greening" individual behaviors to fit a greener vision of the status quo. As a result, Approach 2 risks falling short of much-needed social, political, and economic transformations. Due to the appropriability of green life skills, it is all the more imperative that stakeholders pursuing CCE or ESD clearly define the intended application and overarching transformative vision of change from the outset. This means addressing head on the ultimate incompatibility of sustainability and unfettered capitalistic expansion.

A predominant focus on behavior change translates into limited scope for impact. While this approach aims to promote ecologically aware and sustainable ways of being, the scope for impact is limited due to its predominant focus on behavioral change. Similar to our discussion in Approach 1, Approach 2 is focuses on practical (or conformative and reformative) change. Though green life skills have the potential to be utilized for transformative ends, like (non-green) life skills they must be developed and deployed in conjunction with broader systems change, not in isolation.[80]

Relatedly, when it comes to behavioral change, the question of who does and who should take on what type of behavioral change is rarely brought

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78. Although, at the time of writing, Mexico's new environmental education law is still awaiting formalized congressional approval.
79. Jickling and Wals, 2008.
80. Kwauk and Braga, 2017.

into question. The assumption is that all behavioral change is rendered equal and equally possible, when in reality who acts and who does not act is a result of historic socioeconomic, political, and geographic privilege. Take for example, in the current global order, countries with higher levels of education and economic development are known to cause greater levels of environmental damage, with a higher ecological footprint.[81] Yet research has shown that these are the countries least likely to pay attention to education for climate action.[82] Furthermore, sustainability remains marginal in educational systems struggling to deliver basic education to alleviate global poverty, as well as in educational systems with an outsized emphasis on standardized tests and resume building for college applications.[83] Consequently, across many contexts, there exist widespread gaps in political will and resources needed to deliver a quality education with the aim of addressing environmental challenges and the promotion of sustainable, systems change. As a result, educational systems often end up reinforcing rather than resisting the existing macro structures of economic, environmental, and social inequities that underlie these challenges. And by largely avoiding addressing issues of climate change, and through the marginalization of certain groups of students, including girls, indigenous populations, and students of color, Approach 2 inadvertently perpetuates the status quo.

> Essentialist portrayals of girls and women as the "greener" gender functions to rationalize and excuse unsustainable behaviors and climate silence by boys and men, rather than facing the need to address the linkages between toxic masculinities, patriarchy, extractive capitalism, and environmental destruction.

Pervasive gender stereotypes present a crucial barrier to green life skills.

Studies and popular discourse around gender and climate change tend to frame girls and women as inherently more caring, conscientious, and concerned with the environment.[84] Essentialist portrayals of girls and women as the "greener" gender are harmful to the extent that they frame girls' and women's individual behavioral changes as the panacea of the climate crisis and locate the responsibility of addressing it onto their shoulders. It also rationalizes and excuses unsustainable behaviors and climate silence by boys and men, rather than facing the need to address the linkages between toxic masculinities,

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81. Kelly, 2020; Wals and Benavot, 2017.
82. Kwauk, Cooke, Hara, and Pegram, 2019.
83. Kwauk, 2020.
84. Arora-Jonsson, 2011; Dietz, Kalof, and Stern, 2003; Zelezny, Chua, and Aldrich, 2000.

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patriarchy, extractive capitalism, and environmental destruction.[85] Just as discourses around (non-green) life skills have increasingly championed the unique importance of a gendered approach to life skills, including educating boys about gender justice,[86] we should expect the green life skills approach to follow a similar pattern of emphasizing the importance of green life skills in light of gendered assumptions about attitudes and behaviors toward the environment. As this discussion suggests, the absence of a critical feminist, intersectional, climate justice-oriented framework in Approach 2 means there is no anchor for a more transformative social and environmental agenda. The next section proposes ways to address this shortcoming.

Centering a critical feminist, intersectional, climate–justice agenda in green life skills

Research tells us that being told what to do is not the best route to behavioral change. The same follows with pro-environmental behaviors.[87] While behavioral change is complex and hardly a linear process, research suggests that deeper engagement with the sociopolitical and human dimensions of climate change is important for creating the motivation behind pro-environmental behavioral change and creating feelings of personal responsibility to take climate action.[88] Studies also suggest that teaching about issues that are rooted in scientific processes and have significant social implications and impacts (like illegal logging or hunting, deforestation and land development, and plastic pollution of large water bodies) is a more effective way to help students develop green life skills, like evidence-based decisionmaking, reasoning, empathy, and the ability to communicate a position, that are important for shaping behavior.[89]

Indeed, if we want to ensure that our efforts at developing green life skills are effective, research suggests that education for climate action should include five design elements:

> 1) a cognitive point of entry, like a recent climate-related disaster or the introduction of a local environmental resource challenge, and the possible solutions to it;

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85. Brough, et al., 2016; Onwutuebe, 2019.
86. Fyles, 2018; Sahni, Jain, and Chitravanshi, 2018.
87. Kollmuss and Agyeman, 2002; Schultz, Gouveia, Cameron, Tanhka, Schmuck, and Franek, 2005.
88. Bouman, Verschoor, Albers, Böhm, Fisher, Poortinga, Whitmarsh, and Steg, 2020; Karpudewan and Roth, 2018; Monroe, Plate, Oxarart, Bowers, and Chaves, 2019.
89. Karpudewan and Roth, 2018.

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2) An affective dimension that helps to cultivate one's empathy toward
the environment;

3) An existential component that challenges one's sense of self, one's
way of living and being, and one's values, beliefs, and worldview;

4) An ownership dimension, like the self-identification of a community-
based environmental challenge, or developing a plan that builds one's
knowledge of, personal connection and commitment to, and sense of
responsibility for a local climate change issue;

5) Opportunities for empowered action or dissent, like a community
action project or political protest to not only feel a sense of direction, but
to also increase sense of agency and confidence in making informed
choices (see Figure 7).[90]

Figure 7. Five design elements of green life skills education
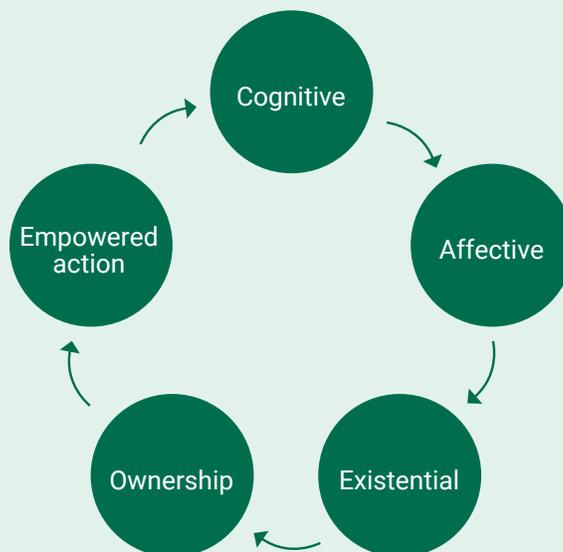
But beyond effective efforts to green behavior, we must ensure CCE and
ESD are not co-opted by neoliberal logics that place the onus of change on
individuals—particularly girls and women—while leaving unsustainable social
and economic structures and systems untouched. That is, we must ensure our
efforts are centered in and oriented toward a critical feminist, intersectional,

90. Cordero, Centeno, and Todd, 2020; O'Brien, Selboe, and Hayward, 2018; Sterling, 2010.

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and justice-oriented agenda. While all five design elements of green life skills education are important, the **cognitive** and **existential** design elements create particularly important opportunities for harmonizing green life skills with this agenda. First, **cognitive elements** of CCE and ESD should draw upon *effectiveness knowledge* (e.g., knowledge of whether an action will lead to an intended outcome and whether there are any unintended

> We must ensure efforts to green behavior are not co-opted by neoliberal logics that place the onus of change on individuals—particularly girls and women—while leaving unsustainable social and economic structures and systems untouched. We must ensure our efforts are centered in a critical feminist, intersectional, and justice-oriented agenda.

outcomes, as well as consequential thinking) and *social knowledge* (e.g., knowledge of the social desirability of certain behaviors, or the social cost of transgressing conventional norms, as well as social awareness and emotional intelligence) as launching points for critical discussion on equity and fairness.[91] Engaging with effectiveness and social knowledges make it possible to begin traversing from the behavioral (the practical domain) into the political and personal domains. In terms of the former, this is through attention to the impact of individual action compared to more widescale systems change, or to recognizing the cost and benefits for different populations located in different geographies and constrained by circumstances defined by their identities. The latter helps to incite critical reflection of the beliefs and values that motivate and incentivize action or inaction, and to examine whether these are constrained by certain social identities, such as gender, race, socioeconomic status, or age, and certain social norms, such as gender norms.

However, Approach 2 is, at present, heavily focused on *declarative knowledge* (knowledge about climate change, its scientific components, and its solutions—i.e., the facts) and *procedural knowledge* (knowledge of how to separate recyclables, how to maximize energy efficiency, how to conserve water—i.e., know-how and how-to). This may not be a surprise, as it enables and is enabled by an instrumentalist approach to green life skills that teaches (or tells) students what the problem is and what the solutions are. While engagement with all four types of knowledge is necessary to shape new

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91. Frisk and Larson, 2011.

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behaviors, effectiveness and social knowledge help teachers and learners anchor those new behaviors in a socially conscious and intersectional way.

Another cognitive entry point is that attention to multiple domains of knowledge means also recognizing indigenous, traditional, and place-based knowledges, and intergenerational knowledge, as well as other identity-based knowledges, like those of marginalized groups including girls and women, indigenous populations, and people of color, or minority ethnic or religious groups. Indeed, ESD has increasingly been invoked as a framework that can help to pluralize knowledge in an effort to advance collective action toward a joint vision of sustainability.[92] In addition, ESD's emphasis on utilizing interdisciplinary and multi-sectoral frameworks helps to ensure actors approach education for climate action from a holistic perspective and avoid cognitive design elements from being rooted solely in one epistemology.[93]

Second, **existential elements** of CCE and ESD can help ensure behavioral change efforts are targeted at more transformative outcomes. For starters, critically reflecting upon the low-impact nature of "feel good" sustainability behaviors, like switching to LED lightbulbs or learning how to conduct a home energy audit, can help learners to see the incompleteness of their worldview and to begin to critically question what they may have taken as sustainable decisions. UNESCO describes the process of transformation, once a student has perceived this gap, as being:

> "awakened to a new reality and to facts/situations that were formerly part of their lives and about which they were not aware. The learner may then undergo an internalization process, working on an observed gap. When such processes combine with a learner's understanding of how the others are experiencing that gap and there is a connection made both cognitively and emotionally, a learner may be brought closer to undertaking action and/or behavioral change." [94]

But in bridging these gaps, learners (and teachers and facilitators) must be supported in grappling with the harder existential questions, like dealing more explicitly with the contradiction between a commitment to both sustainability

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92. Tilbury, 2007.
93. Wals and Benavot, 2017.
94. UNESCO, 2019, p. 6.

and unfettered economic growth. In this way, this green learning agenda can be buffered against co-optation by neoliberal logics and vested interests, and instead, serve as a stepping stone for CCE and ESD to shift its focus on the practical realm of behavior change to the personal and political realms where radical transformation can be catalyzed (see the last box in Figure 8).[95]

Figure 8. Theory of change from investing in the development of generic capacities through critical climate change education

| Critical climate change education drawing on multiple domains of knowledge and digging into existential issues | → | Development of generic capabilities (green life skills) for reformative change | → | More sustainable pro-environmental behaviors (practical sphere of transformation) | → | Development of a critical foundation from which to shift to the personal and political spheres of transformation (Approach 3) |

A steppingstone to transformation

Even a more critical version of CCE and ESD—such as the one presented here—risks missing the deeper sociological transformations needed to achieve the 1.5°C target. Its focus on the practical realm of change makes education a project of managing human behavior, rather than fundamentally changing our relationships with each other and with the more-than-human world. As a result, we risk merely putting a "green" label on our existing unsustainable systems—or as some critics put it, we merely green capitalism.[96]

This is brought to light further when we consider how transformative this approach can be for marginalized and vulnerable girls. Like critiques of efforts to build girls' non-green life skills, a focus on building girls' green

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95. Selby and Kagawa, 2010. For an example of co-optation, see Saffa and Jabbie (2020, p. 149) for their definition of "transformational competencies" as the "skills, capabilities, or capacities that promote innovation, creativity, and entrepreneurship for sustainable growth and development."
96. Huckle, 1993.

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life skills translates into a means of strengthening her "fit" in our capitalist and patriarchal systems—it is as much about turning her into a modern day Wonder Woman as it about turning her into a female Captain Planet. If we maintain that gender equality—as well as racial equality, human rights, and climate justice—is a necessary precursor to a sustainable society, we cannot talk about building girls' green life skills to strengthen her resilience and adaptive capacity in a gender-discriminatory system that sustains unequal social structures and perpetuates her climate vulnerability. This is too low of a bar. Rather, we must come to acknowledge that transformational change requires us to break from "maladaptive resilience of unsustainable systems."[97] We do not have time to wait for superheroes.

To illuminate these risks and shortcomings is not to say that green life skills have no role to play in a green learning agenda. As mentioned earlier, all educative mechanisms and approaches are needed as planetary offshoot approaches. However, to help get us closer to transformative change, this paper proposes a theory of change for Approach 2 (see Figure 7, above) that begins with a more critical approach to green life skills. Rather than a natural "end" to this vision being the achievement of more sustainable, pro-environmental behavior, it builds in a jumping-off point to a more radical, transgressive approach to skills for green transformation, Approach 3.

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97. Lotz-Sisitka, Wals, Kronlid, and McGarry, 2015, p. 73.

Approach 3. Developing transformative capacities

Problem frame for the climate crisis	Source of the problem	Vision of the solution	Education objective	Green skills framework	Green learning agenda
Adaptive challenge	Unjust social and economic systems	Sustainable, equitable systems	Transformative capabilities	Green transformation (personal and political realms	Transformative learning for climate action
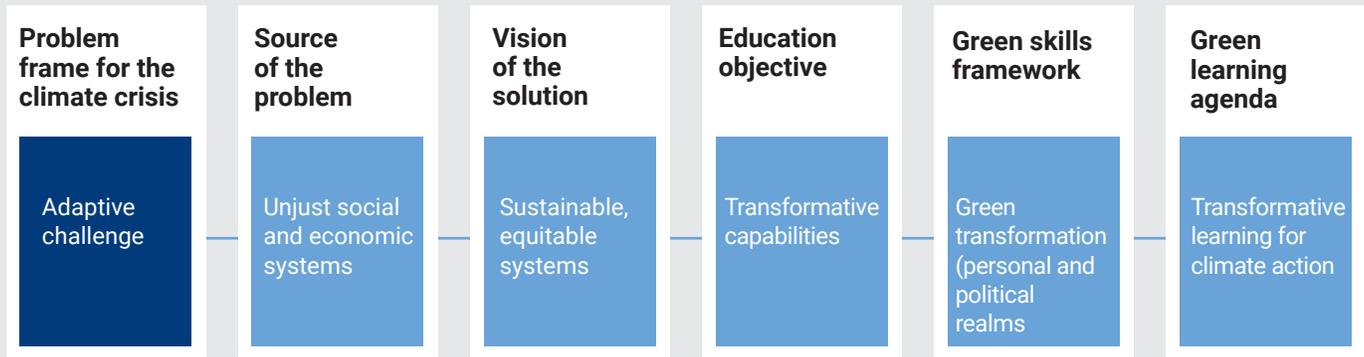
Like Approach 2, Approach 3 situates the educational response to climate change in the need to think and be differently in the world. But where it branches off is in its emphasis on critically thinking and being differently with each other and the more-than-human world in order to create more sustainable and equitable systems. Approach 3 extends the need for self-awareness (with the aim of behavioral change) to the need for social and ecological awareness (with the aims of transforming one's relationships with others, including the environment and natural world). It shifts from a patriarchal paradigm of economic growth and sustainable development to a feminist paradigm of care, stewardship, and compassionate governance. This critical social framing of the climate change problem-solution centers attention on the role of power, politics, capitalism, discrimination, patriarchy, and other social and economic systems of inequality that are at the root of the climate crisis.[98] As such, this paradigm frames the problem of education as its reluctance to confront controversial topics, its complicity in furthering human dependency on fossil fuels, and in its perpetuation of the values and attitudes that create the conditions for environmental exploitation, gender inequality, and social and racial inequity.

Returning to the three spheres of transformation in Figure 5, Approach 3 begins its work at the political sphere with a critical interrogation of the

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98. Leichenko and O'Brien, 2020; Pirgmaier and Steinberger, 2019; Stevenson, 2006.

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structures and systems driving climate change and its unequal impacts. Through such interrogation, self-work begins in the personal dimension where the "individual and collective ideas about what is just, desirable, and sustainable" are themselves questioned, negotiated, and transformed.[99] As learners disrupt the boundaries of their worldview and their identities—and are supported through the experience of grief, despair, trauma, and anger from coming to terms with the climate emergency and social injustices—learners can begin to actively transform the rules and goals of the very political spheres that they interrogated at the beginning. As a result, learners are connected through action by shaping the behavioral and technical solutions prioritized and pursued in the practical sphere.

To set off the personal and political changes that drive more radical practical change, education systems must adapt gender-transformative learning pedagogies focused on developing learners' transformative capacities—or their capacity to transform themselves, others, and society in a deliberate, feminist way that is conscious of planetary boundaries, in balance with the carrying capacity of the earth, and aims for the flourishing of all life, human, and the more-than-human.[100] This includes an orientation to green skills that fosters global or planetary citizenship, environmental stewardship, and activism or political action.

A sociological framing of green skills: Skills for green transformation

The focus of Approach 3 on "skills for green transformation" is not limited to developing the transformative skills listed in Figure 1. Rather, this paradigm can be better understood as a framework for conceptualizing broader dimensions of learning that must be nurtured to successfully disrupt the individual and structural factors that exacerbate the climate crisis. In particular, these dimensions include sustainability competencies and a feminist planetary consciousness.

> **1. Sustainability competencies** include the green life skills discussed in Approach 2 when they are directed toward more transformative ends. In this paradigm, however, green life skills are conceptualized as part of

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99. O'Brien, 2018, p. 157.
100. Selby and Kagawa, 2010; Stevenson, 2006; Ziervogel, Cowen, and Ziniades, 2016.

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a triad of knowledge about climate change and its solutions ("K," what one knows); generic cognitive, interpersonal, and intrapersonal skills in Figure 1 ("S," what one has); and pro-environmental attitudes ("A," what one believes and values) that together constitute the sustainability competencies to think and be in greener ways (see Figure 9). These dimensions collectively form the basic foundations for expanding from working solely in the practical sphere of change to also addressing the political and personal dimensions of change.

Figure 9. Reconceptualizing green life skills as sustainability competencies

K	S	A	sustainability
climate change knowledge	green skills	pro-environmental attitudes	competencies
(what one knows)	(what one has)	(what one believes & values)	(what one can do, greener)
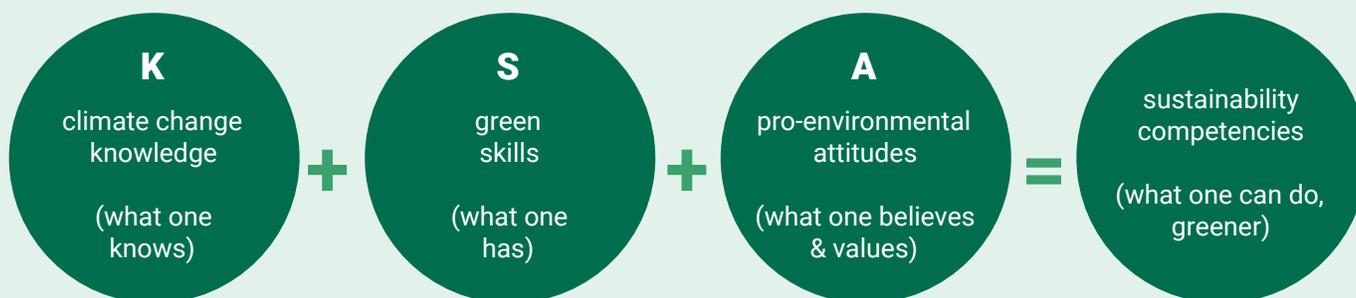
Adapted from Kwauk and Braga, 2017, p. 5.

2. **Feminist planetary consciousness.** While Approach 2 focused on building green lenses through which to view the world, Approach 3 focuses on building a feminist planetary consciousness. This concept combines philosophical and critical feminist definitions of a planetary consciousness and feminist consciousness, respectively. A planetary consciousness is "the knowing as well as the feeling of the vital interdependence and essential oneness of humankind" that is imperative to the survival of humanity on this planet.[101] A feminist consciousness is constituted by a critical understanding of the ways in which patriarchy constrains the lived experience of girls and boys, and women and

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101. Laszlo and the Dalai Lama, 1996.

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men.[102] Together, a feminist planetary consciousness creates a sense of awareness of the root problems of power and patriarchy underlying planetary challenges, including the linkages between gender inequality and the climate crisis, violence against indigenous peoples and indigenous lands, and the exploitation of vulnerable populations amidst uneven global economic growth. In effect, a feminist planetary consciousness brings to awareness

> A feminist planetary consciousness brings to awareness how an imbalance of power between men and women, the majority and the minority, settler colonialists and indigenous groups, and so on, are just as destructive to life on this planet as an imbalance of greenhouse gases.

how an imbalance of power between men and women, the majority and the minority, settler colonialists and indigenous groups, and so on, are just as destructive to life on this planet as an imbalance of greenhouse gases. A feminist planetary consciousness is necessary for the development of global citizenship (a sense of place, identity, and care that is intertwined with a larger global community; an awareness of the interconnectedness of global challenges) and planetary citizenship (a sense of place and identity that positions environmental stewardship alongside an ethic of care and compassion for humanity; an awareness that humanity's challenges are interconnected with the state of the planet).[103]

Such a focus means a "skills for green transformation" paradigm expands the breadth of skills from the cognitive and socioemotional to include those relevant to the development of values, perspectives, and identity—dimensions that can help move attention beyond behavioral change (the practical sphere of transformation) to a change in mindsets and paradigms (the personal sphere of transformation). One particular mindset shift that is targeted is one that moves away from a "dominion over" worldview that positions the earth—as well as vulnerable groups, including girls, the poor, and minorities—as resources to exploit for economic growth and development, and for power and control.[104] Instead, through the cultivation of both sustainability competencies and a feminist planetary consciousness, the aim is to move toward a justice-oriented worldview of "care for" and "compassion toward" that strengthens the social bonds between people and thus their transformative capacities and the possibilities for sustainable change.[105]

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102. Lerner, 1986; Sahni, 2017.
103. Moraes and Freire, 2017; Russell and Bell, 1996.
104. Ziervogel, Cowen, and Ziniades, 2016.
105. Ibid.

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As such, many of the skills promoted in this paradigm are those that can equip individuals with the capacity to critically interrogate and address not only their assumptions about the world, but also the multidimensional and interlinked factors which exacerbate socio-ecological destruction. To this end, skills associated with this paradigm include systems thinking, futures thinking, disruptive thinking, and social and political awareness (the right-hand column of Figure 1).[106] Another central set of green skills within this paradigm is the ability to critically interrogate power relations and to recognize the systems, processes, and institutions that perpetuate those unequal power relations across gender, race, class, and other identity markers.[107] And because this paradigm is targeting transformative change, not only are skills for engaging in collective action important—such as relational and participatory competencies like trust building, coalition building and enrolling others in a common cause—but so is understanding the consequences and implications of taking action, which entails a great deal of emotional intelligence, a high tolerance for risk, as well as a bit of normative thinking.[108]

> Not only are skills for engaging in collective action important—such as relational and participatory competencies like trust building, coalition building and enrolling others in a common cause—but so is understanding the consequences and implications of taking action, which entails a great deal of emotional intelligence, a high tolerance for risk, as well as a bit of normative thinking.

Translating green skills into empowered climate action

But transformation isn't merely a cognitive exercise or an existential journey of individual self-discovery.[109] Systems thinking or a paradigm shift by itself is not enough for transformational change to happen; they are prerequisites. The development of skills for green transformation and the shifts in mindsets must translate into an individual and collective desire to affect change, a sense that one can affect change, and the opportunity to engage in empowered climate action for change. Again, insights from girls' life skills education offer a useful framework for thinking about skills for green transformation. Particularly key is its attention to opportunity structures and

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106. Staufer, et al., 2015; Frisk and Larson, 2011; Tilbury, 2007; Wiek, Withycombe, and Redman, 2011.
107. See Resurrección, et al., 2019; Henderson, 2019; Kaijser and Kronsell, 2014.
108. Frisk and Larson, 2011; Lotz-Sisitka, 2018; Ziervogel, Cowen, and Ziniades, 2016.
109. Sterling, 2010.

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political agency as two important mediating factors in the translation of green skills into desired green transformation (see Figure 10).

Figure 10. A framework for translating green skills into empowered climate action

Green skills   Mediating factors   Green transformation
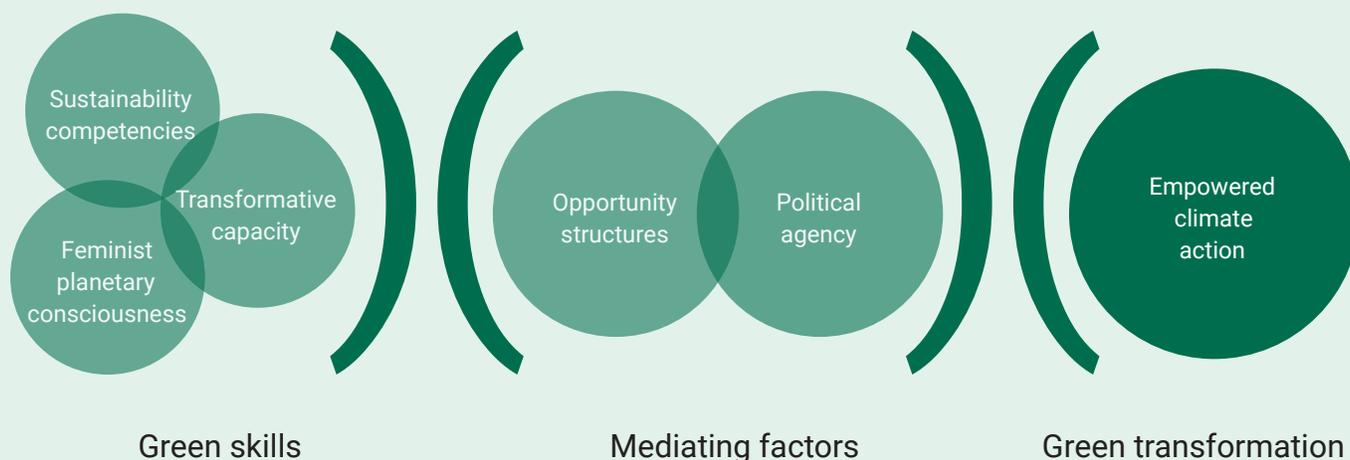
Adapted from Kwauk and Braga, 2017, p. 15.

1. Opportunity structures are the policies, institutions, social networks, social norms, and gender expectations that constrain or enable the translation of green skills into empowered climate action.[110] In the context of green transformation, these may include the absence of a public consultation process in the development of a new land management policy; the strong social bonds of a mentoring network that provide women in STEM with a space for professional development and career success in green sectors; or the belief that a girl's place is in the safety of her home rather than protesting for climate justice in a mixed crowd. In all cases, these opportunity structures affect whether or not an individual can apply her green skills. And, depending on the individual and/or context, the same opportunity structure may be an insurmountable obstacle or a commonplace feature of her social environment. In some cases, the opportunity structure might be characterized by "structural inertia," which a quality education for climate action should help build capacity to recognize and counteract.[111] In other

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110. Kwauk and Braga, 2017.
111. Bostrom, Andersson, Berg, et al., 2018.

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cases, it is charged with momentum and the challenge is recognizing how to strategically channel one's energy for lift off.

2. Political agency enables individuals to engage in systems change.[112] But to get here, one's personal agency must be at a minimal level first. In this case, the individual must be able to make ethical choices based on a vision of what is possible within planetary boundaries and in pursuit of what will sustain humanity on this earth. Efforts to develop such agency are often focused on "depositing" a sense of self-efficacy and a sense of possibility in the individual. But agency is not something that can be transferred from teacher to learner; rather, "it develops and fluctuates over the life course and across life situations through an iterative and dialogical process of building upon past achievements, learning, and patterns of action."[113] That is, it is temporal, dynamic, and emergent. Moreover, agency is not something one possesses, but something that one achieves, and its impact depends on context. Finally, agency is not only individual, but also relational and distributed. It depends on whether others recognize one's agency, as well as the degree of agency achieved by others.[114]

Opportunity structures can be understood to either outline possible pathways for empowered climate action or create dead ends and closed doors. Political agency can determine the extent to which the individual (and the collective) can engage with those structures for transformative ends. Together, opportunity structures and political agency interact in complex ways, functioning to mediate the extent to which the translation of green skills into empowered climate action can result in transformative change. For example, low levels of political agency and opportunity structures with a great deal of structural inertia may translate into less effective action regardless of how "green" the individual's and the collective's skills are. Or, higher levels of political agency and opportunity structures with greater momentum may translate into rapid and effective action that helps to flatten, and eventually bend, the curve of the climate crisis.[115]

What makes Approach 3 unique—as well as complementary to Approaches 1 and 2—is that it removes the onus of change from the individual and places

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112. O'Brien, Selboe, and Hayward, 2018.
113. Kwauk, and Braga, 2017, p. 16.
114. Kwauk and Braga, 2017; Lotz-Sisitka, 2018.
115. O'Brien, Selboe, and Hayward, 2018.

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it in the relationship between individual/collective and structure. Importantly, this green learning agenda might be targeted at transformation within the individual, but through processes of social learning and paradigmatic shifts that will engender collective climate action located in the political realm to transform structures and systems. The next section highlights what it might look like for the education to help shape this relationship in a manner that helps realize a greener future.

Centering a feminist transformation in green learning

Scholars define transformative learning as a transgressive process of changing one's frame of reference, worldview, and assumptions about the world.[116] The end result is an orientation to the world that is more socially sustainable, gender inclusive, and self-reflective.[117] In fact, transformative learning is very closely aligned with the vision and approach to gender-transformative education: It "moves [learners] to an understanding of structures of domination or power for the purposes of transforming these relations of power. […] [It] involves a high degree of participation, recognizes mutual learning, stresses the creation of new knowledge and is directed toward social, economic, or other forms of justice and democracy. It is political in its intent and has as its goal, structural change."[118] This overlap helps to reinforce the interlinkages between the achievement of gender equality in education and quality education for climate action and climate empowerment.

Yet we should ensure a transformative green learning agenda does not just orbit around concepts of gender equality, but rather intentionally develops transformative capacities for a green, feminist transformation of our human ecosystems. To develop such green skills, a green learning agenda must be oriented to political engagement, activating a feminist planetary conscious, and engaging in radical acts of care.

Engage girls (and boys) in a co-constructed learning process toward political engagement. Transformative learning that is unapologetically feminist is about empowering people to see what new socioecological structures and

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116. Bostrom, Anderson, Berg, et al., 2018; Lotz-Sisitka, Mukute, Chikunda, Baloi, and Pesanayi, 2017; Mezirow, 1997; O'Brien, 2018; Tilbury, 2007.
117. Mezirow, 1997.
118. Clover, 1995, p. 3.

systems are possible, why they are desirable, and therefore why we should work collectively to achieve them.[119] To create such transformative learning opportunities, however, we cannot focus on manipulating or social engineering greener, more gender-equal behavior or increasing the quantity of knowledge about gender and climate change, for this risks turning people into objects to be changed through the ideological indoctrination in pre-determined values, beliefs, and worldviews. It also sets learners up to be measured in narrowly objective terms like "carbon footprints" or standardized test scores.

Instead, we must approach transformative learning by creating the enabling conditions that promote the development of sustainability competencies, a feminist planetary consciousness, awareness of opportunity structures, and the achievement of individual and collective political agency. This means approaching education as a co-constructive, reflexive learning process between learners and teacher-facilitators, and viewing learners as agents of change capable of shaping larger systems transformation in the political sphere.[120] Indeed, the process of co-developing the learning process may be equally important to actually delivering a quality curriculum when it comes to achieving

> A participatory, democratic approach to education is a key pathway to the acquisition of knowledge.

transformative outcomes.[121] Studies suggest that a participatory, democratic approach to education is a key pathway to the acquisition of knowledge.[122] By centering youth engagement alongside the cultivation of green skills, learners can develop democratic values, become more aware of democratic processes, and strengthen a sense of political identity and agency necessary for political engagement.

Orient transformative capacities toward the activation of a feminist planetary consciousness. Centering a feminist lens in transformative learning also means orienting transformative capacities like interdisciplinary thinking, integrative thinking, and disruptive thinking to activate a feminist planetary consciousness. Specifically, a gender-transformative education

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119. O'Brien, 2018.
120. Keller, Stötter, Oberrauch, Kuthe, Köftgen, and Hüfner, 2019; Macintyre, Lotz-Sisitka, Wals, Vogel, and Tassone, 2018; O'Brien, 2018.
121. Bezner, et al., 2019; Cutter-Mackenzie and Rousell, 2019.
122. Balls, 2016; Chawla and Cushing, 2007; Schwab, 2018.

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for empowered climate action requires learners to leverage green skills to confront controversial issues, including the incompatibility of a commitment to sustainability and to economic growth. Green skills must also be directed at unveiling unequal relations of power across gender, race, socioeconomic status and other axes of difference; the opportunity structures granting privilege to some but not others; and the conflicts of interest supporting these inequities. If we are to deploy all possible climate solutions, then it is imperative that education develop in learners an awareness for identifying and asking critical questions about interconnected inequities and inequalities and then leveraging disruptive ideas to transform systems.

Prioritize radical acts of care and reconnections to systems of care. Because this approach to education engages headfirst with issues of power and inequality, this means conflict, grief, anger, and trauma are a core experience of transformative learning.[124] This is especially the case in the context of coming to terms with the full complexity of the climate crisis, its underlying systemic drivers—including gender inequality and the violation of human rights—and its irreversible losses.[125] Indeed, researchers suggest that an important mediating process—in addition to agency and the recognition of opportunity structures—is the affective or emotive experience of climate change.[126] While educators can design experiential, action research or action learning projects to engage learners with personal change or local community-level action, it is the facilitation of the psychological and the emotional process that lead students to either withdraw from action or become motivated to act. Such emotive processes can either render learners hopeless and without a sense of purpose, or can help to build their identities as change makers, paving the way to the development of political agency and a political consciousness.[127]

Experts describe transformative learning as a cumbersome process rife with conflict, but with the careful facilitation of this conflict through collective care between teachers, community members, and learners, stronger social bonds, social cohesion, and sense of belonging can emerge.[128] Such attention to care as a radical act of solidarity is critical to achieving a sense of collective political

123. Monroe, Plate, Oxarart, Bowers, and Chaves, 2019.
124. Bostrom, Andersson, Berg, et al., 2018.
125. Cunsolo and Ellis, 2018; Usher, Durkin, Bhular, 2019; Willox, 2012.
126. Bouman, Verschoor, Albers, Böhm, Fisher, Poortinga, Whitmarsh, and Steg, 2020; Cordero, Centeno, and Todd, 2020.
127. Usher, Durkin, Bhular, 2019; Westoby and McNamara, 2019.
128. Leichenko and O'Brien, 2020; McNeal and Petcovic, 2019; Ziervogel, Cowen, and Ziniades, 2016.

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agency.[129] But more importantly, such attention re-values work that is a fundamental component to social movements, yet which patriarchy and capitalism have used to subsidize the destruction of our socioecological systems.[130]

By confronting power inequalities and issues of climate justice with radical acts of care, centering a feminist transformation can also help focus efforts on reconnecting learners with those systems—or parts of systems—that *do* support social well-being and human dignity.[131] This includes reconnecting to sustainable and regenerative elements of indigenous knowledges of care that have been pushed aside in favor of those prioritized by the free market and extractive industries.[132] Such reconnection will help learners break from the dominant logics of economic growth, job creation, and the business bottom line and identify instead with the policies, systems, and practices that prioritize what truly matters for a sustainable society, including education, healthcare, and clean water and air.[133]

> By confronting power inequalities and issues of climate justice with radical acts of care, centering a feminist transformation can also help focus efforts on reconnecting learners with those systems— or parts of systems—that *do* support social well-being and human dignity.

While transformation is not linear, its endpoint can be conceptualized as the achievement of sustainable and equitable social and economic systems (see Figure 11).[134] But getting here will be challenging, as centering such transformative learning requires education as we know it to be radically transformed. And there are several major roadblocks preventing such radical transformation from occurring.

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129. Hobart and Kneese (2020) define radical care as "a set of vital but underappreciated strategies for enduring precarious worlds […] [It] is often connected to positive political change by providing spaces of hope in dark times" (p. 2). However, radical care can be co-opted by "a robust industry of neoliberal wellness ideology rends offer[ing] indivudalized solutions to structural problems" (p. 3). Relatedly, radical care "can be used to coerce subjects into new forms of surveillance and unpaid labor, to make up for institutional neglect, and even to position some groups against others, determining who is worthy of care and who is not. Even so, in the face of state-sanctioned violence, economic crisis, and impending ecological collapse, collective care offers a way forward" (p. 2).
130. Bunting, 2020; Hobart and Kneese, 2020.
131. Waldron, Ruane, Oberman, and Morris, 2019; Ziervogel, Cowen, and Ziniades, 2016.
132. Harmin, Barrett, and Hoessler, 2017.
133. Pirgmaier and Steinberger, 2019; Russell and Bell, 1996.
134. Ziervogel, Cowen, and Ziniades, 2016.

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Figure 11. Theory of change from investing in the development of transformative capacities through transformative learning for climate action

| Transformative learning for empowered climate action | → | Development of sustainability competencies and transformative capacities (skills for personal and political green transformation) | → | Strengthened political agency and feminist planetary consciousness | → | Epistemic shifts in worldviews: mindset change (personal realm of transformation) | → | Increased awareness of opportunity structures and systems of oppression | → | Desire, opportunity, and capacity to act for sustainable, equitable systems (political realm of transformation) |

Shortfalls to transformation

There is great urgency for a feminist transformative learning for climate action. Given the extent of climate breakdown, the window of time for such action is closing rapidly. And with each passing year of inaction or not enough action, the impacts of climate change will become more disruptive and the magnitude of impact needed by each climate solution will be magnified. There is no time like today when education needs to be repurposed toward realizing "a global ethic of climate justice" and creating an "active, constructive and radical citizenry" as mentioned above.[135]

However, and unfortunately, the education system is characterized by a high degree of structural inertia and resistance to change, not to mention chronically under-resourced. Mainstreaming a transformative green learning agenda in the global education system would require a radical reorientation of the purpose and vision of education, a reordering of global and national educational priorities, and a restructuring and redesign of education monitoring and accountability mechanisms.[136] As discussed earlier, Approach 1 often risks falling short of achieving transformation because it continues to ignore the inherent paradoxes and inconsistencies in its economic vision—hence our proposal for a more gender-transformative approach to identifying and developing skills for green jobs TVET. Approach 2 risks falling short because it ignores the political economy in its attention

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135. Selby and Kagawa, 2010, p. 45; Pavolva, 2013, p. 659.
136. Kwauk, 2020.

to individual behavioral change—hence our proposal for a more critical, feminist, intersectional, justice-oriented approach to green life skills. And while Approach 3 attempts to confront these issues head on, it is a dangerous approach for those in power and thus risks being avoided by teachers, rejected by ministries of education, and lobbied against by vested interests on the notion that it is too political for the classroom.[137] The COVID-19 economic crisis is a stark reminder that the health of human society is tied to the health of the planet, and that our global economic system is holding together this fragile balance. Not attending to these tenuous relationships makes it incredibly difficult, if not impossible, to achieve transformative change.

> The COVID-19 economic crisis is a stark reminder that the health of human society is tied to the health of the planet, and that our global economic system is holding together this fragile balance.

Yet these political roadblocks face an additional set of practical and personal implementation challenges at the classroom level that could impede the ability of Approach 3 to seed transformation. Centering (feminist) transformation in learning is dependent on the quality of the learning environment, which includes:

- Co-constructing knowledge through democratic and participatory learning
- Nurturing students' political agency and feminist planetary consciousness
- Facilitating disruptive inquiry on controversial topics
- Mediating conflict, guilt, grief, and loss
- Reconnecting to systems of care and compassion

But experts suggest that in addition to the learning environment, the learning partnership between the teacher-facilitator and his/her learner is critical.[138] Transformative learning is "deeply uncomfortable" and "involves a restructuring of basic assumptions caused by the recognition of 'incoherence' between assumptions and experience."[139] Thus, the learning process is likely to elicit resistance and possibly denial from the learner. Likewise, because teachers (and parents) are social beings too, a transformative green learning agenda is also likely to be met by political resistance before ever being

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137. Monroe, Plate, Oxarart, Bowers, and Chaves, 2019.
138. Sterling, 2010.
139. Sterling, 2010, p. 25.

implemented in the classroom. While with regard to the former, efforts can be developed to support teacher capacity to facilitate critical engagement with the more existential elements of transformative learning, it is the latter that requires deeper systems change. After all, Approach 3 is not just a cognitive endeavor,[140] it is also an inherently political one and requires an enabling policy environment to implement.

140. Sterling, 2010.

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Leveraging Policy Mechanisms for Green, Feminist Transformation

The heuristic presented above is intended to provide national and subnational decisionmakers and stakeholders of gender, climate, and education with a tool for considering three approaches to quality, gender-transformative education for climate action and a framework for conceptualizing the green skills necessary for broader technical and social transformation. Depending on the context, certain approaches may be more feasible than others, although the aim should be that all three approaches are pursued together—or progressively over time—as a new green learning agenda. Each approach solves a different aspect of the climate crisis, takes a different approach to addressing the problems of education, and, as a result, leads to a different degree of change. All approaches are valid, and all are needed for human society to catalyze the rapid technical and social transformations needed.

To summarize:

■ Approach 1 ensures technical education and training aimed at building specific capacities, or skills for green jobs, are capable of achieving a just transition to a green economy through a gender-transformative approach. It expands our conceptualization of green skills beyond STEM skills to also include gender-empowerment skills like the ability to read, decode, and act upon one's social environment. It argues that if girls and women are excluded from the present brown economy, they will be at the fringes of a green economy without deliberate efforts to make green TVET initiatives more gender inclusive and gender transformative.

■ Approach 2 ensures that the building of generic capacities, or "green life skills," translates into long-standing, pro-environmental behaviors by centering a critical, feminist, intersectional, and justice-oriented agenda in climate change education or education for sustainable development. It conceptualizes green skills as the cognitive and socioemotional skills that can be "worn" like a pair of green glasses, helping individuals to make greener decisions and engage in greener behaviors in a wide

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variety of contexts. It argues that if girls' experiences are added to the "shade" of the green-tinted lenses, the resulting behaviors can be more gender empowering. Additionally, this approach targets the transformation of gender norms that have rendered the pro-environmental behaviors associated with green life skills as feminine—or "unmanly."

■ Approach 3, perhaps the most radical of the three, focuses on developing transformative capacities, or "skills for green transformation," by centering the feminist transformation of mindsets and confronting the underlying structures of inequality and systems of oppression that sustain climate vulnerability. It positions green skills like disruptive thinking and political agency as a core piece of a larger framework of change that includes attention to the opportunity structures that enable or inhibit individual and collective climate action. It argues that through the development of girls' (and boys') feminist planetary conscious and the active disruption of gender inequality, education can seed the social transformation needed to achieve the 1.5°C target.

To adopt these approaches, a strong enabling policy environment is imperative, as is the political will among state and non-state actors to break with the status quo and the notion that building resilience and adaptive capacity to an unsustainable system is desirable. Indeed, the policy mechanisms that can help make progress toward quality education for climate action include some of the very same mechanisms needed to make progress toward gender equality in education. That is, both require disrupting the structures that have perpetuated the marginalization of the vulnerable, the exploitation of the labor and resources of those less powerful, and the oppression of those who have been rendered voiceless. Education has an important transformative role to play in seeding the mindset shifts and changes in worldviews to replace these unjust systems. But the education sector cannot do this alone. It requires leveraging policy at the national and subnational level; cross-sectoral, international, and transnational collaboration and coordination; and financing mechanisms to unlock local and grassroots efforts at scale.

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Opportunities for capacity building and awareness raising

The new green learning agenda presented in this paper does not assume a ready policy audience. Indeed, a foundational step is to ensure that policymakers and key downstream decisionmakers and administrators accept the scientific consensus that climate change is a result of human activity and that gender inequality persists.[141] Second, given the likelihood of educators and parents objecting to the teaching of controversial (or, in some contexts what is perceived to be less academically important) topics like climate change, gender, power, and justice—plans must be in place for responding to and contending with climate apathy, climate deniers, and climate skeptics, as well as custodians of patriarchal tradition.[142]

> A foundational step is to ensure that policymakers and key downstream decisionmakers and administrators accept the scientific consensus that climate change is a result of human activity and that gender inequality persists.

Green learning advocates are likely to engage educators and education decisionmakers who hold different ideological perspectives on climate change than themselves. In such cases like in the U.S.—where climate skepticism is highest in the world and opinion about climate change is highly structured along political ideological lines[143]—researchers recommend emphasizing the skills, like problem-solving, critical thinking, and open-mindedness, to be acquired through quality student-centered, inquiry-based pedagogies.[144] The green skills framework provided in this paper (see Figure 1) can serve as a tool for shaping such skills-focused discussions, with the aim of shifting over time into the gender-transformative vision of each of the green learning agendas.

But beyond identifying ways to avoid the new green learning agenda being "dead on arrival," it would be prudent to pursue efforts at raising awareness and building capacity among decisionmakers and educators on a number of fronts, including on the role of education in increasing adaptive capacity and resilience to climate change, on the gendered impacts of climate change, on

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141. Holland, 2020.
142. Research has shown that political ideology is one of the most important factors determining one's beliefs about climate change. But then again, research has also demonstrated that belief in climate change is not necessarily a precondition for pro-environmental behaviors, so changing the minds of climate skeptics need not be a priority. (See Carrico, et al., 2015; Hall, Lewis, and Ellsworth, 2018; Kahan, et al., 2012.)
143. Burn-Murdoch and Hook, 2019; Leiserowitz, et al. 2020.
144. Hall, Lewis, and Ellsworth, 2018; Kunkle and Monroe, 2019.

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issues of climate justice and environmental racism, and on the incompatibility of sustainability goals and unfettered economic growth. In addition, teachers must have an opportunity to engage in professional development and continuing education not only to strengthen their understanding of climate change, but also to develop methods and support for responding to climate skeptics, to counseling students with ecological grief and anxiety, and to increase their confidence in engaging in controversial topics and encouraging political action. Supporting teachers is especially important because each approach to the new green learning agenda attempts to engage learners in a journey from self-, to social-, to ecological awareness grounded in concepts of ethics, justice, fairness, and equality. Facilitating this process requires a degree of personal experience with the emotions and existential crises that this learning journey evokes—something that not all teachers will have engaged.[146]

Recommendations

■ **Build capacity and raise awareness of government decisionmakers on issues of gender, education, and climate justice.** At a national level, such capacity building could take the form of UNFCCC webinars for including the 121 national ACE focal points,[147] trainings with national Conference of the Parties (COP) delegates and negotiators, or workshops with country authoring teams of NDCs and other national climate strategies. Countries that may be more primed to champion such issues include the Solomon Islands, Malawi, Venezuela, and Zambia— the only countries out of 160 analyzed whose initial NDC included at least one reference to girls and/or made a reference to girls' education. At the subnational level, develop partnerships with youth-led climate organizations, student climate activists, and school eco-clubs to engage elected representatives and school leadership in reverse town halls or community action projects to raise awareness among decisionmakers of the demands of youth on leaders to address existential problems of education, including climate change and climate justice.

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145. Cunsolo and Ellis, 2018; Holland, 2020; Pihkala, 2018; Usher, Durkin, Bhular, 2019; Waldron, Ruane, Oberman, and Morris, 2019.
146. Sterling, 2010.
147. For a list of National ACE Focal Points, see https://unfccc.int/topics/education-and-outreach/focal-points-and-partnerships/ace-focal-points.

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■ **Raise awareness and understanding across the current and future teacher workforce of the anthropogenic drivers of climate change, the difference between low-impact and high-impact climate solutions, and the intersections between climate change and climate justice.** This can be through strategic partnerships between teachers unions, teacher professional societies, and subject-area organizations working alongside international, regional, national, and subnational climate change communications, education, and advocacy organizations and networks like World Wildlife Fund, Greenpeace, the Climate Education, Communication and Outreach Stakeholders Community, the Women's Earth and Climate Action Network, the Secretariat of the Pacific Regional Environment Programme, Future Climate for Africa, the Climate Literacy and Energy Awareness Network, or the GREEEN Network. Countries that could be primed for such partnerships include those like Italy and Mexico that have national mandates to integrate CCE across the curriculum, or like Australia and Germany that have strong support for ESD. In addition, countries in the Global South working with the UN CC:Learn to develop National Climate Change Learning Strategies may also benefit from such teacher professional development.[150] These include Ghana (whose strategy was the only one out of eight that mentioned gender equality), Malawi (whose strategy was the only one to position girls and women as agents of change), and Benin (whose strategy was one of three to position women as a stakeholder).

■ **Co-develop with educators a teacher training program and teacher leadership development program on gender-transformative education for climate action.** This could be done in partnerships with climate change education organizations, climate justice organizations, indigenous peoples organizations, gender and climate organizations, and environmental psychologists. Efforts should include developing a cascading teacher support and solidarity network to provide regular check-ins, debriefs, and feedback on the implementation of new feminist pedagogies of care and new gender-transformative CCE curricula. Such a support and solidarity network could be instrumental in helping teachers dealing with ecological grief and climate anxiety also help

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150. At the time of writing, these include Benin, Burkina Faso, Dominican Republic, Ethiopia, Ghana, Indonesia, Kenya, Kyrgyz Republic, Malawi, Niger, Uganda, Zambia, Zimbabwe, and a Central American and a West African hub.

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their students find additional care and support, ultimately moving them toward collective empowered action.

Opportunities for policy coherence and coordination

There are several international policy frameworks and national policy trends that can be leveraged to create policy coherence and a unified approach to education for climate action and climate empowerment that enable downstream efforts at resource mobilization and implementation.

At the top, Article 6 of the UNFCCC and Article 12 of the Paris Agreement both mandate work on ACE. It is envisioned that all members of society will be empowered to engage in climate action through six primary activities: education, training, public awareness, public participation, public access to information, and international cooperation. While there have now been a number of ACE workshops and eight high-level dialogues since the Doha Work Programme on Article 6 of the Convention was adopted in 2012, ACE activities have been unevenly mainstreamed in UNFCCC and Paris Agreement policy documents. For instance, as parties to the Paris Agreement, countries submit an NDC—or a national strategy to reduce greenhouse gas emissions and to adapt to the effects of climate change—every five years. The first NDCs were finalized after the adoption of the Paris Agreement (with some countries lagging behind and submitting their first NDC several years later). The first round of updated NDCs were expected this year at COP26; however, COVID-19 will likely delay many submissions.

As mentioned earlier in this paper, an analysis of 160 NDCs found that these policy documents are not adequately attending to education for climate empowerment. For starters, only 42 percent of NDCs include a direct reference to children or youth, and while 68 percent of NDCs include education-related terms, only 26 percent make these references in relation to children.[151] Only four NDCs referred to girls, two referenced girls' education, and none acknowledged the contributions that investments in girls' education and gender equality could make on the country's ability to achieve its climate goals.[152] Finally, the top 20 carbon-emitting countries in the world were the least likely to have referenced education and children in their NDC, while the youngest

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151. Kwauk, Cooke, Hara, and Pegram, 2019.
152. Kwauk, Cooke, Hara, and Pegram, under review.

countries in the world were more likely to do so.[153] While a broader analysis of 368 country submissions to the UNFCCC found ACE concepts more widely referenced, researchers found that cognitive learning was emphasized more than socioemotional learning, reflecting a bias toward knowledge of climate change rather than the breadth of skills discussed earlier in this paper.[154] There is a clear opportunity to ensure that updated NDCs do a better job integrating a new green learning agenda as a national strategy for mitigation and adaptation.

Second, the Sustainable Development Goals also include three relevant targets:

> *4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development*

> *12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature*

> *13.3 Improve education, awareness-raising, and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning*

The measurement framework for these targets, however, is not focused on substance but rather on prevalence. For example, countries are being measured on whether or not ESD concepts are present in policy, curriculum, teacher education, and student assessments, rather than on whether the inclusion is relevant for engaging in climate action or is gender-responsive.[155] While monitoring data have not yet been collected for these targets, analysis of 47 country Voluntary National Reviews (VNRs) from 2019 suggest that countries are not proactively engaging with these Sustainable Development Goal targets. For example, less than half of VNRs' education discussions

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153. Kwauk, Cooke, Hara, and Pegram, 2019.
154. UNESCO, 2019.
155. Kwauk, 2020.

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referenced sustainable development and just 17 percent referenced gender equality. Although these targets were just recently upgraded to Tier 2 status, the UN is in the process of refining its measurement framework. This is an opportunity to push the Sustainable Development Goal monitoring mechanisms to better hold governments accountable to a more radical vision of sustainability.

Third, there are several other national-level policy entry points to leverage for gender-transformative systems change. For example, as mentioned earlier, the One UN Climate Change Learning Partnership (UN CC:Learn) has been working with countries to develop National Climate Change Learning Strategies (NCCLS). Since 2011, seven countries and one region (Central America) have finalized their strategies through this partnership. An analysis of these strategies suggest that countries are focusing primarily on a technical approach to climate change learning, but are not doing so in a gender-transformative way. Six of the eight policies analyzed framed green skills as skills for green jobs, five framed them as green life skills, and none framed them as skills for green transformation. Only four of these policies were gender-sensitive, including ensuring images in textbooks were not gender biased. At minimum, all NCCLSs should be gender sensitive and aligned with and reinforce global, regional, and national agendas in girls' education. Interviews with policy authors confirm that there is room for expanding awareness of the range of education approaches and to ensure these approaches are gender-transformative and oriented to climate justice.

> At minimum, all National Climate Change Learning Strategies should be gender-sensitive and aligned with and reinforce global, regional, and national agendas in girls' education.

Other policy entry points include National ACE Strategies and green economy or low-emissions strategies. In terms of the former, the Doha Work Programme called on all parties to designate a national ACE focal point to help mobilize the development of a national ACE strategy, as well as to strengthen country-level coordination of ACE activities. However, as of 2020, 121 of the 195 parties to the Paris Agreement have appointed one ACE focal point. And out of the five largest nations—which account for more than half of global emissions and nearly half of the world's population—only one

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has a national ACE focal point (Indonesia).[156] More research is needed to determine how many and which countries have actually developed a national ACE strategy, and whether these strategies also prioritize girls' access to quality education, training, and information for girls, and later women, to engage in empowered climate action and advance gender equality.

Finally, in many countries around the world, it is the subnational level where key education decisions are made. This is especially the case in countries with decentralized education systems. When it comes to policy coherence, a national coordinator like the national ACE focal point can be critical in supporting a subnational architecture of climate change educators, youth organizations, and public champions to mobilize subnational education systems into action for more centralized policy. Indeed, research suggests that there may be a "sweet spot" for climate action at a smaller scale than the nation-state. That is, there may be a particular population scale of action (roughly 10,000 to 100,000 people) where collective action is optimized in terms of its impact on carbon reduction.[157] At this scale, depending on the population of students served in a local education system, this means targeting education system transformations at roughly the level of a school district or school county. Depending on what level education policy and budgets are determined, there may be a quicker way to implementation through the local level than through national education and climate policies. Viewing the entry point at this scale also helps to ensure education efforts are responding directly to local gendered impacts of climate change and environmental issues, and less likely to be "dead on arrival" on the grounds of being threatening to vested interests. It also means stakeholders can tap local school support structures and networks to build capacity of teachers and school administrators in the implementation of a radically new vision for education.

Recommendations

■ **Include reference to all three green learning agendas in NDCs, NCCLSs, National ACE Strategies, and national green economy or low-emissions strategies.** That is, the national climate and CCE policy landscape should address gender-transformative TVET, critical feminist CCE, and gender-transformative learning for early childhood,

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156. These countries are China, India, U.S., Indonesia, and Pakistan (Kwauk, 2020).
157. Bhowmik, et al., 2020

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K-12, and tertiary education. In addition, these national policies should identify key cross-sectoral actors to be engaged in the coordination and implementation of these education strategies, including education, climate, gender, and other relevant sectors at the national and sub-national level. This might entail developing partnerships with entities supporting country NDC and NCCLS author teams, including the NDC Partnership, the UNFCCC, UNDP, UNEP, and other UN agencies to ensure they are aware of the significance of including quality, gender-transformative education for climate action. As of now, no countries are leading the charge, and it is urgent that this absence of champions be filled. In countries with decentralized education systems, it might be more effective to build a subnational architecture of education champions for climate action to mobilize grassroots, community-based policy change that can signal to national policymakers not only the need for a country-wide new green learning agenda but also what pathways are possible.

■ **Align monitoring mechanisms for Sustainable Development Goals 4.7, 12.8, and 13.3 and ACE implementation to a more radical vision of education for climate action** to hold national and subnational governments accountable. This means ensuring gender equality-related targets (e.g., girls' completion of 12 years of basic education, girls' participation in STEM fields, girls' and women's participation in green sector jobs and climate leadership) are prioritized equally to reductions in carbon, transitions to renewable energy, forest area preserved, and so on. To achieve this, coordinated and strategic advocacy by girls' education and gender and climate change groups must be targeted at the Inter-agency and Expert Group on Sustainable Development Goal Indicators, national statistics offices of member states, and relevant global indicator working groups—including the Global Alliance to Monitor Learning Task Force on SDG 4.7—to align existing indicators and data collection methods and to develop new indicators on the transformative outcomes we care about.

■ **Build a dashboard to monitor country coherence in national and sub-national approaches to quality education for climate action.** Such a dashboard should indicate which of the three green learning agendas has been adopted and implemented or are absent. Such monitoring will help to hold governments accountable to the urgent need to build

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back differently from COVID-19 and to transform education systems for climate action now. Where countries have not achieved coherence across investment in the specific, generic, and transformative capacities needed to address climate change and its underlying drivers, they should work on expanding their approach to education for climate action and climate empowerment. Where countries are lagging, the UN CC:Learn and other multilateral and bilateral partnerships should help these countries develop their climate change learning strategies, with the aim of all countries adopting a comprehensive new green learning agenda within three to five years.

Opportunities for international collaboration

Beyond international, national, and subnational policy entry points is the need to leverage transnational, multilateral, and bilateral collaboration. This is particularly important for climate action, as the countries that are historically responsible for the climate crisis are not the ones to bear its greatest costs. Although developing countries contributed less than a quarter of present-day emissions, they bear between 80-90 percent of its social cost due to their greater exposure to natural disasters, weaker infrastructure, and lower capital reserves.[158]

Recognizing this, under a framework of justice, equity, and fairness, the Paris Agreement—like the UNFCCC—distinguishes between country responsibility, placing the greater burden of responsibility on developed countries.[159] This means that countries traditionally and presently responsible for the majority of greenhouse emissions have a greater mitigation role than countries with lower emissions levels. It also means that developed countries have a "moral responsibility" to support developing countries to adapt to the impacts of climate change and meet their emissions targets, while also reaching their sustainable development goals.[160]

This "common but differentiated responsibilities and respective capabilities" principle is reflected in the conditionality of many of the NDCs, especially those of developing countries, that require international cooperation,

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158. Busch, 2015; UNESCO and UNU, 2012.
159. Pauw, Mbeva, and van Asselt, 2019.
160. Pauw, Castro, et al., 2019.

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international finance, capacity building, and the transfer of technology in order to fulfill their contribution. In practice, however, developing countries are still bearing the burden. An analysis of the conditionalities of NDCs found that while developing countries—especially least developed countries (LDCs) and small island developing states (SIDS)—are more likely to have conditionalities on part or all of their contributions than developed countries, they are the least likely to actually receive it. In fact, the countries actually providing support to LDCs and SIDS are emerging economies like Brazil, Chile, and Panama, rather than developed countries like the U.S. or the U.K.[161]

Notably, the Paris Rulebook—also known as the Katowice Climate Package, adopted at COP24—provides provisions on the monitoring of equity and fairness, and creates an opportunity to hold developed countries to account for their responsibility to provide support to developing countries.[162] Although the first global stocktake does not occur until 2023, early signs on international cooperation for climate do not bode well. Indeed, only one of the 47 VNRs analyzed for this paper explicitly referenced international cooperation activities (Azerbaijan). There is a clear need in the next three years to hold developed countries (also known as Annex I countries under the UNFCCC) accountable to their commitment to equity and fairness. This could be a timely opportunity to leverage the fairness framework and the need to support capacity building in developed and developing countries alike to create international collaboration on the new green learning agenda.

Recommendations

■ **Lean in on the Paris framework for equity, justice, and fairness to call on developed countries to make good on their responsibility to support LDCs, SIDS, and emerging economies in their ability to fulfill their NDC targets.** While this principle of common but differentiated responsibilities has translated primarily into concerns about the flow of financial resources from developed countries to developing countries (albeit with some nuance in the flow between country type), a commitment to equity and fairness must go beyond the quantity of (financial) resources to the quality of such transfers and cooperation. That is, stakeholders should track whether international collaboration on climate-related

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161. Pauw, Mbeva, and van Asselt, 2019.
162. Pauw, Mbeva, and van Asselt, 2019; Winkler, 2020.

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finance, technologies, knowledge, policies, and practices contribute to climate and gender justice. Or, whether these transfers perpetuate uneven geopolitical relations of power, the privileging of knowledge and solutions from the Global North, the exploitation of women's unpaid labor—especially of indigenous populations and women of color—and the persistence of harmful gender stereotypes and practices. Capacity building and awareness raising efforts around the new green learning agenda, as well as international collaboration in the implementation of this agenda, should reflect these principles of justice, equity, and fairness. To illustrate, awareness raising efforts among teachers in the Global North should emphasize critical reflection on the gendered and environmental legacies of capitalist colonial expansion and present-day consumption patterns. Capacity building among TVET facilitators in the Global South could emphasize knowledge of gendered global supply chains in renewable energies from the mining of raw materials to the designing of technologies to the flows of renewable energy consumption and production. Such awareness could help transform this supply chain through the development of international feminist mentoring, apprenticeship, or business networks that disrupt the status quo.

■ **Leverage bilateral mechanisms, like feminist foreign policy, for more transformative multi-solving collaborations between countries.** The emerging trend of countries like Sweden, Canada, France, and Mexico adapting a feminist foreign policy provides a timely model (and opportunity) to align a climate-smart agenda with a gender-smart agenda. Indeed, a present working definition of feminist foreign policy is only too fitting for a new green learning agenda: it is "the policy of a state that defines its interactions with other states […] in a manner that prioritizes peace, gender equality and environmental integrity [and] seeks to disrupt colonial, racist, patriarchal and male-dominated power structures."[163] Widespread adoption of a feminist foreign policy mechanism could help to mainstream a focus on both gender equality and climate justice in a country's international development, international trade, and humanitarian assistance, among other foreign policy pathways. Such an approach would help decisionmakers shift from siloed problem-solving to multi-solving—or, solving several

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163. Thompson, et al., 2020.

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challenges through a single intervention.[164]   While the existing feminist foreign policy countries could become champions of multi-solving for climate and gender, Mexico could be an exceptional model with its new draft environmental education law and its position as a non-Annex 1 country. Advocates and activists should urge feminist governments to expand their feminist foreign policy priorities to include investments at the intersections of gender, education, and climate change, and to become champions of quality, gender-transformative education for climate action. This may mean first implementing an awareness-raising campaign with key high-level or high-visibility stakeholders to increase their understanding of what is at stake if gender-transformative education or a feminist green learning agenda continues to be ignored (e.g., the cost of doing nothing).

■ **Build a transnational social movement and multisectoral coalitions of support for green, feminist transformation.** Partnerships between global education entities like the Global Partnership for Education, the Education Commission, and UNESCO and global climate entities like the UNFCCC, the International Union for Conservation of Nature (IUCN), and the NDC Partnership will help to ensure education stakeholders are aware their attention must extend to the education issues highlighted by Sustainable Development Goals 12.8 and 13.3 (as well as others). Likewise, such partnerships would help to ensure climate stakeholders are also aware of the full potential of quality, gender-transformative education to empower girls, women, boys, and men to engage in more effective and systems transforming climate action. Indeed, there is an urgent need to ensure the new green learning agenda is as much a part of the education sector as it is of the environment and gender sectors, just as it should be as much an Annex I country strategy as a non-Annex I country. Importantly, such transnational movement building should meet up with subnational movements and cross-sectoral partnerships and collaborations, including the private sector.

Opportunities to unlock climate financing

Financing is key among the challenges to accelerating progress toward climate action broadly, and most specifically to quality education for

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164. Sawin, 2018.

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climate action and the inclusion of girls and women in climate mitigation, adaptation, and leadership activities. However, data on climate financing at the intersections of issues like gender and education is scant, leaving little room for diagnostics and response. For example, previous analysis found that bilateral aid for gender and climate change was 31 percent of total climate aid in 2014, but this analysis has not been updated since.[165] Of note, however, is the fact that a dismal 3 percent of this assistance targeted gender equality as a primary goal. Even more alarming is that 2 percent of this assistance went to organizations located in the Global South.[166] When it comes to global philanthropic grant funding to climate change, the picture is even more bleak: Less than 0.01 percent of these funds in 2014 went to projects that also addressed women's rights.[167] Considering that in 2018, 43.4 percent of total (non-climate specific) bilateral aid by OECD Development Assistance Committee (DAC) countries targeted gender—only half of what is recommended by key women's organizations—it is unlikely that total gender and climate financing has increased dramatically from 2014 levels. One opportunity to tap into—and something already referenced above—is the increasing (but slow) trend of countries declaring their commitment to gender equality as feminist foreign policy governments. Perhaps even more promising is that some governments do not need a label before making a commitment. Spain (23.2 percent), Australia (16.5 percent), and the Netherlands (15.3 percent) each gave a greater percentage of their aid toward gender as a principal outcome than some of the self-declared feminist foreign policy governments. Directing awareness-raising efforts to these feminist governments about the intersections of gender, education, and climate change and the opportunities to multi-solve through gender-targeted foreign aid and climate financing could create a short-term strategy for developing high-level gender, education, and climate champions.

> Directing awareness-raising efforts to these feminist governments about the intersections of gender, education, and climate change and the opportunities to multi-solve through gender-targeted foreign aid and climate financing could create a short-term strategy for developing high-level gender, education, and climate champions.

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165. OECD DAC GENDERNET, 2016.
166. Equality Fund and Nobel Women's Initiative, 2020, p.10
167. Equality Fund and Nobel Women's Initiative, 2020, p.10.

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When it comes to climate financing that is targeted at education, even less is known. In 2017-18, only USD $30 billion (or 5 percent) of climate financing went to climate adaptation efforts (compared to $537 billion toward mitigation activities), and only $2 billion of this went to "other" activities outside of direct sector-specific financing to disaster risk management, water and waste, industry and infrastructure, or land use. It is perhaps safe to assume that if education received any climate financing it was less than 0.03 percent of total climate financing.[168] Given ACE is a key strategy for achieving the Paris Agreement's goals around justice, equity and fairness, it is important for monitoring and accountability purposes that climate financing mechanisms begin to mark both gender- and ACE-related activities.

> No city-, state-, province-, regional-, or country-level COVID-19 recovery plan currently included in the database includes attention to education. This is a missed opportunity to not only build back better education systems, but to build back differently in a way that rebalances humanity's relationship with the planet.

As countries develop their COVID-19 recovery plans, it is imperative that these plans not only prioritize green and gender-responsive economic recovery, but that they provide the necessary financing to education entities needed to kickstart the transformation of education systems toward greener, gender-transformative outcomes. At the time of writing, out of all the plans, open letters, and academic studies included in Climate Interactive's Green, Resilient, and Equitable Actions for Transformation database tracking green COVID-19 recovery plans, only the International Energy Agency and the Oxford Smith School of Enterprise and the Environment have explicitly mentioned that education efforts be prioritized amidst COVID-19 recovery plans. No city-, state-, province-, regional-, or country-level COVID-19 recovery plan currently included in the database includes attention to education.[169] This is a missed opportunity to not only build back better education systems, but to build back differently in a way that rebalances humanity's relationship with the planet.

Beyond increasing climate financing toward quality, gender-transformative education for climate action, another step that should be taken in the short term is around building a better sense of cost, both in terms of financial and carbon

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168. Clark, Falconer, Buchner, Meattle, Wetherbee, Macquarie, and Tolentino, 2019.
169. Climate Interactive, 2020.

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costs. This is particularly important for helping developing countries advocate for the new green learning agenda as part of their ACE activities, which requires support from developed countries. Experts suggest that identifying low-cost contributions and estimating implementation costs are critical for empowering developing countries to leverage conditionalities in their NDCs and improve the likelihood of receiving the necessary financing support to implement more ambitious climate policy.[170] Current estimates have placed girls' education and family planning as the most cost-effective climate solution available to us today and the second ranking climate solution in terms of estimated gigatons of carbon avoided— although we recognize that this calculation uses an imperfect proxy for estimating carbon reduction as a result of education.[171] A quality, gender-transformative education that builds the necessary green skills for a greener economy, greener behaviors, and greener ways of being should result in even better outcomes.

> An important barrier to unlocking climate financing for more gender-transformative approaches to climate action, including to education, health, and care work, is that the majority of climate financing today goes to male-dominated climate mitigation sectors.

Beyond bilateral climate financing, another untapped mechanism is domestic financing, especially at the subnational level. This is particularly relevant for countries with highly decentralized education systems, and where education interventions at smaller scales may be more likely to take hold than blanket measures across an entire nation. This recommendation also represents a disruption from the current trends in domestic climate change financing that tend to allocate very low levels of investment at the local level: For instance, within the US context, "while the worst impacts of climate change are felt locally, less than 10 percent of the US $17.4 billion climate change finance approved for spending between 2003 and 2016 [targeted] the local level."[172]

Finally, one additional key consideration pertains to the distribution of climate financing to the areas of climate mitigation versus climate adaptation.

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170. Pauw, Castro, Pickering, and Bhasin, 2019.
171. Hawken, 2017. Project Drawdown's 2020 estimates lower girls' education and family planning—now labeled as health and education—from first to second in its ranking of solutions (Wilkinson, 2020). Project Drawdown has developed a model that uses female education (measured as years of schooling) and its estimated impact on fertility as a proxy for understanding the relationship between education and carbon emissions (Hawken, 2017). Cordero, Centeno, and Todd (2020) have attempted a different method of calculating education's impact on carbon emission by estimating the total carbon impact of self-reported changes in sustainability behaviors, like driving less or eating a plant-based diet.
172. Equality Fund and Nobel Women's Initiative, 2020, p.3.

An important barrier to unlocking climate financing for more gender-transformative approaches to climate action, including to education, health, and care work, is that the majority of climate financing today goes to male-dominated climate mitigation sectors. Indeed, the integration of gender in climate financing has been impacted by gender stereotyping that positions women as victims of climate change, which gets mapped onto their relative absence in the design and implementation of climate solutions and thus climate financing. There also is an overemphasis in the field on technical solutions to mitigating against and reducing carbon emissions—a reflection of a technical framing of climate change as a problem of greenhouse gas levels. The fact that technical fields like engineering and construction are over-represented by men and receive the majority of climate financing further compounds gender gaps in climate action. Indeed, the gendered nature of climate financing is a dangerous one. If accepted uncritically, these gender gaps will serve to further reproduce gaps and hierarchies in the distribution and burden of who acts where, how, why, and to what cost in response to and in anticipation of climate change and its impacts. If we are to truly achieve gender equality and address the climate crisis, data should be regularly gathered to track gender-targeted climate financing and the proportion going toward climate mitigation and climate adaptation efforts, including green learning strategies.

Recommendations

■ **Develop a costing tool for education decisionmakers to determine the financing needed to implement the three approaches to a new green learning agenda.** This will also require researchers to develop more robust models to better understand the relationship between quality, transformative education for climate action, learners' subsequent specific, generic, and transformative capacities, and their collective impact on short- and long-term carbon emissions and systems transformation.[173] Such models and tools could also help to unlock subnational efforts by directing local school district or school county funding toward grade-appropriate adaptation of a new green learning agenda and to teacher professional

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173. Project Drawdown has developed a model that uses women's education levels (measured as years of schooling) and its impact on fertility as a proxy for understanding the relationship between education and carbon emissions (Hawken, 2017). Cordero, Centeno, and Todd (2020) have attempted to examine this relationship by estimating the impact of self-reported changes in sustainability behaviors, like driving less or eating a plant-based diet.

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development and support networks. Focusing on subnational efforts also opens the possibility for local champions to build collective agency to engage in broader systems change from both the bottom-up and top-down.

▪ **Push green financing mechanisms, as well as the OECD DAC, to develop a series of green learning agendas and/or ACE markers to monitor climate financing toward quality, gender-transformative education for climate action.** This series could include one marker to track investments in TVET with gender as a principal or significant target, and another to track whether investments in CCE or ESD in the K-16 system or to civil society organizations has gender as a significant target. Similarly, a gender marker could be developed for each of the six ACE priority areas (education, training, public awareness, public participation, public access to information, and international cooperation for ACE). While it should facilitate the development of a financing architecture that supports international and domestic investments in a new green learning agenda, a key priority is to ensure this funding infuses a focus on the intersections of climate change, gender, and education in both adaptation and mitigation efforts. Such a focus will ensure efforts are attuned to principles of equity, justice, and fairness.

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Conclusion

What is quality education in a time of climate change? The answer stems from how we frame the climate crisis: whether it is a technical problem and/or a sociological problem. Framed as a technical problem, quality education, especially for girls, is one that provides girls and boys with the specific capacities, the "skills for green jobs" to fully participate in green industries and to lead in the innovations required to help support countries to transition to a green economy. But relying solely on the proliferation of STEM skills as green skills misplaces our attention on technological innovations that allow us to sustain our habits under the belief that we can do so without consequence to the environment.[174] Any technical approach to education for climate action must recognize the limitations to transformation and at a bare minimum focus on ensuring such an approach centers gender-transformative outcomes for people and planet.

Framed as a sociological problem, quality education is on the one hand about building the general capacities, the "green life skills," required to adapt more sustainable, pro-environment behaviors; and on the other hand it is about building the individual's and collective's transformative capacities, the "skills for green transformation," to help manifest a world and way of life that values the well-being of girls equally with boys, and of human systems equally with non-human systems. Regardless of how the climate crisis is framed, our solutions to it must be wholeheartedly and unapologetically feminist. There can be no climate justice without gender justice. And achieving gender justice is dependent on whether our societies not only fight to ensure girls and women complete at least 12 years of quality, empowering education, but also on whether they aim for girls and boys to see the human and natural world through a feminist planetary consciousness. Such an awareness that our human challenges are intricately tied to the health of the planet is vital to our collective ability to transform our presently unsustainable socioecological systems.

> **Regardless of how the climate crisis is framed, our solutions to it must be wholeheartedly and unapologetically feminist.**

Climate policy, including the UNFCCC Article 6 and the Paris Agreement Article 12, recognizes the need for broad approaches to education for climate

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174. Selby and Kagawa, 2010; Tikly, 2020.

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empowerment. However, this has translated into education strategies, including the few National Climate Change Learning Strategies that exist today, that focus primarily on building learners' specific capacities for a pre-defined, male-dominated, growth-oriented economic system. What is needed, however, is for climate and education policy to recognize the need to transform our social, economic, and education systems—in particular, to align them toward the goals of justice, fairness, and equity. If transformation is the goal, education strategies must attend to the development of generic and transformative capacities, especially those that can enable a feminist transformation of the underlying systems driving the climate crisis.[175] Striking the initial balance across these three approaches will depend on where national and subnational education systems lie on a continuum of resources and political will.

> If decisionmakers really want to leverage this unprecedented moment of disruption for good, they must begin to see how the road to achieving a 1.5°C world is intertwined with the road to achieving greater gender equality.

This paper introduces for decisionmakers and stakeholders what a "new green learning agenda" might look like for their community—national or subnational. It lays out what education systems should aim for at a bare minimum by way of adapting a gender-transformative approach to a technical solution to education for climate action. It also outlines a more radical approach to seed the systems transformation needed to eliminate gender inequality and to restore balance with the life-giving and life-sustaining resources of the planet. It is clear that we cannot afford to just do things better when the existing system, processes, and practices have created the conditions for our present pandemic and climate crisis. Doing better things may help temporarily address the inequities of our present system. However, if decisionmakers really want to leverage this unprecedented moment of disruption for good, they must begin to see how the road to achieving a 1.5°C world is intertwined with the road to achieving greater gender equality.

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175. Ziervogel, Cowen, and Ziniades, 2016.

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Appendix A:
Green Skills Literature Review Methodology

The literature search process utilized the below list of key search terms, organized in three broad categories (1) Gender & Adolescence, (2) Greening & Sustainability, and (3) Education and Educational Outcomes. Several combinations of these terms across categories were searched via Google Scholar, traditional Google search, and within relevant bibliographic databases such as ERIC and Greenfile. Literature was purposively selected based on its relevance to the guiding research questions, with a particular emphasis on literature situated at the intersections of gender, education, and sustainability.

On an ongoing basis, citation searches were conducted on key texts identified throughout the literature review process. Additionally, as prominent global actors in the green skills landscape were identified, key institutional websites were searched to collect relevant gray and white literature.

Through the literature search process, 297 pieces of literature were collected and stored on Dedoose, a data analysis software. Literature was organized according to broad groupings, reviewed, and descriptively coded. Throughout the review process, codes were analyzed for emerging themes. Additionally, descriptive and analytic memos were utilized to summarize and synthesize literature.

Key terms utilized in literature review:

Gender & Adolescence	Greening & Sustainability	Education & Educational Outcomes
adolescence	action for climate empowerment (UNFCCC)	abilities
adolescent	carbon emissions	action, climate action, collective action
child, children	carbon neutral	activism
ecofeminism	climate	behaviors

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Gender & Adolescence	Greening & Sustainability	Education & Educational Outcomes
feminism	climate adaptation	change, systemic change, systems change
future generations	climate change	citizenship
gender	climate crisis	competencies
gender blind	climate ethics	curriculum
gender equality	climate justice	economy
gender inequality	climate mitigation	education
gender justice	climate-related disasters	education for sustainable development
gender norms	climate sector	empowerment
gender relations	climate strikes, protests	equity
gender sensitive	development	inclusivity
gender transformative	earth	jobs, employment
girl, girls	eco-justice	life skills
intergenerational	environment	mindsets
transnational feminisms	global warming	pedagogies
women, young women	green, greening	policy, policies, policymakers
youth	green sector	politics
	greenhouse gas emissions	programs
	just transition	resilience
	pollution	school
	regeneration	skills
	sustainable development	sustainable development goals
	sustainable, sustainability	teacher training
		technical education, technical skills, TVET
		training
		transformative, transformation
		urban planning
		workforce

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Appendix B:
Interview Stakeholder Group

Stakeholder category	Number of interviews	Organization/countries/regions represented
Multilateral organization	5	UNESCO, UNESCO-UNEVOC, ILO, European Institute for Gender Equality
Government ministry	5	Chile, France, Ghana, Indonesia, Zimbabwe
Nongovernmental organization (international, regional, national)	7	Africa, Brazil, Europe, Sierra Leone, International
Green sector organizations and professional working groups	6	Brazil, Nigeria, United Arab Emirates, International
Higher education	1	Canada

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