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THE WOMEN-WASTE-CLIMATE NEXUS:

Unlocking the potential of women entrepreneurs to tackle the global waste crisis and accelerate the race to net zero

WHITE PAPER

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EXECUTIVE SUMMARY

Challenge: The public, climate actors, and investors have come to recognize the urgent need to cut greenhouse gas emissions and shift to a circular economy to avoid climate catastrophe. But the ubiquitous and insidious role that waste plays in driving the triple planetary crisis – climate change, waste pollution, and biodiversity loss – remains a relatively overlooked area of climate action and investment, especially at the intersection with gender. Waste and resources management – central to reducing emissions, closing loops, and achieving circularity – have been conspicuously neglected in global dialogue, research, and funding around climate in general, and climate and gender, in particular. This points to a lack of awareness among climate and gender actors of the critical link between waste and climate change, as well as women and waste. To meet our ambitious climate goals, the world must address the challenge of waste and resources management in every industry, sector, and segment of society, but succeeding is a long shot without women at the table. Success requires radical collaboration to overcome massive climate finance and innovation gaps, especially in low- and middle-income countries, during a time of global economic decline and in the face of relatively gender-blind climate policies and funding mechanisms.

Opportunity: The crisis demands that we take rapid, efficient, and effective action to accelerate a massively complex transition to a circular economy, globally and locally. Meanwhile, a sizeable and ever-growing body of evidence has established that women deliver innovation and foster inclusion. They are adept at complex, nonlinear problem-solving, and they deliver stronger environmental and financial performance. Harnessing these strengths, women entrepreneurs are also more motivated to make a difference in the world. These are precisely the attributes needed to tackle the global waste emergency and ensure a just transition. To unlock the full potential of women entrepreneurs to drive transformational change in waste and resources management, there is an urgent need to advance learning, unlock and engender climate finance, and co-create entrepreneurial ecosystems with women waste entrepreneurs (WWEs) that fuel their innovation capacity.

Goal: This white paper is a direct response to that need. It is a preliminary step toward catalyzing the radical collaboration required to elevate attention and spark immediate action. The paper is the product of a half-day collaborative learning event, **The Women-Waste-Climate Nexus**, based on a research-action project to advance the role of women in waste management and the circular economy. ImpaXus partnered with the Legatum Center for Development and Entrepreneurship at MIT to host the event and produce this paper with support from Engineering X (a Royal Academy of Engineering and Lloyd's Register Foundation initiative) [1] and the International Development Research Center (IDRC).

Outcomes: Feedback from participants during and after the event affirmed not only the urgent need, but the keen desire to address the women-waste-climate nexus. Ultimately, women waste entrepreneurs were recognized as an untapped but potentially transformational force in the fight against climate change and the transition to a gender-just, net zero future. There was a resounding call to: (1) Continue collaborative learning discussions and include additional stakeholders, notably corporations, informal sector

organizations, and local governments; (2) Link the dialogue to key forums and institutions working in the climate, waste, and gender arenas; and (3) Translate learnings into practical action and partnerships that disrupt the status quo and galvanize immediate attention and action.

KEY TAKEAWAYS

1. **Centering women waste entrepreneurs and innovators is vital in the shift to a circular economy**

- Women entrepreneurs – both in the private and informal sector – have been largely overlooked in the waste sector, resulting in a dearth of data, gender-blind policies, programs, and funding mechanisms.
- Increasing attention to the link between waste and climate change, as well as between gender and climate action, presents an opportunity to amplify awareness and center WWEs in new investments, policies, and initiatives.
- Women informal waste workers need a seat at the table, and WWEs can help pave the way.

2. **Unlocking climate finance – notably adequate, right-sized, risk capital – for WWEs is necessary to drive circular innovation in waste and resources management.**

- The perceived risk associated with investing in climate innovation and the waste sector presents a significant barrier to raising capital for WWEs developing circular waste solutions, above and beyond the persistent gender bias that women entrepreneurs already face in obtaining finance.
- Most investors do not understand the significance of waste and how it relates to the circular economy, nor do they appreciate the advantages of gender smart investing or the realities of unconscious gender bias inherent in the investment ecosystem.
- Despite a dearth of data on WWEs, there is a compelling case for investing in female entrepreneurs at the nexus of climate and waste.

3. **An ecosystem-building approach is needed to bolster WWE-led entrepreneurship, nurture innovation, and overcome the systemic challenges WWEs face.**

- WWEs in emerging economies are operating largely in nascent entrepreneurial ecosystems and in male-dominated sectors.
- Lack of visibility is a key obstacle for WWEs to connect with investors and identify market opportunities.
- WWEs expressed a strong need for longer-term support systems beyond early-stage programs.
- To accelerate successful innovation, WWEs require support with research and development (R&D) to identify new ways to process and add value to waste, and access to existing, affordable technologies to help develop circular value chains.

4. **Radical collaboration is needed to address the scale and complexity of the women-waste-climate challenge with urgency.**

- Waste, gender, finance, and climate actors operate in silos, impeding their understanding and ability to affect the radical, systemic change needed.
- Radical collaboration requires more inclusive, diverse, and disruptive forms of cooperation that challenge the "business as usual" approach and bring all voices to the table.
- Accountability and transparency among climate actors and investors were also stressed as key factors for success.

TOP RECOMMENDATIONS

1. **Actions to unlock access to climate financing for WWEs and innovators:**

- **Strengthen the investment case** with more robust data on WWEs in emerging markets.
- **Raise awareness and educate climate investors and actors** on (1) the multiplier benefits of climate investing in waste with a gender lens; and (2) the importance of integrating waste and circularity in climate investment objectives.
- **Amplify the visibility of WWEs and innovators** from emerging economies, connecting them with climate investors, mentors, and waste sector stakeholders locally and globally.
- **Employ blended finance approaches and public-private-philanthropic partnerships** to unlock catalytic funding and attract new investors.
- **Provide adequate, right-size, risk capital** to meet the varying needs of WWEs at different stages of growth, innovation, and formality.
- **Embed a gender lens in climate investments and tie to zero waste and/or circularity.** Public and private climate funds and financing mechanisms should:
  - **Incorporate clear gender and circularity targets** in investment criteria, procurements, funding requirements, and monitoring and reporting frameworks of climate funds and institutions.
  - **Increase female representation** (beyond a token one or two women) in institutional governance and leadership of climate funds, institutions, and on investment committees.
- **Invest in women fund managers in emerging markets**, supporting them to integrate a gender-waste-climate lens in their investment portfolios.

2. **Actions to nurture women-led entrepreneurship and circular innovation in resources and waste management:**

- **Strengthen the evidence base** on gender, waste, and climate to inform policymaking, programming, and investments. Push to include waste in global gender and climate data collection efforts.
- **Conduct ecosystem mapping** to identify both active and missing stakeholders, existing WWEs, resource and data gaps, and sector-specific market opportunities to reduce waste and improve circularity.
- **Launch strategic, co-designed programs –** including fellowships, prizes, accelerators, and early-stage capital programs – to support WWEs and innovators in emerging economies.
- **Connect innovators with existing technologies** that can be adapted to local contexts and scaled.
- **Provide WWEs with support for R&D** to identify new ways to process and add value to waste and develop new circular value chains.
- **Provide longer-term support** to WWEs past early-stage programs, notably during scale-up.
- **Strengthen WWEs' capacity to employ and integrate women informal sector workers.**
- **Convene diverse (and sometimes antagonistic) stakeholders** to engage directly with WWEs in collaborative learning and to co-design policies and solutions.
- **Elevate the voices and leadership of diverse WWEs** in climate and gender related dialogues, forums, and networks.
- **Support new and existing women's networks** in waste management and circular innovation; connect them across regions and with other waste, gender, and climate actors.
- **Raise public awareness and appreciation** of the waste sector, its connection to climate change, and the invaluable contributions of women in combating the waste crisis.

INTRODUCTION

This white paper serves as a call to action for climate actors – including investors, policymakers, donors, governments, academia, civil society, the private sector, and gender actors – to invest in the advancement of women in the resources and waste management sector as a vital but overlooked pathway to accelerate progress on climate goals. With the aim of moving the issue higher up the global agenda, it presents the case for increased investment in women-led climate innovation and entrepreneurship in the sector, while elucidating the link between the global waste crisis and climate change.

This white paper summarizes the main discussion points that arose from a virtual panel discussion and high-level roundtable on the topic of **The Women-Waste-Climate Nexus: Unlocking the potential of women entrepreneurs to combat the global waste crisis and accelerate the race to net zero.** The event was held on October 19, 2023, and co-hosted by ImpaXus and the Legatum Center for Development and Entrepreneurship at MIT, with the support of Engineering X and IDRC.

The event builds on the author's Engineering X-funded project, which identified the women-waste-climate nexus and, specifically, the role of women waste entrepreneurs and climate innovators in emerging economies, as a neglected but highly opportune area for climate action and investment. The author presented these findings at the beginning of the roundtable to inform subsequent discussions. The event also draws on the Legatum Center's Foundry Fellowship – a first-of-its-kind program for successful entrepreneurs designed to catalyze locally led entrepreneurship and innovation ecosystem building as a transformational force for growth in emerging markets. Finally, the event was inspired by the United Nations High-Level Climate Champions' resounding call for radical collaboration to unlock climate finance, accelerate innovation, and increase the inclusion of women, youth, and indigenous people in climate action. Recognizing the scale of the challenge and the need for immediate and broad cooperation to move the dial on the women-waste-climate nexus, the event was thus conceived as an experiment in radical collaboration.

The event began with a panel discussion with the esteemed Dr. Mahmoud Mohieldin, UN Climate Change High-Level Champion (UNCCHLC) for Conference of Parties (COP) 27 and UN Special Envoy for Financing the 2030 Agenda; Mr. Carlos Silva Filho, President of the International Solid Waste Association (ISWA) and Member of the UN Secretary General's Advisory Board on Zero Waste; Professor Linda Godfrey, Principal Scientist and Manager of Circular Innovation South Africa at the Centre for Scientific and Industrial Research (CSIR); and Delila Khaled, Principal of ImpaXus, Safer End of Engineered Life (SEEL) Champion with Engineering X, and former Foundry Fellow with the Legatum Center at MIT. The panel discussion was moderated by Dina Sherif, Executive Director of the Legatum Center at MIT. Panel discussions were carefully curated to lay the foundation for the high-level roundtable that followed.

The roundtable convened 45 diverse actors across geographies, sectors, disciplines, and institutions, including donors, investors, accelerators, academics, researchers, development practitioners, alongside pioneering women waste entrepreneurs from emerging markets. Among this esteemed group were some of the world's leading female experts in ocean plastic pollution, recycling and waste management, circular innovation, the informal waste sector, and women's economic empowerment and entrepreneurship (see Participants).

Roundtable participants met in smaller, carefully selected groups to enable deeper discussion, maximize participation, and ensure a diversity of perspectives and expertise. At least two women waste entrepreneurs (WWEs) participated in each group. Participants reconvened to share learnings, identify action points, and offer suggestions on areas requiring further attention.

The panel and roundtable discussions were structured around four main themes:

1. **Centering women waste entrepreneurs in the shift to a circular economy:** How can we center WWEs and innovators in climate funding, policies, and initiatives?

2. **Unlocking climate finance for women waste entrepreneurs:** How can we increase access to adequate and appropriate climate financing for WWEs in emerging economies to develop and scale circular innovations?

3. **Learning from entrepreneurship and innovation ecosystem builders:** How can different ecosystem builders support women in emerging economies to take up innovation-driven entrepreneurship in waste and resources management?

4. **Radical Collaboration:** How can we break silos and strengthen collaboration and problem-solving among diverse waste, gender, finance, and climate actors?

The goals of the event were to:

1. **Strengthen the business case** for investing in women entrepreneurs at the nexus of waste management and climate change.

2. Draw down on the diverse expertise of participants to **leapfrog learning gaps and identify both proven and transformational solutions** that could be adapted from other sectors.

3. Create an opportunity for diverse ecosystem actors to engage in direct conversation to **overcome silos, reveal blind spots, and motivate further action** at the intersection of women, waste, and circular innovation.

2 THE WOMEN-WASTE-CLIMATE NEXUS

The need to advance learning, collaboration, and investment at the nexus of women, waste, and climate is urgent. While the waste sector has been largely overlooked in climate dialogue, women - both in the private and informal sectors – have been largely overlooked in the waste sector. Most of the nascent but burgeoning attention around women-led climate action in emerging economies focuses on energy, agriculture, and water. Meanwhile, resource recovery and waste management – the foundations of a circular economy and vital to the mitigation of ocean, land, and air pollution – are often neglected.

Those initiatives that do focus on women in the waste sector tend to concentrate on plastics recycling by informal recyclers and women-owned small- and micro-enterprises; or on women as agents of social and behavior change around recycling and waste segregation at the community and household levels. Though this work is vital, it underestimates women's broader impact potential. It fails to recognize the growth-oriented women entrepreneurs driving circular innovations for local waste problems – including plastics, agricultural, automotive, and electronic waste, to name but a few. Reflecting the broad nature of waste work, women waste entrepreneurs (WWEs) include engineers, educators, executives, scientists, and more. They are innovating across a range of sectors to address both social and environmental needs. WWEs contribute to the development of circular value chains and generate green jobs for other women and the informal sector.

> "Women are choosing to work more on the upper parts of the waste hierarchy, with a tendency towards solutions that reduce, reuse, and repair."
>
> Dr. Linda Godfrey

The landscape in which women waste entrepreneurs operate, however, is daunting. They face an array of systemic and gendered barriers impeding their access to finance, opportunities, and the resources they need to start, scale, and sustain their business (see sections 5 and 6). The dearth of data on the waste sector in general and on WWEs in particular further inhibits effective programming, policymaking, and investments.

Overcoming these complex challenges at the pace and scale necessary to respond to the global waste crisis and accelerate progress on climate goals requires a broad range of climate, gender, and finance actors collaborating across sectors, disciplines, and institutions to affect systems change locally and globally. Their efforts to bolster women's entrepreneurship and innovation capacity must be more intentional, inclusive, broader, and bolder. Ultimately, this requires radical collaboration to build the evidence base, integrate a gender lens framework in climate finance, and nurture inclusive, entrepreneurship- and innovation-driven ecosystems for women waste entrepreneurs.

CONNECTING THE DOTS: HOW WASTE CONTRIBUTES TO CLIMATE CHANGE

Climate change is now the single biggest threat facing humanity. Nearly half the world's population will be at severe risk of climate change impacts by 2030, even in a 1.5-degree world.[2] The triple planetary crisis – climate change, pollution, and biodiversity loss – declared by the UN Environment Program (UNEP) is helping to raise awareness and concern among citizens of the world, with calls for climate action growing louder. Transitioning to a circular economy, improving waste management, and increasing resource recovery could mitigate 21 percent of global greenhouse gas (GHG) emissions.[3] Yet, the connection between climate change, waste, and resources management remains poorly understood by the public, investors, and climate actors – even more so at the intersection with gender.

Chemicals and waste pollution as well as climate change are directly related to waste management and the circular economy. Put simply, the aim of a circular economy is to minimize waste and maximize resource efficiency. To achieve net zero emissions by 2050 and avoid the worst impacts of climate change, we must deal with the daunting impact of waste across every sector, industry, and segment of society. On a global scale, waste generation has increased massively over the past many decades and continues to rise at an alarming rate. By 2050, worldwide municipal solid waste generation is expected to increase by roughly 70 percent to a staggering 3.4 billion metric tons. At present, some 31 percent of this waste is openly dumped, reaching as high as 93 percent in low-income countries.[4] A mere 7.2 percent of materials are reclaimed and cycled back into the global economy after the end of their useful life.[5]

The way in which the world uses physical materials has never been more important, and this is changing the dialogue around waste. Long-term prosperity will be impossible without achieving sustainable economies, including combating climate change and more efficient use of physical resources. Recent years have seen high volatility, high prices, and, in some cases, shortages of key materials. As a result, how to make the most of material resources is now at the center of the agenda from corporate boardrooms to foreign ministries. Bold action in improving waste management would be a major contributor to solving these global problems.

FIGURE 1: EVERYDAY WASTE STREAMS IMPACTING THE TRIPLE PLANETARY CRISIS

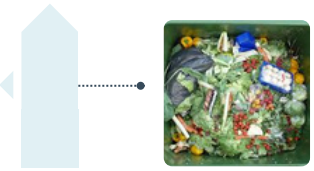
- Mismanaged waste contributes significantly to pollution, biodiversity loss, and climate change, threatening environmental and human health and the livelihoods of millions of people.
- Marginalized and low-income communities and the informal waste sector are the most vulnerable.
- By 2050, 3.4 Bn metric tons of municipal solid waste (MSW) will be generated worldwide.
- Richer countries produce more waste per capita than poorer countries but have better waste management. Globally, 2.7 Bn people lack access to MSW collection services.
- Total waste generated in low-income countries is expected to triple by 2050.

LANDFILLS, OPEN DUMPING AND BURNING

- Waste sector contributes **10% of GHGs**, of which 31% due to open dumping. (Estimates vary widely.)
- Landfills are among the biggest contributors to soil pollution.
- Almost 40% of collected waste ends up in uncontrolled or illegal dumpsites or is openly burned.
- Open burning produces 11% of black carbon aerosols (5,0000x the warming potential of CO2).

FOOD WASTE

- The most common form of waste. Accounts for 50% of global MSW. A leading cause of environmental pollution.
- Food waste in landfills is responsible for **10% of GHGs** where decomposing organic waste generates methane: a key ingredient in ground-level ozone pollution.
- Methane is 25x more potent than CO2 and second-largest contributor to global warming.

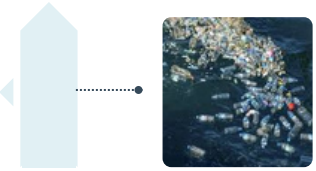


FASHION WASTE

- The fashion industry is responsible for 10% of carbon emissions, 20% of global wastewater, and huge amounts of waste.
- Approximately 60% of material made into clothing is plastic (polyester, acrylic and nylon textiles).
- Our clothing has led to an estimated 1.4 million trillion plastic fibers in the ocean.

PLASTIC WASTE

- New plastics account for **50% of GHGs and 90% of all biodiversity loss and water stress.** Production doubled from 2000-2019.
- Less than 9% is recycled, 19% is incinerated, 50% ends in landfills, 22% is openly dumped or burned. Nearly two-thirds come from plastics with lifetimes of under 5 years.
- An estimated 8-13 million metric tons (MMTs) end up in oceans annually, causing $13 Bn in damage to marine ecosystems and livelihoods.



ELECTRONIC WASTE

- World's fastest growing domestic waste stream, fueled mainly by high consumption rates of electric and electronic equipment, short life cycles, and few options for repair.
- A record 53.6 MMTs generated in 2019, up 21% in five years. Expected to double in the coming decade.
- Only 17.4% collected and recycled in 2019. High-value, recoverable materials dumped or burned conservatively valued at US $57 billion.

Sources: (World Bank, ISWA, OECD, UGA, WEF, GESP)

MAKING THE CASE: WHY WE SHOULD BE INVESTING IN WOMEN WASTE ENTREPRENEURS

A substantive and growing body of evidence has established that gender equality and environmental goals are not only inextricable, but mutually reinforcing.[6] Climate action that recognizes women's knowledge of resource management and their potential to affect long-term change has been found to be more just and more successful.[7] Women are leading climate action at every level of society, and this is no less true when it comes to waste. While the dearth of data on women entrepreneurs in the waste sector is steep, the case for investing in women entrepreneurs is strong. Women bring a unique value proposition desperately needed to accelerate a gender-just transition to a circular economy: They drive innovation, generate greater financial returns, improve environmental outcomes, and foster inclusion. (See Table 1).

TABLE 1: THE CO-BENEFITS OF INVESTING IN WOMEN

AGENTS OF CHANGE	INFORMAL WASTE WARRIORS	ENTREPRENEURS
• In households: women drive consumption decisions; prioritize the welfare of their families and communities in resource-management decisions. [8] • In community: drive social and behavior change around 3Rs, and segregation at source. • In companies: deliver greater returns on equity[9] and lower operating costs. [10] • On boards: gender diversity is associated to lower CO2 emissions. [11] • As investors: 2x as likely to finance women founders, 3x as likely to invest in companies with female CEO. [12] • As policymakers: more likely to pass stricter climate legislation.	• Of 15-20 M informal recyclers globally, more than half are women. • Fill critical municipal service gap in low- and middle-income countries (LMICs) where 2.7 Bn people lack access to waste collection. • Reclaim and recycle waste for raw materials, reducing carbon emissions and waste to landfills. • Divert more than half of plastics to recycling.[13] • Often the last line of defense against ocean plastic pollution in as primary sorters of recyclables. • As microentrepreneurs, create income generating opportunities in their communities (e.g., recycling shops that buy/sell plastics for cash).	• Impact: Driven by motivation to make a difference in the world. [14] • Inclusion: More likely to innovate to address social needs; and to employ more women than male-led firms. [15] • Innovation: Gender diversity drives greater innovation with less risk; women-led businesses in Africa shown to be more innovative and resilient. [16] • Financial performance: startup teams with women founders generate more revenue per dollar invested than those with all-male founders—on average 78 cents vs. 31 cents.[17]

Globally, women are recognized for their central role in affecting social and behavior change and driving decision-making around household consumption and the subsequent waste it produces. Professionally, women are assuming more diverse roles as agents of change when it comes to waste. They are scientists, engineers, entrepreneurs, executives, policymakers, development experts, researchers, and more. What they all have in common is that women approach problem-solving holistically and systematically. Research shows that women are particularly adept in utilizing multiple lenses when analyzing challenges and addressing nonlinear, complex problems with creative solutions.[18] These attributes are notably critical to ushering in the systems change and climate innovation needed to close material loops and shift to a circular economy. As entrepreneurs, women are also more likely to innovate to address social needs,[19] and are driven by the motivation to make a difference in the world, compared with their male counterparts.[20] In other words, they are uniquely poised to deliver the innovative and inclusive solutions their societies need for a just transition to a sustainable, net zero future.

Pioneering research on gender-lens investing in the waste management sector in emerging markets led by Catalyst at Large, Circulate Capital, and Sagana found that, "being gender-smart can unlock growth through innovation, market share, improved traceability, and talent. It can help mitigate risks such as reputation, climate, and lack of supply chain sustainability."[21] When you consider these strengths alongside the fact that women entrepreneurs also generate more revenue per dollar invested,[22] the case for investing in women waste entrepreneurs is undeniably compelling, especially for impact investors. In an economy where every dollar counts and with net zero goals woefully out of reach, women waste entrepreneurs can deliver greater climate gains and prosperity for all.

THE LANDSCAPE: CHALLENGES AND OPPORTUNITIES FOR WOMEN ENTREPRENEURS IN RESOURCES AND WASTE MANAGEMENT

To inform roundtable discussions, participants were presented with a brief overview of the main challenges and opportunities for WWEs, which are summarized in the table below (see Table 2).[23] During subsequent discussions, participants remarked on the complex web of challenges that women waste entrepreneurs face, and the need for broader, more inclusive collaboration and disruptive approaches to overcome these challenges with more urgency and intention.

In the absence of gender-inclusive policies and financing frameworks, as well as ecosystems to nurture innovation and entrepreneurship, women waste entrepreneurs in emerging markets face significant barriers at all stages of their business – from startup, to scaling, and beyond. The need for more data was repeatedly mentioned by entrepreneurs and experts alike, underscoring the chronic lack of gender-informed research and sex-disaggregated data across the waste management sector globally, and in environment-related sectors overall.[24] Participants recognized how this dearth of data impedes investment and detracts from effective gender-informed planning and policymaking, as in the case of climate financiers, which has been repeatedly criticized for being largely gender-blind. Several of the WWE participants affirmed the barriers they face in accessing capital, noting that this challenge is further compounded for women innovators given their lack of visibility as well as investors' risk aversion toward investing in climate innovations and the waste sector.

TABLE 2: THE OPERATING LANDSCAPE FOR WOMEN WASTE ENTREPRENEURS

CHALLENGES	OPPORTUNITIES
• **Systemic and gendered barriers** across legacy male-dominated waste sector, and related sectors and disciplines. • **Dearth of data** on waste sector in general, and women entrepreneurs in particular. • **Investors' unconscious bias** around investing in women entrepreneurs,[25] waste, and climate innovation. • **Weak policy and legal frameworks** for regulating waste and incentivizing circularity. • **Gender-blind climate and waste sector policies.** • **Insufficient climate financing** for LMICs. • **Gender-blind climate financing frameworks** creating massive gender-climate finance gap. • Chronically **underfunded waste sector.** • **Nascent entrepreneurial and innovation-led ecosystem**s to support WWEs. • The waste sector and those who work in it are **not sufficiently recognized or valued.**	• **Growing attention** to climate, zero-waste, gender, and the need for a just transition. • **UN Climate Champions call to action**: finance, inclusion, innovation, nature-positive solutions. • **New national and global policy frameworks** for waste and circularity (e.g., global plastics treaty). • **Informal sector integration** in new circular value chains. • **Clear targets**: potential for 21% GHG mitigation by shifting to a circular economy and improving waste management. • **Strong body of evidence to support investing in women**-led entrepreneurship and innovation. • Emergence of **gender-smart climate finance and a massive opportunity for investment.** • Women waste entrepreneurs actively support a **gender-just transition** for the waste sector.

To succeed, WWEs require access to finance on adequate terms to meet their needs, especially access to the kind of capital needed to de-risk innovation. The outlook on that front remains daunting, however, even by the most optimistic calculations. Though data on gender in climate finance is weak due to insufficient monitoring, reporting and verification,[26] research shows that a paltry 1.5 percent of climate-related overseas development assistance identified gender equality as a primary objective, and two-thirds of projects do not even consider gender in their design, budgeting or implementation.[27] Of this aid, experts estimate that a shocking 0.2 percent reaches women-led and women's organizations.[28] Other sources report that while climate finance flows amounted to more than $600 Bn in 2021, only 1 percent integrated a gender lens – revealing vast opportunity for change and growth.[29] In terms of venture capital, less than 3 percent of global VC funding goes to companies with a female CEO, and in emerging market,[30] and only 7 percent of total funding in emerging markets goes to women-led businesses.[31]

DISCUSSION THEMES

Following are the key takeaways, insights, and recommendations synthesized from the roundtable discussions. Discussions revolved around four key themes designed to address weaknesses in the women-waste-climate nexus and to identify pathways for collaborative action, learning, and investment.

6.1. CENTERING WOMEN WASTE ENTREPRENEURS IN THE SHIFT TO A CIRCULAR ECONOMY

The urgency of the climate crisis demands that we undertake a rapid shift to a circular economy. This requires drawing on indigenous knowledge, spurring local circular innovation, and affecting significant social and behavior change, all while ensuring social inclusion for a just transition. Participants agreed that women are uniquely poised to deliver these solutions and therefore must be at the center of this transformation, globally and locally.

Women – both in the private and informal sector – have been largely overlooked in the waste sector. The need for more robust data on women entrepreneurs in the waste sector was repeatedly mentioned. Several WWE participants also underscored that they lack visibility and called for more opportunities and forums to showcase their impact and network with peers, investors, and other stakeholders. Panelist Carlos Filho, President of the International Solid Waste Association, as well as several WWEs suggested the need for ecosystem mapping to fill data gaps and identify sector-specific obstacles and market opportunities for WWEs, key stakeholders, funding availability, and the presence of WWEs. Such tools would help to motivate and inform programming and investments to support WWEs.

The increasing attention to the link between waste and climate change, as well as between gender and climate action, presents an opportunity to center WWEs in new investments and initiatives. Panelist and UNCCHLC Dr. Mahmoud Mohieldin drew attention to the priority areas from the Sharm El Sheikh Agenda, noting they connect strongly to the gender and waste nexus, namely: agriculture and food; water and nature; coastal areas and oceans; and human settlements. He emphasized the vital need for financing, incentives, research and development (R&D), and affordable technology to support WWEs to innovate, scale, and replicate their businesses. Several WWEs corroborated this statement during the roundtable discussion, highlighting the importance of R&D in identifying new ways to process and add value to waste, and the use of affordable technology to help develop circular value chains that connect urban and rural areas to enable better informal sector integration.

Climate actors (notably development finance institutions, multilateral development banks (MDBs) and funds, and donors) **need to integrate gender in institutional policies and financing frameworks, and improve transparency and reporting on gender impacts.**

Participants suggested integrating gender requirements in terms of reference and funding targets. The need for standardization and the operationalization of gender mandates was also stressed. Tools like gender auditing of finance flows and climate change programs are vital, but only possible if there is a common understanding of what constitutes truly gender-responsive climate action. Likewise, strong gender indicators should be a prerequisite in the allocation of climate funding and finance and can be modeled on existing development cooperation guidelines. Finally, given the multiplier effects associated with investing in women, social impacts should be a central part of results monitoring frameworks to help build a stronger evidence base to unlock further investments in the women-waste-climate nexus.

Joyce Kamande is the co-founder and COO of Safi Organics in Kenya. Safi works with **3500+ women smallholder farmers** with the aim of improving sustainable agriculture, reducing waste, and decentralizing fertilizer value chains to revive rural livelihoods.

Safi uses **cutting-edge hardware technology** and recipes developed and tested at the Massachusetts Institute of Technology (MIT) to produce **high-yielding organic fertilizer from agricultural waste.** It's main product, biochar, offers both **carbon sequestration and soil enrichment.**

To date, Safi's impact includes: 30% increase in yields and 50% increase in income for farmers; 12,000+ famers impacted; 60,000 tons of waste recycled; 7,000+ acres of farmland rejuvenated; 511 jobs created (including 50+ rural youths employed); and $500,000+ income generated.

In recognition of her impact, Joyce has been selected as a UN Climate Champion Project Pioneer, MIT Foundry Fellow, Mandela Washington Fellow, and a Net Zero Hero.

Women informal waste workers need a seat at the table, and WWEs can help pave the way. Several panelists stressed that as we push for the advancement of WWEs in climate dialogue, investments, and interventions, we must ensure that women in the informal sector have a voice in such efforts, recognizing that their needs and motivations for working in the sector are different (namely, to sustain livelihood as opposed to growing a business or protecting the environment). WWEs employing women in the informal sector noted their desire and struggle to deliver better benefits (social, health, etc.) to support these workers, especially during startup years. As we formalize circular economy value chains, this will create more opportunities for WWEs to integrate the informal sector and help drive a gender-just transition. (See text box.) This will generate employment for the most marginalized while saving cities money and improving the environment; but doing so effectively requires the direct participation of the informal sector to inform policies and decision-making.

To strengthen the impact investment case for WWEs and provide them with support in this regard, it would be helpful to **build the evidence base around WWEs employing women in the informal sector** and the benefits this conveys to the latter versus working either independently or for male-owned enterprises.

6.2. UNLOCKING CLIMATE FINANCE FOR WOMEN WASTE ENTREPRENEURS

Despite the dearth of data on the women waste entrepreneurs, participants agreed that that investing in WWEs at the nexus of climate and waste will deliver inclusive innovations needed to drive a just transition to a circular economy in emerging markets. Yet, among the biggest challenges facing WWEs is access to markets, especially in male-dominated sectors, and access to finance, especially adequate capital to de-risk innovation.

The perceived risk associated with investing in climate innovation presents a significant barrier to raising capital for WWEs developing circular waste solutions, above and beyond the persistent gender bias that women entrepreneurs already face in accessing finance globally.[33] Investors in the group noted that, **compared with other investments competing for venture capital, climate investing is not as attractive given the very long-term returns** (10 to 20 years). Plastic pollution was given as an example by one participant, who said investors are increasingly interested in what will have the greatest impact in one to five years.

Participants agreed that blended finance mechanisms offer an optimal and proven solution for addressing actual and perceived risks associated with climate innovation and gender lens investing. Donors, philanthropies, and other public entities should play a key role providing catalytic capital (including concessional loans and first loss guarantees) alongside commercial capital from DFIs, MDBs, and multilateral climate funds. The public-private-philanthropic partnerships are essential to stimulate high-impact private sector investments in WWE-led innovation in emerging and developing economies. This approach can help mitigate investment risks and address behavioral constraints while serving the varying objectives of different types of investors. This is especially important to unlock first-time financing for WWEs developing circular waste innovations, given the additional stigma associated with the waste sector.

To ensure financing reaches WWEs, participants cautioned that actors must be intentional about including gender requirements, targets, and metrics in climate investment mechanisms. Collaboration with gender experts was encouraged to ensure the operationalization and monitoring of such efforts. Participants again emphasized the importance of recognizing the differing systemic barriers and needs of WWEs in the formal and informal sectors. Whereas the former may need support with raising capital and connecting with like-minded venture capital funds, the latter may need support to access microfinance loans or simply to open a bank account. The need for right-sizing finance was also raised in this context as well as the need for better incentives for smaller volume investments to drive a more inclusive agenda.

These discussions revealed a significant need for greater investor awareness and education around gender lens climate investing. Most investors do not understand the significance of waste and how it relates to the circular economy, nor do they appreciate the advantages of gender smart investing or the realities of gender bias inherent in the investment ecosystem.

Participants discussed the multiplier effects of investing with both a gender and climate lens, which yields positive impact across all Sustainable Development Goals (SDGs), thus presenting an attractive case for donors and impact investors.

Male participants **raised the interesting question of a possible perverse effect of promoting gender lens investing among mainstream male investors who perceive the question of investability to be gender blind.** This further underscores the need to educate climate actors and investors on the realities of gender bias and the advantages of gender lens investing for greater climate outcomes and financial returns. Strong collaboration among gender and climate actors and investors is required to overcome these silos, share knowledge, and collectively expand the evidence base needed to unlock gender smart climate finance. While the challenge of overcoming gender bias will take time, the need for investment in WWEs is urgent.

To accelerate progress, participants agreed that we need more women on investment committees and in the leadership and governance structures of climate funds, institutions, and venture capital funds. This recommendation builds on clear evidence that women investors have the power to unlock capital flows for women-led startups, and to ensure more women's representation on corporate boards, driving companies toward a more inclusive and sustainable future (see section 4 and table 1). The European Investment Bank reports that, "women investors … are increasingly important, because they have a stronger preference than men for investments that emphasize environmental, social and governance factors. By supporting women as investors, fund managers, and entrepreneurs, we will have a much better chance of accelerating climate solutions."[34] To ensure more funding gets to WWEs faster, climate actors should invest in women fund managers and gender-smart VCs, while supporting climate VCs to adopt a gender-smart lens.

6.3. LEARNING FROM ENTREPRENEURSHIP AND INNOVATION ECOSYSTEM BUILDERS

Driving ecosystem change at nexus of women, waste, and climate will require strategic interventions to address the areas of weakness previously discussed (see figure 2). These interventions include programs such as: accelerators and incubators; talent programs and diaspora networks; prizes and competitions; and early-stage capital programs.[35] Many, if not all, the pioneering WWE participants at the event have benefitted from such programs but stressed that they should be adapted to incorporate a gender lens and to address the specific needs of WWEs in emerging markets. Existing programs are primarily donor-led and focus almost entirely on women in the informal sector, missing the massive co-benefits of investing in women entrepreneurs operating inclusive and/or innovative enterprises higher up the waste value chain.

Figure 2: Why we need an ecosystem-building approach

- **A complex problem** that is systemic, multi-sectoral, social/cultural, and long-term.
- **Siloed approaches** won't work. Systems thinking and broad collaboration are needed to mobilize all stakeholders toward shared goals.
- **Systemic change** is required for a gender-just transition that creates opportunity and leverages the full potential of all members of society.
- **Innovation is critical,** but nurturing innovation capacity is expensive, takes time, and requires cooperation among many ecosystem actors.

(Adapted from Budden and Murray, MIT)

WWEs in emerging economies are operating largely in nascent entrepreneurial ecosystems and male-dominated sectors. As such, they lack the support needed to navigate the various systemic and gendered barriers to starting and scaling their businesses, not to mention the specialized assistance needed to test and scale innovations. Participants stressed that success requires ecosystem builders to factor this reality into future interventions. They cautioned that entrepreneurship and venture building models that work in the West are not always as effective elsewhere – especially given that those models have failed to overcome the gender investment gap. They called on ecosystem builders to engage in direct consultation with WWEs to gauge their differing needs dependent on factors such as stage of growth, local context, and the pursuit of innovation.

WWEs repeatedly noted the need for longer-term support systems to nurture growth, and to test and scale their innovations. Several entrepreneurs mentioned the need to for "safety nets" to allow them to sustainably innovate, take risks, and even fail. They called on ecosystem actors to fund the development of women-led networks and peer-to-peer mentoring circles in emerging markets to support women entrepreneurs through the "valley of loneliness" – that is, following their initial success and/or completion of early-stage entrepreneurship programs, when they are left alone to navigate the most challenging years of scaling their businesses. Peer-to-peer networks are invaluable because the encourage women to set higher aspirations for their businesses, plan for growth, and embrace innovation.[36]

WWEs cited their lack of visibility as a key obstacle to connecting with investors and identifying market opportunities. Beyond mentoring and early-stage capital programs, WWEs commented on the difficulty of finding like-minded investors and even their lack of desire to pursue investors based on prior negative experiences and lack of success. This was deemed an important area of intervention for ecosystem actors, particularly international agencies, accelerators and incubators, and academia, to step up support. One entrepreneur reminded participants that once they are discovered, successful female entrepreneurs in emerging markets are often over-trained but underfunded.

Ecosystems builders emphasized the importance of accelerating innovation by enabling WWEs in emerging markets to leverage and adapt technologies that have succeeded in developed countries. Linda Godfrey noted that a lot of existing technology in the West can be adapted and applied in emerging markets; however, entrepreneurs are not always aware of these advancements. Dina Sherif shared examples of highly successful entrepreneurs in Africa and Asia who employed this approach – adapting proven technologies to their local context – and were able to scale rapidly. The challenge put forth to the group was how ecosystem builders can embrace and implement the idea of matching existing technology with WWEs that have the capacity to adapt and scale it. Dynamic platforms for matchmaking and cross-fertilizing innovations are needed, including support in addressing intellectual property. Importantly, Dr. Godfrey stressed that this type of technology exchange also offers entrepreneurs an opportunity to learn from the mistakes of others, citing the example of thermal waste-to-energy (a widely use treatment method in

the West, which can reduce the volume of waste and generate energy but can also have negative environmental impacts). She encouraged WWEs to identify alternative approaches to circularity in emerging markets, noting that regions such as Africa have followed a different development pathway that is more circular and less resource intensive.

6.4. RADICAL COLLABORATION

Partnerships were recognized as a pivotal force in advancing climate action. The UN Climate Change High-Level Champions have been calling for radical collaboration among non-state actors to achieve the pace and scale of climate action and innovation necessary to avert a 1.5-degree scenario and achieve net zero emissions by 2050. To unlock WWEs' full potential to help tackle the global waste crisis and achieve this goal, nothing short of radical collaboration is required.

Waste, gender, finance, and climate actors must break silos and strengthen collaboration and problem-solving to address the scale and complexity of the problem and affect systemic change. Participants discussed the immediate need for new forms of institutional and cross-sectoral collaboration spanning the public, private, and informal sectors, including more public-private-philanthropic partnerships to unlock catalytic funding and investments (see section 6.2). Participants emphasized that these partnerships must be deliberate in connecting local actors to regional and global actors to share learnings, leapfrog innovations, and ensure that WWEs remain at the center of such efforts.

Radical collaboration requires more inclusive, diverse, and disruptive forms of cooperation that challenge the business-as-usual approach and bring all voices to the table. Participants stressed that radical collaboration must extend beyond the "usual suspects" and cooperation frameworks. Importantly, participants cautioned that this includes stakeholders who may not feel comfortable or want to cooperate. One example that was shared included brands, corporations, and other big polluters that disproportionately contribute to the waste crisis. Another example was local governments together with the informal sector, noting their typically antagonistic relationship.

The need for new, more inclusive forums that enable direct and more frequent engagement between diverse (and sometimes antagonistic) stakeholders and women waste entrepreneurs (formal and informal) was also suggested. This was seen as an important means for enabling WWEs to inform policy- and decision-making processes locally and globally, such as the forthcoming global plastics treaty.

Accountability and transparency among climate actors and investors were also stressed as key factors for success. This requires broad collaboration to standardize monitoring and reporting frameworks to track financial disclosures and funding allocations against gender and waste reduction and/or circularity targets and criterion. Participants indicated that this was particularly important in relation to large private sector waste polluters, such as the plastics industry and extractives industry, as well as multilateral climate funds and institutions.

Dr. Laila Iskander stressed an immediate urgency in addressing this issue as economies and corporations are quickly shifting toward new value chains, such as EV batteries, that have serious social and environmental implications in the transition toward circularity. She noted the possible need to disrupt this shift to ensure a gender-just transition inclusive of women, the informal sector, and indigenous people who are noticeably invisible though highly active in this domain. Relatedly, other participants stressed that women are missing not only from the discourse on this issue, but from decision-making processes and positions as well.

Finally, noting the daunting scale, complexity, and urgency of the issue once again, one participant suggested **the need for influential, high-profile storytellers to educate the public and incentivize more rapid global climate action**, including via mainstream media and film. Such forms of communication are important to build empathy and galvanize support for the sector by enhancing the public's appreciation and respect for the contributions of both women entrepreneurs and informal waste workers.

CONCLUSION: TOWARD A ROADMAP FOR ECOSYSTEM BUILDERS

As we begin to grasp the ubiquitous and insidious role that waste plays in driving the triple planetary crisis – climate change, waste pollution, and biodiversity loss – the public, climate actors, and investors are recognizing the urgent need to shift to a circular economy. This presents enormous incentive and opportunity for transformational change and innovation at the nexus of women, waste, and climate change. Drawing on the various discussions and supporting research, following is a brief list of recommendations and suggested next steps for ecosystem actors to support the advancement of WWEs in emerging markets.

Actions to unlock access to climate financing for WWEs and innovators:

- **Strengthen the investment case** with more robust data on WWEs in emerging markets.
- **Raise awareness and educate climate investors and actors** on (1) the multiplier benefits of climate investing in waste with a gender lens; and (2) the importance of integrating waste and circularity in climate investment objectives.
- **Amplify the visibility of WWEs and innovators** from emerging economies, connecting them with climate investors, mentors, and waste sector stakeholders locally and globally.
- **Employ blended finance approaches and public-private-philanthropic partnerships** to unlock catalytic funding and attract new investors.
- **Provide adequate, right-size, risk capital** to meet the varying needs of WWEs at different stages of growth, innovation, and formality.
- **Embed a gender lens in climate investments and tie to zero waste and/or circularity.** Public and private climate funds and financing mechanisms should:
  - **Incorporate clear gender and circularity targets** in investment criteria, procurements, funding requirements, and monitoring and reporting frameworks of climate funds and institutions.
  - **Increase female representation** (beyond a token one or two women) in institutional governance and leadership of climate funds, institutions, and on investment committees.
- **Invest in women fund managers in emerging markets**, supporting them to integrate a gender-waste-climate lens in their investment portfolios.

Actions to nurture women-led entrepreneurship and circular innovation in resources and waste management:

- **Strengthen the evidence base** on gender, waste, and climate to inform policymaking, programming, and investments. Push to include waste in global gender and climate data collection efforts.
- **Conduct ecosystem mapping** to identify both active and missing stakeholders, existing WWEs, resource and data gaps, and sector-specific market opportunities to reduce waste and improve circularity.
- **Launch strategic, co-designed programs –** including fellowships, prizes, accelerators, and early-stage capital programs – to support WWEs and innovators in emerging economies.
- **Connect innovators with existing technologies** that can be adapted to local contexts and scaled.
- **Provide WWEs with support for R&D** to identify new ways to process and add value to waste and develop new circular value chains.
- **Provide longer-term support** to WWEs past early-stage programs, notably during scale-up.
- **Strengthen WWEs' capacity to employ and integrate women informal sector workers.**
- **Convene diverse (and sometimes antagonistic) stakeholders** to engage directly with WWEs in collaborative learning and to co-design policies and solutions.
- **Elevate the voices and leadership of diverse WWEs** in climate and gender related dialogues, forums, and networks.
- **Support new and existing women's networks** in waste management and circular innovation; connect them across regions and with other waste, gender, and climate actors.
- **Raise public awareness and appreciation** of the waste sector, its connection to climate change, and the invaluable contributions of women in combating the waste crisis.

The Women-Waste-Climate Nexus event sparked strong interest among both the public panel and roundtable participants. There was a resounding call to continue discussions engaging a broader array of stakeholders (notably corporations, informal sector organizations, and local governments); link the dialogue to key forums and institutions working in the climate, waste, and gender arenas; and translate learnings into collaborative practical action that disrupts the status quo and galvanizes immediate attention and action. Feedback from participants during and after the event affirmed not only the urgent need but the keen desire to advance learning, unlock gender-smart climate finance, and continue to pursue radical collaboration in support of women waste entrepreneurs. Ultimately, women waste entrepreneurs were recognized as an untapped but potentially transformational force in the fight against climate change and the transition to a gender-just, net zero future.

PARTICIPANTS

PANEL

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ENDNOTES

1 Engineering X works to bring together some of the world's leading problem-solvers to address the great sustainability challenges of our age. Through its Champions programs, Engineering X convenes and supports organizations and individuals to take action and advocate for change. The Safer End of Engineered Life (SEEL) Champions program has been running since 2019 and works to prevent harm to humans and the environment caused by unsafe decommissioning and disposal practices of engineered products and structures. Read more about Engineering X here: engineeringx.raeng.org.uk/.

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