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Initial Assessment of Gender Considerations in Plastics Policy

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Introduction and Background

Globally, the generation of plastic products and subsequent mismanagement of plastic waste in the environment has proliferated since the 1940s. Approximately two-thirds of all plastic ever produced is still in the environment in some form today (Azoulay et al. 2019). Without meaningful and systemic improvements in the design, use, and disposal of plastics, production and waste generation is expected to triple by 2060 (OECD 2022).

Pollution from across the plastics life cycle has resulted in a myriad of global ecological, social, and economic consequences (Worm et al. 2017). An increasing body of evidence demonstrates that the effect of plastic across socioecological systems is not equitable or proportionate across populations (Karasik et al. 2023a; Landrigan et al. 2023). In particular, women¹ are found to be disproportionately burdened and impacted by the harmful effects of plastic across the life cycle of products. These burdens vary across cultural, socioeconomic, and political contexts, and based on how women engage with plastic, but broadly include health and safety impacts, access to opportunities in the waste sector, and exposures to harmful plastic-associated chemicals.

There are thousands of harmful chemicals associated with the plastic life cycle; negative health effects linked with exposure to these chemicals are well-documented (Landrigan et al. 2023; Lynn et al. 2017; Raubenheimer and Urho 2022; Wiesinger et al. 2021). The effects of these chemicals are not the same across sex. For example, phthalates—a group of chemicals used to make plastics softer and more durable (CDC 2021) that

¹ We define women as people who menstruate and can get pregnant, and/or people who are assigned female at birth and have been socialized as females, and/or female-identified people. Plastic and policies to address plastic will have varied social and biological impacts on women. This definition was prepared with support with Duke's Center for Sexual and Gender Diversity.

are often found in medical equipment, toys, food packaging film, cosmetics, and personal care products—have been shown to act as endocrine disruptors (Liao et al. 2018), which can result in a wide array of health issues (Landrigan et al. 2023; Lynn et al. 2017). For women, phthalate exposure during pregnancy has been shown to result in recurrent pregnancy loss (Liao et al. 2018), and prenatal phthalate exposure via the pregnant person can result in increased autism risk, poor motor skills, aggression, and changes in brain development in the child (Landrigan et al. 2023). Women’s bodies may bioaccumulate some harmful plastic-associated chemicals such as benzotriazoles at higher rates than men because these chemicals are lipophilic, or fat-loving, and women have a higher proportion of body fat than other sexes (Lynn et al. 2017). Women are also disproportionately exposed to harmful plastic additives found in common household items. For example, because of the high amount of phthalates in cosmetics and personal care products, higher levels of phthalates are found in women as compared to men (Liao et al. 2018).

In addition to health, safety for women in the waste sector is an important consideration. A survey of women waste pickers in four countries in Asia, for example, indicates that because of the nature of their work, they often work in poorly maintained areas of cities such as alleyways where exposure to gender-based violence and other crime is high (Krishnan and Backer 2019).

Distribution of labor and job opportunities in the waste sector often differs for women and men. In many countries, participation by women in the informal waste sector, particularly as waste pickers, is very high. This is as opposed to men, who typically work in more formalized waste sector jobs—such as scrap dealers or recycling collectors—that may provide greater access to higher-value recyclables, economic benefits, security, and worker protections (Krishnan and Backer 2019). The informal waste sector inherently has minimal benefits and worker protections (World Bank et al. 2019), leaving women in these informal roles relatively unprotected and insecure. However, surveys indicate that in some cases women prefer such informal roles because they allow flexibility, independence, and opportunities to work with their children present, since childcare is often unavailable (Krishnan and Backer 2019).

Women often work in segments of the waste management sector that expose them to harmful chemical substances found in plastics at higher rates. Informal waste pickers are known to be a group with one of the highest health risks associated with emissions of hazardous substances released through the burning of plastic waste and recycling of e-waste. Women face additional exposure to toxic substances released from incineration of household waste that contains plastics, as women in many locations are responsible for disposing of household trash (Landrigan et al. 2023; Krishnan and Backer 2019).

Thus, it is clear there are notable differentiated social and economic impacts of plastic on women, which we refer to as *gender-differentiated impact* in this brief. It is important to consider that these impacts are complex, context-specific, and interconnected, while remembering that gendered impacts can also intersect with other forms of marginalization (Arnould and Quiroz 2023). For example, while women predominate the waste worker economy in some countries, in others women can be discouraged from working in the informal waste sector, which both disproportionately exposes men to toxic chemicals and bars women from access to a source of

income. Given these disparate implications, policy responses seeking to address the multifaceted harms of plastic should account for and alleviate the differentiated effects of plastic on women.

While governments at all levels are increasingly designing and passing new policies in an effort to mitigate plastic pollution and its harms (Diana et al. 2022; Karasik et al. 2020), it is unclear the extent to which known gender-differentiated impacts are considered during all stages of the public policy life cycle: formation, adoption, implementation, evaluation, and adaptation.

Based on a literature review, scan of policy documents, and expert interview process, we find emerging evidence that: (1) women may be negatively affected by plastics policy implementation, and (2) women are largely excluded from plastics policy design, implementation, and evaluation. We provide additional examples of inclusion of women in environmental policies related to waste management, climate, and fisheries to provide insights into how gender differentiations might be incorporated into plastics policy looking forward. Lastly, we offer recommendations to inform how to better and more explicitly incorporate gender into policy design.

METHODS

Using noncomprehensive literature review methods, we searched the scientific and grey literature for papers that clarified the intersection of gender and plastics policy. Based on iterative testing and recommendations from gender studies and environmental policy research librarians at Duke University, we developed and iteratively tested Boolean search strings in the following databases: Web of Science, PAIS Index, Proquest Theses & Dissertations Global, and Google Scholar.

The search string found to provide the most relevant results for Web of Science, PAIS Index, and Proquest Theses & Dissertations Global was:

(Microplastic OR Microfiber OR Plastic NOT Surge* NOT elast*) AND (Policy OR Govern OR Institution OR Law OR Regulat* OR Legal OR Intervention) AND (“gender equity” OR “gender mainstreaming” OR feminist OR ecofeminist OR women OR gender) AND (environment)

The search string found to provide the most relevant results used for Google Scholar was:

(Microplastic OR Microfiber OR Plastic) AND (Policy OR Govern OR Institution OR Law OR Regulat* OR Legal OR Intervention) AND (“gender equity” OR “gender mainstreaming” OR feminist OR ecofeminist OR women OR gender) AND (environment)

Because of the limited number of results for each search string, we chose not to limit the search to any date range. Titles and abstracts were screened to determine relevance and included if they covered (1) differentiated impacts of plastic on gender, (2) differentiated impacts of plastics policy on gender, or (3) policy recommendations to better account for differentiated impacts on gender. We also included literature broadly focused on waste management, as there is a strong evidence base documenting risks and harms experienced by informal waste workers in this sector, even if the literature does not explicitly mention plastics. Documents were excluded if the abstract did not indicate a discussion of plastics policy and gender. Papers that were selected for further

screening were read in their entirety and relevant information outlining evidence of policy considerations of gender or gender-differentiated impacts of policy and recommendations for researchers and policymakers were extracted.

Next, a review of coded documents from the Plastics Policy Inventory determined which policies incorporated gender in their design. The Plastics Policy Inventory is a publicly available, searchable, and regularly updated database of close to 900 policy documents on the international, national, and subnational levels (Karasik et al. 2023b). The design of a subset of this database—policies that are written or translated in English—have been characterized using the qualitative coding analysis software Nvivo. This subset of policies are read and coded for policy design elements, including plastic types and life cycle stages targeted as well as instruments used. Using the word search function in Nvivo, all of the coded text of every policy was searched for the terms “women,” “woman,” and “gender.” This yielded nine policy documents, which were subsequently qualitatively characterized.

Because the aforementioned methodology returned relatively few ($n = 16$) relevant papers and policies, the research team also conducted a nonexhaustive review to find fisheries and climate policies that included consideration of gender in their design. This was done to determine how other environmental policies employ gender-inclusive policy mechanisms. Fisheries policy documents were found in the World Trade Organization’s (WTO’s) Database on gender provisions in Regional Trade Agreements, where the term “fisher*” was searched (WTO 2022). Climate policy documents were found in the Climate Change Laws of the World database; the terms “women” “woman” and “gender” were searched in the search box of those databases (LSE 2023). From these searches, a small number of policy returns were scanned for inclusion and subsequently qualitatively characterized.

To ground truth findings from the literature and policy documents, we identified and conducted semistructured interviews with 11 experts and stakeholders with knowledge and experience in the intersection of gender and plastics policy, solid waste management, the informal waste sector, and UN Sustainable Development Goals. Experts and stakeholders were identified through project advisors and in the literature. Any published literature they recommended was also read and included in our literature review.

The semistructured interviews used the following template:

- (1) Have you observed evidence of consideration of gender in the development of plastic policy?
- (2) Have you observed any gender-differentiated impacts of plastic policy?
- (3) Do you have any recommendations for researchers or policymakers on how to better incorporate gender into plastic policies?
- (4) If gender-differentiated impacts of plastic policy is something that is on policymakers’ minds, but is not being incorporated into policy, what are the barriers?

- (5) Our research seeks to identify plastics policies that consider gender differentiations in their design or have been evaluated for gender-differentiated impacts and we aren't finding much. We're curious if there is more information about waste management policy, or even environmental policies more broadly, that are known to take these impacts into consideration or have been evaluated to see if they address gender differentiations.

RESULTS

There is relatively little evidence to suggest gender has been considered in the design of plastics policy. The analysis found few policies and studies that explicitly mention either gender considerations in plastics policymaking or gender-differentiated impacts of plastics policy. Interviews confirmed there is limited scholarship on this topic. Ultimately, 16 secondary literature documents and 9 policy documents focusing on plastics policy and gender were assessed.

Evidence of Gender-Differentiated Impacts of Plastics Policy is Emerging

Although gender appears to rarely be considered in the plastics policymaking process, there are (likely unanticipated) gender-differentiated impacts of plastics policies upon their implementation. For example, Mexico City's 2021 ban on single-use plastics characterized as nonessential resulted in disparate social impacts on low-income women. While single-use plastic bans are generally seen as useful measures to reduce plastic waste, tampon applicators were listed among the single-use plastics deemed nonessential. The ban resulted in a shortage of tampons in areas subject to its enforcement, and the price of already costly alternative menstrual products increased (Sprague 2021, Griffin and Karasik 2022).

The gendered division of labor within many households places the burden to comply with waste reduction initiatives on heads of households, who are most often women (Johnson et al. 2021). Policies such as bans or fees may require consumers to transition away from plastic materials by finding and traveling to stores to purchase products made from or packaged in alternative materials, carrying refillable containers to and from specific stores, and returning reusable containers in specific drop-off locations to participate in reuse programs (de Wilde and Parry 2022; personal communication with authors). This is additional and often unnoticed labor that falls disproportionately on heads of households. Additionally, the transition to low- and zero-waste lifestyles requires paying for new items and subscription services, which can exclude socioeconomically disadvantaged women from participation.

There is also evidence of policymaking that could be designed to address gender-differentiated impacts, but has not been. One study found that recycling and waste management, downstream actions that traditionally employ women in the Yucatán region in Mexico, are frequently excluded from economic development programs. The study found that, despite evidence of the region experiencing increasing plastic litter on private property and in protected wetlands and marine areas, the majority of funded economic development programs in the area were awarded to sustainable fishing and ecotourism, which are industries dominated by men (Hanson 2016).

Economic development funding programs could be more intentionally designed such that they empower multiple industries and genders, as waste management funding may also provide benefits for both the tourism and fishing industries. Another study assessing Canada's Chemicals Management Plan notes that the plan fails to acknowledge gender-differentiated impacts of chemical exposure from plastics, particularly among low-income women (Scott and Lewis 2015). Interviewees emphasized that women's groups and interests are not consulted during policy design, which likely limits appropriate consideration of gender impacts.

Global Environmental Policymaking

One interviewee noted that gender has occasionally been on the agenda in global environmental policymaking fora, such as the United Nations Environment Programme, which oversees the global plastics treaty negotiation process. Gender inclusion in these fora has taken the form of formalized stakeholder groups representing women's interests or hosting gender-focused side events during negotiations, Conference of the Parties, or other convenings. Such provisions, while capable of influencing policy decisions, do not yet guarantee development or implementation of gender-focused provisions.

Example Considerations of Gender in Plastics Policy

The review of the literature was unable to find any studies providing evidence that gender-differentiated impacts were explicitly considered in the design of plastics policies. Beyond the published literature reviewed, a search of coded policy documents from the Plastics Policy Inventory yielded nine policy documents that include considerations of gender in their actionable provisions. These provisions do not include oversight of the risks associated with either exposure to plastics and additives or participation in the informal waste worker economy. They do, however, focus on the inclusion of women in economic development opportunities associated with solutions to the plastics crisis or the exclusion of socially vulnerable women from having to comply with bag policies. These provisions are described as follows.

Global Examples of Policy Instruments

Ocean Plastics Charter, G7 (2018)

Under this international agreement, leaders from Canada, France, Germany, Italy, the United Kingdom, and the European Union committed to “move toward a more resource-efficient and sustainable approach to the management of plastic.” The countries outlined several actions that may be taken to move toward resource-efficient life cycle management of plastics, including a focus on sustainable lifestyles and education. Under this initiative, one aim is to “promot[e] the leadership role of women and youth as promoters of sustainable consumption and production practices” (G7 2018).

Regulations Regarding Extended Producer Responsibility, South Africa (2020)

These regulations shift the burden of responsibility for managing plastic onto producers, through management of end-of-life products and implementation of circular economy initiatives. The policy document contemplates gender in both its definitions and policy actions. For example, *decent work* is defined to mean, among other considerations, that there is “equality of opportunity and treatment for all women and men.” Further, under the implementation of extended producer responsibility measures, producers of certain products or classes of products must “prioritise

the promotion of small businesses and entrepreneurs with a special focus on women, youth and persons living with disabilities” and “implement transformation within all levels of the value chain with a special focus on women, youth and persons living with disabilities” (Forestry, Fisheries and the Environment 2020a).

National Waste Management Strategy, South Africa (2020)

The National Waste Management Strategy (NWMS) 2020 “outlines a strategic approach to reduce littering and illegal dumping, and to reducing the production of single-use plastics such as food wrappers, disposable cups, and straws.” NWMS 2020 considers gender in several aspects of the policy, including “supporting women ... in the circular economy” and “addressing the skills gap within the sector with a special focus on women.” Notably, gender is addressed in several performance indicators of key interventions. For example, one key intervention under the waste minimization pillar is to “prevent waste generation through cleaner production, industrial symbiosis and extended producer responsibility.” One corresponding performance indicator is to “increase the training and technical support provided by NCPC-SA² with a special focus on women, youth and people living with disabilities.” Another intervention is to “increase technical capacity and innovation for the beneficiation of waste.” Performance indicators in this intervention look to the “number of waste management graduates prioritising women, youth and people living with disabilities.” Notably, the policy document establishes a target goal of having 120 new graduates and 20 waste management professionals in the public sector, prioritizing women, youth and people with disabilities. Performance indicators for other interventions include number of grants provided or new jobs created with priority for women, youth and persons living with disabilities (Forestry, Fisheries and the Environment 2020b).

National Marine Litter Policy and Action Plan (NMLPAP) 2021–2030, Malaysia (2021)

The overarching purpose of the NMLPAP is to “highlight priority areas and actions to address marine litter pollution in Malaysia” which will “be implemented through 17 identified actions and 103 key activities, under five priority pillars.” Under the fifth pillar, “Adopt Whole-Of-Nation and Multi-Stakeholders Approach in Harmonising Cross-Cutting Objectives,” one action plan is “considering women’s role in advocating more sustainable consumer behaviour.” Several of the national actions under this pillar address gender-differentiated impacts, including:

- *“Encourag[ing] involvement of the women entrepreneurs and SMEs³ in supporting the usage of green packaging/recyclable products or practicing green business by providing non-financial incentives and recognitions*
- *“Collect[ing] gender-disaggregated data to identify women/men role, needs and challenges faced along the plastic value chain*
- *“Integrat[ing] gender indicators and targets into projects and monitoring and evaluation plans*
- *“Design[ing] and promot[ing] policies, action plans and interventions that invest in solutions for women and girls to create a level playing field*

² National Cleaner Production Centre of South Africa

³ Small and medium enterprises

- *“Build[ing] women’s capacity to participate equitably and meaningfully in decision-making, interventions, consultations and awareness raising campaigns as agents of change*
- *“Institutionalis[ing] multi-stakeholder cross-ministerial dialogues involving women’s organisations*
- *“Creat[ing] visibility for women’s needs, interests and contributions, raise awareness of gender importance, build capacities to strengthen accountability mechanisms”* (Ministry of Environment and Water, Malaysia 2021).

Ordinance for Plastics in Muntinlupa, Philippines (2011)

The rules and regulations under this ordinance prohibit the use of plastic bags on dry goods, the selling of plastic bags, and the use of Styrofoam. The policy document includes a provision to develop a program for the implementation of livelihood projects in which receptacles that might normally be made out of plastic are made out of alternative materials and then sold and distributed. These livelihood projects are required to be designed such that they help women in Muntinlupa earn additional income (Alabang Bulletin 2011).

US-Based Examples of Policy Instruments with Exemptions for Women

In the following four policies, policymakers implemented various plastic bag policies but opted to provide exemptions for customers who use the federal assistance program Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). WIC vouchers are provided to “low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children who are found to be at nutritional risk” (USDA 2022). The policies appear to recognize the negative consequences of placing additional economic burdens on already vulnerable women.

Plastic Bag Reduction Ordinance in San Francisco, CA (2007)

Under this ordinance in San Francisco, stores are limited to providing recyclable paper bags, compostable plastic bags, and/or reusable bags. The store must charge the customer at least \$0.10 for every recyclable paper bag, reusable bag, or compostable plastic bag provided to a customer. However, an exemption exists for customers who pay in part or in whole through WIC (San Francisco Environment Department 2007).

Act Relating to Checkout Bags in Oregon (2019)

The Oregon state legislature passed a law prohibiting retail establishments from providing “single-use checkout bags to customers.” Retail establishments can provide recycled paper, reusable fabric, or reusable plastic checkout bags to customers, but must charge at least \$0.05 for each bag provided. However, people who use a voucher under the WIC program can be provided a recycled paper or reusable plastic checkout bag at no cost (Oregon Legislative Assembly 2019).

Carryout Bags Policy in Washington (2021)

In Washington state, the legislature banned retail establishment from providing customers with single-use plastic carryout bags. Until December 31, 2025, retail establishments are required to collect \$0.08 for every compliant paper carryout bag or reusable carryout bag provided to

customers. Beginning in 2026, the charge will increase to \$0.12. However, retail establishments are prohibited from collecting a bag charge from any person using a voucher or electronic benefits card under WIC (Washington State Legislature 2019).

Disposable Plastic Bag Tax in Virginia (2021)

Similar to the other plastic bag tax policies, Virginia has allowed municipalities to implement a bag tax (\$0.05) for each disposable plastic bag provided to a customer in grocery, convenience, or drugstores. The revenue from this tax not only goes toward environmental cleanup and mitigating pollution and litter but is also used to provide reusable bags to WIC recipients (Code of Virginia 2020).

Examples from Policies to Address Other Global Environmental Problems

Our analysis determined there is a lack of evidence available to characterize how gender-differentiated impacts are included in design or evaluation of plastics policy. We conducted a review of secondary literature and several policy documents addressing waste management, fisheries, and climate that, to some extent, consider gender. From this review, we were able to identify additional policy mechanisms with gender considerations in design or implications in implementation that may be useful examples for policy responses to plastic. Based on this limited sample, we find that climate policy may provide useful example solutions to address global environmental problems that incorporate gender-differentiated impacts and may serve as a template for replication in plastics policymaking.

Examples Consideration of Gender in General Waste Management Policy Solid Liquid Resource Management Model in Ambikapur, India

Through this management model piloted in 2014, women waste workers received technical and soft-skills training regarding safe collection, sorting, and disposal of waste. The training then encouraged women to self-organize into groups that worked together to collect, recover, and process of high-value waste from Solid Liquid Resource Management Centres. When measured in 2020, the program employed 447 women and resulted in 100% cost recovery via user fees, sales of recyclables, and a tax, proving that the program was sustainable. In addition, the dumping ground from which waste workers collected waste was converted into a park (Dey 2021).

Brazilian National Solid Waste Policy

In 2010, Brazil's National Solid Waste Policy formalized the informal waste sector, recognizing the value of the more than 280,000 waste pickers in the country (Dias 2011). The policy itself does not explicitly mention gender; however, a significant portion of waste pickers in Brazil (and elsewhere) are women. Recognition of waste pickers in this policy ensured their inclusion in extended producer responsibility programs and municipal waste management plans. This inclusion improved waste picker access to higher-value recyclables, allowing them to have higher revenue yields for collected waste. Formalizing the informal sector as Brazil did guarantees waste pickers income for collection services and also provides investments to waste picker cooperatives to support training and improved infrastructure (e.g., vehicles). Average income for waste pickers subsequently increased in places where the policy implementation was measured (Ribeiro 2016).

Waste Management Policies in Ireland and the UK

Buckingham et al. (2005) found significant efforts toward gender mainstreaming in municipal waste management policy in Ireland. These efforts, which are largely incorporated into evaluation criteria for funded waste management projects put forth by the Irish National Development Plan Unit, require (1) incorporating gender equality in criteria for funding projects, (2) creating effectiveness measures that can be disaggregated by gender when possible, (3) including gender equality in evaluations of programs, and (4) placing a “balance” of women and men and representative of all stakeholder groups on the plan’s monitoring committee.

Example Considerations of Gender in Fisheries Policy

A number of regional trade agreements on fisheries have included, with some slight modifications, the following language on cooperation with and participation of women and other minoritized groups:

“Encouraging participation of marginal groups in the fishing industry, for example, through the promotion of gender equality in fisheries by developing the capacity of women engaged in fisheries, as well as other disadvantaged groups with the potential to engage in fisheries for sustainable social economic development” (United Kingdom 2019).

These agreements, found in the WTO’s database on gender provisions in Regional Trade Agreements (WTO 2022), are listed as follows:

- *Agreement establishing an Economic Partnership Agreement between the Eastern and Southern Africa States and the United Kingdom of Great Britain and Northern Ireland*
- *Economic Partnership Agreement between the East African Community Partner States, of the one part, and the European Union and its Member States of the other part*
- *Economic Partnership Agreement between the Eastern and Southern Africa states, on the one part, and the European Community and its Member States, on the other part*
- *Economic Partnership Agreement between the United Kingdom of Great Britain and Northern Ireland, of the one part, and the Republic of Kenya, a Member of the East African Community, of the other part*

These policies demonstrate broad commitment to considering gender in policy design, but fall short of outlining provisions to achieve gender equity goals or metrics to measure impact.

Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries

Developed by countries through the United Nations Food and Agriculture Organization, this international policy complements the Code of Conduct for Responsible Fisheries to focus on the small-scale fisheries subsector with the objective of sustaining healthy fisheries, ensuring food security, and eradicating poverty. The guidelines emphasize that gender should be an integral part of all small-scale fisheries development strategies and include a section on recognizing and achieving gender equality via leveraging existing global and national obligations toward human rights, ensuring equal participation in decision-making and within fisheries organizations. The section on gender inequality also recommend member states establish policies to address gender

inequality, including measures against discrimination. Beyond the chapter on gender equality, the guidelines recommend the production of gender-disaggregated data, continued research into work conditions, the development of gender-sensitive interventions, the use of gender-sensitive indicators for measurement and monitoring, and the dissemination of gender responsive educational materials (FAO 2015).

Example Considerations of Gender in Climate Policy

The Climate Change Laws of the World database yields 73 policy results when the term “gender” is searched (LSE 2023). Many of these results are gender and climate policies (e.g., strategies or action plans) developed by countries in the Global South. A review of three of these policies demonstrates that they are comprehensive and often include actions, objectives, and indicators for gender consideration and inclusion in policymaking, implementation, and evaluation. They may serve as a useful template for plastics policy development moving forward.

Climate Change Gender Action Plan of the Republic of Zambia

This plan seeks to ensure that women can have equal access to and participate in climate change initiatives (often called *gender mainstreaming*). The plan organizes its action plans into the following sectors: sustainable agriculture and food security, health, forests, water security, infrastructure, energy and energy efficiency, and tourism). It outlines objectives for gender mainstreaming, actions to achieve those objectives, indicators to measure those objectives, implementing partners, and cost (IUCN 2018).

This plan offers a myriad of actions, including increasing availability of land to women farmers; improving training for women farmers; increasing knowledge of intersection between climate, health, and gender; improving access to health services; forming technical stakeholder consultation working groups that include women; identifying sustainable livelihood alternatives for women; promoting and training women to be leaders via awareness-raising; and more.

The plan also includes actions that specifically target plastic, including promoting climate-resilient and gender-responsive green construction principles (e.g., using plastic waste in house construction) and launching awareness campaigns on waste management and recycling to ensure women understand their benefits.

Bangladesh Climate Change and Gender Action Plan (2013)

The Bangladesh Climate Change and Gender Action plan aims to ensure gender equality in strategies, policies, and interventions related to climate change. The plan includes action plans with measurable indicators of gender inclusion in the following sectors: food security, social protection, and health; comprehensive disaster management; infrastructure; mitigation; and low carbon development (MoEF 2013). Actions outlined in the plan include ensuring women’s participation in the review of energy policies, introducing gender budgeting across government agencies to ensure fairer allocation of financial resources, ensuring women’s participation in vulnerability assessments, and monitoring policy implementation using gender-disaggregated data.

Gender and Climate Change Action Plan: Cambodia (2014–2018)

This action plan organizes actions into the following four priority areas:

- (1) *“Strengthening institutional capacity and cross-sectoral coordination with a focus on women’s role in climate change mitigation and adaptation.”*
- (2) *“Improving capacity, knowledge and awareness on women’s role in climate change adaptation and mitigation.”*
- (3) *“Reducing vulnerabilities to climate change impacts of disadvantaged women and other groups.”*
- (4) *“Reducing GHGs by introducing climate friendly, low carbon economic activities for women”* (Ministry of Women’s Affairs 2014).

The plan also includes strategies to address each priority area and systems to score the effectiveness, cobenefits, and feasibility of each strategy. New actions outlined in the plan include developing training programs on gender and climate change for agency staff, implementing gender-based climate adaptation and mitigation projects, and building gender-based climate responses in climate change plans.

DISCUSSION AND RECOMMENDATIONS FOR RESEARCHERS AND POLICYMAKERS

From the literature review and interviews, recommendations for how policymakers and other stakeholders can incorporate gender-differentiated impacts in policy development, including the upcoming legally binding instrument on plastic pollution, are offered. Recommendations suggest that the path toward tangible consideration of gender-differentiated impacts associated with plastic and plastics policies requires, at a minimum, ensuring the inclusion of women in policymaking, waste management industries, and research and development. The reviewed literature emphasizes that only when power structures are reexamined and corrected for will there be meaningful changes to the ways humanity designs plastics, manages waste, and informs the public about the products they consume.

Policy Measures that Incorporate Gender Considerations

There is growing support for expanding the scope of plastics policy to include provisions regarding the use of chemical additives. Policy recommendations include a phase-out of hazardous substances that risk health and fetal development and a phase-in of safer alternatives could be mandated through product bans or standards. As the use of extended producer responsibility expands across the world, the recognition or formalization of the informal waste sector will be paramount. Without formal recognition, waste pickers may increasingly lose access to higher-value recyclables and other items and be excluded from generating the anticipated economic benefits of extended producer responsibility.

In addition to regulatory instruments, secondary literature and interviews highlighted how information instruments can be used to increase public understanding of the varied gender-

differentiated impacts of plastic and additives across the entire value chain. Educational programming should be designed to increase public understanding of harmful exposures from air pollutants and chemical additives (Ricke et al. 2022; Scott and Lewis 2015) and the disproportionate burden and risk for the informal waste sector. Education interventions can likewise be designed to shift attitudes toward waste workers, who rank low on social hierarchies and are stigmatized across society (Krishnan and Backer 2019). Additional informational instruments include regulations that require products containing harmful chemicals, including phthalates and bisphenol A, to be properly labeled on products and phasing out of chemical additives that pose risks to human health and development (Lynn et al. 2017).

Ultimately, interviewees emphasized that the first step may be for policymakers themselves to understand and acknowledge the gendered impacts of plastic to incentivize solutions that aim to address gendered power imbalances at the same time as issues related to plastic. This can be achieved, in part, by ensuring women are able to meaningfully participate in organizations that interface with the policymaking process. For example, designating a specific person with expertise in the topic of gender and plastic to be involved in and ensure consideration of gender-differentiated impacts in the policymaking process. Historically, the power dynamics of governance structures and institutions of power have limited the tools and resources women were afforded to participate. Reevaluating these structures and making organizational changes can help ensure gender differentiations are brought to the fore.

Research and Development Needs

Given the lack of epidemiological data that causally links exposure from plastic pollutants to disease outcomes in women, interviewees and literature highlighted the importance of investing in and conducting comprehensive research to better understand the effect of micro- and nanoplastics, chemical additives, air pollution, and other exposures to plastic on women, including pregnant women and fetuses (Ragusa et al. 2021). Interviewees also recommended that research awards should be equitably distributed to alleviate historic underfunding of marginalized groups and topics. In this case, efforts to increase knowledge on the gender-differentiated impacts of plastics and plastics policy should ensure more resources are available to researchers who have been harmed by the status quo in research.

Furthermore, gender can be incorporated into monitoring and evaluation of policy design. Collecting gender-disaggregated data, for example, can allow researchers to better understand the distributional equity of policy implementation across genders. Gender-specific metrics, as identified by stakeholders and interest groups who represent women's interests, should also be included in monitoring plans.

Capacity-Building Needs

Ensuring equal opportunity and equity in waste management was frequently noted as an important mechanism to ensure access to financial resources associated with plastics industries. This includes parity within leadership roles across the entire waste sector. Achieving equal and equitable workspaces requires not only a gender balance among roles, but also that the design of work environments and infrastructure, for example waste equipment, enables accessibility for all

(Buckingham et al. 2021). In contexts where women's participation in the waste sector is limited by their domestic responsibilities, the provision of health care, childcare, and education can enable all genders to participate (Krishnan and Backer 2019).

One tangible step toward achieving gender parity in these environments is by conducting assessments to understand current perspectives and awareness of gender issues and what skills women need to develop and build capacity. In this assessment, both men and women should be included in the process to understand how different genders conceptualize gender issues and are affected in various cultural contexts. These assessments are sometimes known as *gender mapping*.

Broader economic development and financing programs that fund infrastructure or technical assistance projects and programs should be designed to ensure that they are financing plastic and waste management programs that empower and employ women specifically. Likewise, training on gender-differentiated impacts of both plastics and plastics policies should be developed and conducted across many sectors, including the informal waste sector and various government agencies overseeing the development of both gender and environmental policy.

CONCLUSION

Based on this initial assessment, scholars and practitioners agree that the current lack of knowledge and recognition regarding gender-differentiated impacts of plastic across the life cycle is a barrier to effective policymaking, implementation, and evaluation. Incorporating gender into the policy life cycle is not straightforward or simple and will vary significantly across cultures and contexts. However, recognizing and addressing gender-differentiated impacts along the plastic value chain and in the policymaking and implementation process is an important step toward achieving equitable outcomes (United Nations Environment Programme, Coordinating Body on the Seas of East Asia 2019).

The limited evidence suggests few plastics policies consider gender, and those considerations are primarily focused on incorporating women in the waste management sector and alleviating the burden of low-income women from complying with plastic bag fees. However, the risks associated with chemical exposure across the plastics life cycle are not yet considered in policy design. Moreover, policies that place the burden of responsibility related to disposal of plastic waste on the individual can be expected to continue to disproportionately burden women responsible for domestic upkeep.

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