



COOLING FOR ALL AND GENDER

Towards Inclusive, Sustainable
Cooling Solutions

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ABSTRACT

Like access to electricity or clean cooking, access to sustainable cooling is an energy service that is essential for achieving Sustainable Development Goal 7 (SDG7) in areas that experience high temperatures. Over 1 billion people in 54 high-impact countries remain at high risk from a lack of access to cooling services that support health and livelihoods and a further 2.2 billion are at risk to have inefficient cooling. By providing protection from a heatwave, refrigeration for nutritious food, or a cold chain for a COVID-19 vaccine, access to cooling is an issue of equity that can support the delivery of the entire SDG 2030 agenda.

Just as women and girls face challenges gaining access to education, healthcare and formal employment, their ability to access and benefit from the range of services that cooling provides is also limited. A lack of access to electricity and cooling appliances can impact women differently than men and can exacerbate existing gender inequalities.

This knowledge brief is the first such analysis of the gender-based impacts of a lack of access to cooling. It examines the gender-related challenges that should be considered, analysed and addressed to ensure cooling interventions and finance acknowledge gender-differentiated impacts and adapt to maximize equitable access. This brief offers a series of recommended steps to address these challenges while pursuing universal sustainable cooling and gender equality. Governments, development finance institutions and non-governmental organizations should raise awareness regarding the gender-based impacts of a lack of access to cooling, bolster policies for protections, drive research to understand gender disparities and increase investments to gender-transformative solutions that also deliver sustainable cooling.

KEY RECOMMENDATIONS

Gender considerations should be accounted for in policies and programmes that support increasing access to cooling and investment in sustainable cooling solutions. The following are key recommendations to consider as first steps to reduce gender-differentiated vulnerabilities associated with lack of access to cooling:

1 Evidence: to better understand gender differences and impacts

- Conduct research and sex-disaggregated collection of data to support tracking access to cooling.
- Establish gender-differentiated measurement and evaluation of policies and initiatives.

2 Policies: supporting workplace safety, community heat planning and personal comfort

- Implement building codes and product standards and labels that support gender equality in achieving access to cooling.
- Implement heat action plans that support gender equality in achieving access to cooling in urban heat islands and extreme heat events.
- Expand enforceable workplace protections, particularly for women-led occupations and sectors employing vulnerable populations, such as migrant workers.
- Address gender equality and access to cooling in multilateral development programming.
- Champion employment gender equality to enable opportunities for women to be part of the solution and lead cooling progress locally.

3 Investment: to finance gender-transformative solutions

- Invest in solutions that remedy disparities considering gender impacts and vulnerabilities.
- Finance women-driven solutions, products and business models.
- Invest in vaccine distribution and medical services, increase outreach to vulnerable populations, and utilize non-medical venues to serve patients with access constraints.

4 Communications: supporting attention and awareness raising

- Use [#ThisIsCool](#) to share information on sustainable cooling solutions.
- Support education of heat adaptability and communicate information to prevent impacts of extreme heat.



INTRODUCTION

As governments across the globe respond to the COVID-19 pandemic, economic and social vulnerability are shown again and again to have cascading and compounding impacts during global crises. Delivering on Sustainable Development Goal 7 (SDG7) – affordable, reliable, sustainable and modern energy for all by 2030 – will be crucial to the recovery, with access to energy being a proven enabler for jobs, poverty alleviation and economic growth. In the face of a warming climate, access to sustainable cooling has emerged as a service necessary to realize SDG7. By providing protection from a heatwave, refrigeration for nutritious food, or a cold chain for a COVID-19 vaccine, access to cooling is an issue of equity that can support the delivery of the SDG 2030 agenda. While knowledge and data on access to cooling continue to expand, there has yet to be an analysis of gender-based impacts of the risks and benefits of access to cooling. This first-of-its-kind research attempts to define the challenges facing equitable cooling access and identify opportunities to address gender inequalities in the provision of cooling services.

Sustainable Energy for All's (SEforALL) *Chilling Prospects* report series tracks trends in vulnerabilities due to a lack of access to cooling and highlights climate-friendly measures to achieve equity in this sector. As of 2020, over 1 billion people in 54 high-impact countries remain at high risk from a lack of access to cooling services.¹ This includes 318 million people living in poor rural areas and 699 million living in poor urban areas who are unlikely to have quality housing, live in neighbourhoods that invest in passive cooling solutions, own cooling appliances, and often suffer from unreliable power sources for those appliances. A further 2.2 billion lower-middle income people are at risk of having inefficient cooling, meaning their limited purchase choices lead them to high energy-consuming devices. The *Chilling Prospects* research has

been important for our understanding of global cooling needs and current, deployable innovations but has largely excluded an interpretation of gender-focused impacts to access gaps.

SDG5 calls for achieving gender equality and empowering all women and girls. Just as women and girls face challenges gaining access to education, healthcare and formal employment, their ability to access and benefit from the range of services that cooling provides is complicated by gender norms. Common examples include gendered levels of deprivation within poor households, limited access to formal finance and the types of household responsibilities assigned to women. The COVID-19 pandemic has disproportionately impacted women with unprecedented setbacks in employment gains, increases in domestic violence and dramatic upticks in unpaid labour and care work within the household (United Nations 2020). In this exceptional moment, we have an opportunity and an obligation to rectify long-standing disparities in energy and cooling access gaps for vulnerable communities and those left behind.

This pioneering knowledge brief examines the many gender-related challenges that should be considered, analysed, and addressed to ensure truly equitable and sustainable cooling for all. This knowledge brief also offers a series of next steps to meet these challenges while pursuing universal sustainable cooling and closing gender gaps. In each setting, decision-makers are encouraged to raise individual awareness regarding access to cooling, bolster policies and plans for protections, drive research to understand gender disparities, and increase investments in equitable solutions. Technological, policy and economic plans to bridging the access to cooling gap should consider gender as a component to any solution to avoid perpetuating disparities.

¹ The 54 countries that face the largest challenges to cooling access. High-impact countries include Algeria, Angola, Argentina, Bangladesh, Benin, Bolivia, Brazil, Burkina Faso, Cambodia, Cameroon, Chad, China, Congo, Cote d'Ivoire, Djibouti, Dominican Republic, Egypt, Eritrea, Eswatini, The Gambia, Ghana, Guinea, Guinea-Bissau, India, Indonesia, Iran, Iraq, Lao PDR, Liberia, Malawi, Mali, Mauritania, Morocco, Mozambique, Myanmar, Namibia, Niger, Nigeria, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Senegal, Somalia, South Sudan, Sri Lanka, Sudan, Thailand, Timor-Leste, Togo, Uganda, Vietnam and Yemen.



CHALLENGE 1

Health and Wellbeing

Physical response to heat

The human body's physical response to excessive heat is well-documented in scientific literature. The gendered impacts of heat stress are noted in a number of studies, pointing to women's slower thermal recovery time after experiencing heat-related illness, including heat rash, exhaustion or stroke (Alele et al. 2020) (Iyoho, Ng, and MacFadden 2017). Other experiments indicate that physical differences in body size and physical makeup, rather than biological sex, can be drivers of varied responses to heat illness (Kenney 1985). Certain categories of people, regardless of gender, are also more at risk for heat-related health impacts, including young children and the elderly. While biological sex is not always a determinant of risk, there are specific lived experiences where gender contributes to greater vulnerability due to heat stress.

This includes pregnant women, who have lower abilities to tolerate heat stress during pregnancy. Higher core temperatures associated with pregnancy increase vulnerability to heat exhaustion during heatwaves and extreme temperatures, and as such can also increase the risk of harm to the fetus (Jacklitsch et al. 2016). According to the International Labour Organization (ILO), future climate change impacts will have disproportionate bearing on the productivity of working women who are pregnant (International Labour Office 2019), with excess heat creating economic stability risks that are specific only to pregnant women. Heat stress has also been associated with temporary infertility, with effects more pronounced in men (Canadian Centre for Occupational Health and Safety 2021).

The gendered nature of women's household responsibilities or cultural norms put women at elevated risk for heat stress during widespread, community-level extreme heat events. In an analysis of the 2010 Ahmedabad heatwave, the result of gender-based structures around daily tasks and access to resources were found to have caused women to suffer disproportionately in poorer settings (Azhar 2017). Poorer women living in

In the 2010 Ahmedabad heatwave, women were found to die more often than men (Azhar et al. 2014). So while biological sex is not a determinant of risk for heat stress, lived experience can exacerbate gender-based risk.

slum communities often prepare meals on outdoor fires and lack access to toilets or fans at home. Women working as manual labourers in Ahmedabad were more likely to wear heat-trapping clothing or work in unventilated facilities. In the Natural Resources Defense Council's (NRDC) *Rising Temperatures, Deadly Threat*, the authors point to these circumstances primarily impacting poor women as compounding their vulnerability to heat strain and exhaustion during this event (Raval 2015).

The daily lives of women in many communities are structured around norms and practices that further perpetuate barriers to cooling services, such as workplaces that lack toilet facilities. Women may avoid drinking water throughout the day to keep from needing a restroom, leading to dehydration and further exacerbating the impacts of heat stress (Azhar 2017).

Healthcare and nutrition

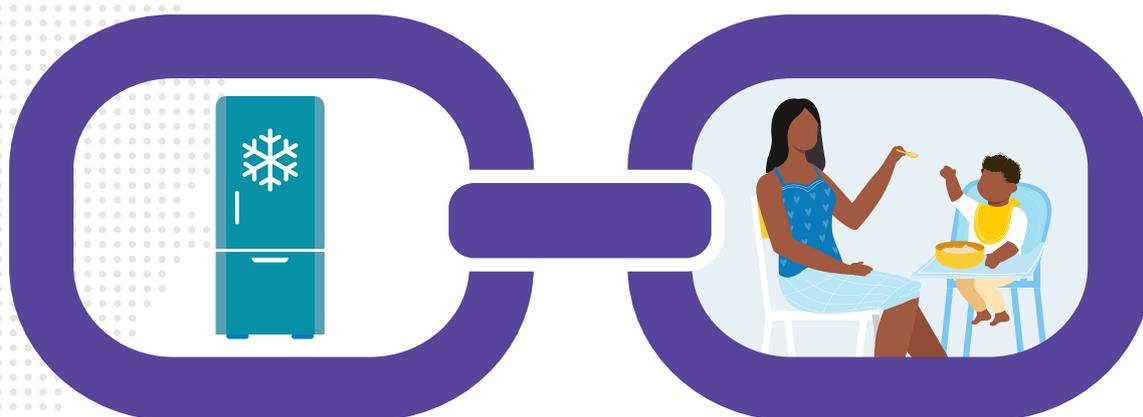
Women face extensive barriers to accessing healthcare and nutritious diets, two needs that rely on cooling. Women, especially in resource-constrained regions, are already at a disadvantage when it comes to accessing reliable healthcare and nutritious diets for themselves and their children. They face additional hurdles in settings and regions where women have limited decision-making power within households, experience lower literacy rates, are restricted in their mobility, or experience discrimination from healthcare providers (World Health Organization 2021).

In rural areas of some countries, many health facilities do not have the reliable electricity necessary to power cooling solutions that reduce heat-related risks to women during pregnancy. For example, in Ghana only 27 percent of health facilities have stable access to electricity and Uganda only has 29 percent access in health centres (Franco et al. 2017) (SEforALL 2020). This can create complications and risks for childbearing women during deliveries or emergency procedures, as well as other postnatal care. Heatwaves exacerbate these risks as they have been shown to increase neonatal stress and mortality. The presence of active cooling solutions powered by reliable electricity can mitigate these risks, but even simple solutions, such as relocating a maternity ward to a lower floor with less indoor heat exposure, can decrease health burdens (Kakkad et al. 2014).

Health centres in poor, rural communities may also lack reliable medical cold chains, meaning vaccines are simply not available or are at high risk for spoilage along the transportation route (Sustainable Energy for All 2020). Women manage a multitude of barriers in accessing vaccines for themselves and their children (Hilber et al. 2010). For diseases that affect a majority of women, such as cervical cancer due to human papillomavirus (HPV), the availability of vaccines and treatments rely on adequate cooling systems. Nearly 90 percent of deaths

due to cervical cancer take place in low- and middle-income countries, and Africa alone reports over 81,000 female cervical cancer deaths each year (World Health Organization 2020) (Bruni et al. 2019). Rwanda has been highlighted for its successfully implemented HPV vaccine programmes that reached thousands of women (Cousins and Mosaic 2019). Nonetheless, the HPV vaccine cannot be frozen and requires cold storage between 2-8°C, rarely available in rural areas (Vanderpool, Stradtman, and Brandt 2019). Increasing cooling infrastructure could bolster this first and most effective intervention against a highly preventable disease affecting women and girls.

The India National Cooling Action Plan, arguably the most comprehensive national cooling strategy developed, does not address gender directly in terms of data, supporting programmes or expected outcomes. However, the strategy does examine the gender-based impact of cold chains for vaccine management, noting that India's Universal Immunization Programme caters to 30 million pregnant women every year and that a cold chain is critical to realizing the national goal of reaching 90 percent full immunization between 2019 and 2024. As COVID-19 has dramatically highlighted, healthcare systems require adequate cooling systems for immediate vaccine distribution and resiliency for future pandemics.



For a group of mothers surveyed in Benin, ownership of a refrigerator was linked to safer food preparation and better nutrition during a critical childhood growing stage.

Women's access to safe and nutritious food, as targeted in SDG2, has an important bearing on their own food security and that of their families (Agarwal 2011). Their power within a household and control over resources are directly related to children's nutrition and weight, though paths vary across regions (Smith et al. 2003). For a group of mothers surveyed in Benin, ownership of a refrigerator was linked to safer food preparation and better nutrition during a critical childhood growing stage (Nagahori et al. 2018). In addition, access to energy-based technologies

– such as low-cost and efficient domestic appliances like a refrigerator or sustainable storage for perishable goods – enhances women's labour productivity and increases the time available for engaging in productive activities outside the household (UNIDO and UN Women 2019). Access to improved energy services such as cooling solutions can alter women's social, economic and political status – reducing the time and effort involved in household activities often linked with food systems (Lambrou and Piana 2006).



Recommendations to improve health and wellbeing through access to sustainable cooling

- Establish gender-responsive education and communication efforts to prevent impacts of extreme heat at local, municipal and national levels.
- Collect and measure data on sex-disaggregated access to cooling at local and national levels.
- Prioritize urban and rural poor for COVID-19 and other vaccine distribution, using non-medical venues to mitigate traditional constraints to healthcare access.
- Invest in and equip women with access to refrigeration technology and services to improve household nutrition and health.

Photo: Asian Development Bank





CHALLENGE 2

Poverty and Household Dynamics

Poverty dramatically exacerbates the risks of heat stress and lack of access to cooling services for men and women. As documented in *Chilling Prospects*, the rural poor (318 million people) and urban poor (699 million people) in 54 countries are at high risk due to lack of access to cooling (SEforALL 2020). Women are more likely than men to live in poverty, particularly in South Asia and Sub-Saharan Africa, and can often experience a deeper level of deprivation within households and communities. (Sánchez-Páramo and Muñoz-Boudet 2018). Women's experiences with poverty, particularly in the forms of informal employment and the unfair burden of unpaid labour within the household, have resounding implications for their ability to access cooling services.

Rural-urban divide

The impacts of rural poverty and climate change are not gender-neutral and make it harder for women to access life-changing cooling services in the form of home shading and ventilation, household appliances, medical services, and climate-mitigating agricultural practices. A decline in rainfall, for example, can force women responsible for many household chores to expend additional time and energy retrieving water, increasing their exposure to heat stress in high temperature environments (Mourdoukoutas 2016). Less than 15 percent of landowners are women, meaning women have unequal access to inputs such as new irrigation technologies or power over a critical source of household income (FAO 2018) (Salcedo-La Viña 2020). A lack of ownership, credit and access to financing means women often have a unique set of roadblocks to adapt and access solutions.

In urban settings, those living in poverty often reside in crowded housing with poor insulation and frequently use second-hand or old equipment with poor energy efficiency while others are unable to afford a fan. They may own or have access to a refrigerator, but intermittent electricity supply may mean that food spoils, running the risk of food poisoning and reduced nutrition (SEforALL 2020). Households often have to pay for electricity and gas with pre-payment

The rural poor and urban poor in 54 countries are at high risk due to lack of access to cooling

318 million people in poor, rural settings

699 million in poor, urban settings

systems, which can be charged on a higher unit cost basis than households with monthly billing systems. Due to the income gap between men and women, and the demographic fact that women live longer, it is estimated that women are disproportionately affected by energy poverty (Clancy et al. 2017) and, by extension, access to cooling as an energy service.

In urban areas with a concentration of buildings, roads and infrastructure absorbing heat from the sun, communities can experience higher temperatures of up to 1-5°C during the day (United States Environmental Protection Agency 2020). These urban heat islands are created by a reduction of vegetation within cities, increased heat absorption in pavement and roofing materials, and a concentration of human activity and energy use in a compact area (United States Environmental Protection Agency 2020). During warmer months, heat islands drive higher energy use for cooling and exacerbate levels of air pollution such as ozone. People living in heat islands are at higher risk of health impacts ranging from discomfort and exhaustion to heat stroke or death. Vulnerable populations, including elderly people, children, pregnant women or those with illness, have increased physiological risks to heat stress. In other cases, particular communities in cities, such as seasonal migrants and those experiencing poverty or homelessness, face additional barriers to mitigating the impacts of extreme heat. The WHO predicted a potential doubling of annual deaths from heatwaves in urban areas resulting from a 2°C rise in global temperature (World

Health Organization 2005). With increasing urbanization in many regions, the impacts of heatwaves in cities will continue to impact the health, safety and incomes of major population centres.

A study of women's mobility in India indicated that women utilize public transportation more than their male counterparts (Shah et al. 2017). These numbers jump significantly when examining lower-income populations. On longer commutes or in crowded public vehicles, women could benefit from increased attention to transit cooling solutions.

Household and care responsibilities

Heat stress within the home is likely to have gender-based impacts. As temperatures rise and heatwaves become more common, the heat-related impacts of indoor chores are expected to be borne primarily by women. UNICEF estimates that girls spend 160 million more hours than boys doing household chores every day, which accounts for 40 percent of their time, often increasing in time and responsibility as they reach adolescence (UNICEF 2016). Open cooking fires or biomass stoves are utilized in kitchens without ventilation to disperse the indoor air pollution caused by burning wood or other fuel sources. A lack of reliable or convenient access to water sources for hydration and sanitation within the home can have adverse effects on women and girls (Kayser et al. 2019). In addition to the use of improved stoves, a number of solutions can be deployed to alleviate heat burdens and improve air quality within households. These include adoption of fans, reflective paints on roofs, wet jute mat curtains on windows, wearing lighter clothing

and prioritizing indoor housework at times that avoid heat peaks and electricity demand. Such changes are key to ensuring women's safety and wellness as they disproportionately spend time in the hottest parts of the home (Azhar 2017).

Social or cultural norms continue to influence decision-making on purchases within the home. In households that can afford to purchase a fan or air-conditioning unit, decisions are impacted by risk preference, spending habits and resulting impacts within the home. Intrahousehold decision-making research on energy technologies and gender has typically focused on solar home systems and clean cookstoves, items that tend to benefit particular rooms and users within a home (Pachauri and Rao 2013). In these settings, the gender of the decision-maker or the choice to make a joint decision plays a large role in whether the technology is purchased and who reaps the benefit of the purchase. A recent study indicates that air-conditioning and cooling appliances are of interest to everyone within the home and the decision to purchase is thought to be gender-neutral (Choudhuri and Desai 2020). Trinidad and Tobago's National Cooling Action Plan specifically indicates that gender must be incorporated into the market assessment for refrigeration and air-conditioning. However, much more research is needed to determine gendered preferences for appliances of households that are in a position to make these purchases. Cooling initiatives at the household level seeking to incorporate a gender lens should consider the entire built environment of a home, including ventilation and building materials, in addition to cooling appliances to avoid traditional pitfalls of unequal benefits.



Recommendations to address poverty and household dynamics through access to sustainable cooling

- Apply a gender-based analysis to cooling initiatives at the household level to avoid unequal distribution of benefits.
- Increase survey data available to understand the benefits of enhanced access to cooling for women disproportionately burdened by household chores.
- Increase public and private investment in sustainable cooling solutions considering gender impacts and vulnerabilities, specifically targeting women for technology and services solutions decision-making.
- Finance women-driven cooling solutions, products and business models.



CHALLENGE 3

The Workplace

Agriculture and fishing sectors

Agriculture is the most important source of employment for women in Southeast Asia and Sub-Saharan Africa (SOFA Team 2011). Women comprise 50 percent of the labour force in these regions compared to 20 percent in the Americas and 40 percent globally. Women are usually more dependent on agricultural jobs, particularly in Asia (57 percent female workers) and Africa (63 percent female) (Agarwal 2011). Although their presence in this sector is substantial, women earn less than men and are more frequently engaged in unpaid and informal agricultural work (FAO 2011).

Increasing shading, air or water movement impacts agricultural workers' and processors' personal cooling comfort, driving both productivity and human safety. Food cold chains can reduce food waste and allow farmers and fishers to market their products in distant communities, increase incomes, hire more workers and reduce local poverty. Development and adoption of these solutions must account for the varied gender distribution and potential vulnerabilities of workers within localized sectors.

Many of the rural poor are likely to engage in subsistence farming but lack access to an intact cold chain that would enable them to sell their products further afield at a higher price (SEforALL 2020). In fisheries, women tend to be involved in post-harvest activities, where quality losses often occur due to lack of access to refrigeration, resulting in lower incomes for traders and retailers. Immediately cooling harvested food products, or pre-cooling, is an efficient tool for farmers and fishers to increase the shelf life of their product

and could support expanded employment and income opportunities for women. Chilled transport of products makes up another important link in the agricultural cold chain. Recent technological innovations and research into business models offer promising solutions to this challenge yet connecting them to an estimated 470 million smallholder farmers and an additional 290 million people who depend on the agricultural value chain remains a challenge for the sector (Rockefeller Foundation 2013). For women, this logistical challenge is even greater as they face significant barriers to accessing finance, further impacting affordability of efficient and advanced equipment (African Development Bank 2015). Often, a pronounced lack of formal land ownership can inhibit women's ability to find financing for potentially life-changing improvements to their livelihoods (African Development Bank 2015).

Agriculture can be an important engine of growth and poverty reduction, but it can also sustain poverty and reinforce gender inequality. A study published by the Food and Agricultural Organization (FAO) and the ILO recommends governments address gender equality in the agriculture sector by implementing labour standards including measures for informal workers in rural areas, rural infrastructure, regulation of natural resource management and promotion of gender equity (SOFA Team 2011). To drive equitable agricultural value chains, the African Development Bank (AfDB) recommends providing technical assistance, increasing finance and improving links to markets for women farmers (African Development Bank 2015). Dramatically improved data collection on gender differences within the agriculture sector will be critical to understanding the full needs of women farmers and food suppliers.

Agriculture cooling advancements must support women's needs - Mozambique, Nigeria, Pakistan and Sudan

In Mozambique, women represent 60 percent of the agricultural labour force, a sector which contributes to only 23 percent of GDP and employs 78 percent of the population (FAO 2010). Ninety percent of women employed in Mozambique work in agriculture, making it a critical sector for women's income development (FAO 2010). They are more likely to encounter challenges accessing larger markets for their products, and diminished ability to reinvest in their farms means female farmers suffer lower levels of productivity. Subsequently, they are not able to make improvements to their business and are less resilient to climate change. Government-led investments in offering cooling and irrigation services and training for women farmers would provide much-needed investment in this critical segment of Mozambique's population.

Nigeria currently has the largest population of rural poor who are at risk of a lack of access to cooling (SEforALL 2020). Over 67 million Nigerians are likely to lack energy access, have housing with poor ventilation and lack sufficient income to purchase or run a fan. Of the countries examined in *Chilling Prospects*, Nigeria relies most heavily on agriculture as inputs to GDP (SEforALL 2020). For the 80 percent of farmers working for subsistence, electricity could provide much-needed refrigeration and allow them to grow and distribute high-value crops. Women make up a large portion of farmers and crop processors across Nigeria, accounting for roughly 75 percent of the farming sector, but very few of them have legal ownership of land, creating additional barriers to financing for improvements (Enfield 2019) (British Council Nigeria 2012). Programmes to incentivize and distribute refrigeration technology should consider targeting women farmers and support efforts to increase financial inclusion.

In Pakistan, women are often responsible for household food production and income through crop sales. At higher risk of heat stress due to their time outdoors, many women begin work later than usual to cope with unpredictable weather patterns due to climate change (Noshriwani 2016). Women must navigate these disruptions to traditional farming practices while also burdened by very low rates of education, around 50 percent across the country (Noshriwani 2016) (Ali et al. 2011). Cooling campaigns targeted to women's specific needs and capabilities have the potential to improve their time spent outdoors as well as increase much-needed access to food storage services.

Agriculture plays a large role for the rural population of Sudan, a least-developed country (LDC). A significant number of the population depends on the agriculture sector for employment, but women are estimated to provide up to 80 percent of the labour on farms (African Development Bank 2013). As reported in *Chilling Prospects*, Sudanese farmers are estimated to lose USD 52.48 per capita annually due to increases in heat stress from an increasingly warm climate in the tropical country (SEforALL 2020). For women farmers facing compounding challenges of rural poverty, gender discrimination and climate change, these estimated losses will be severe. Organizations such as Zenab for Women in Development are addressing this crisis through programming to provide women with necessary inputs, tools, training, market access and financing to improve resiliency in Sudan (Zenab for Women in Development 2021).



Informal employment

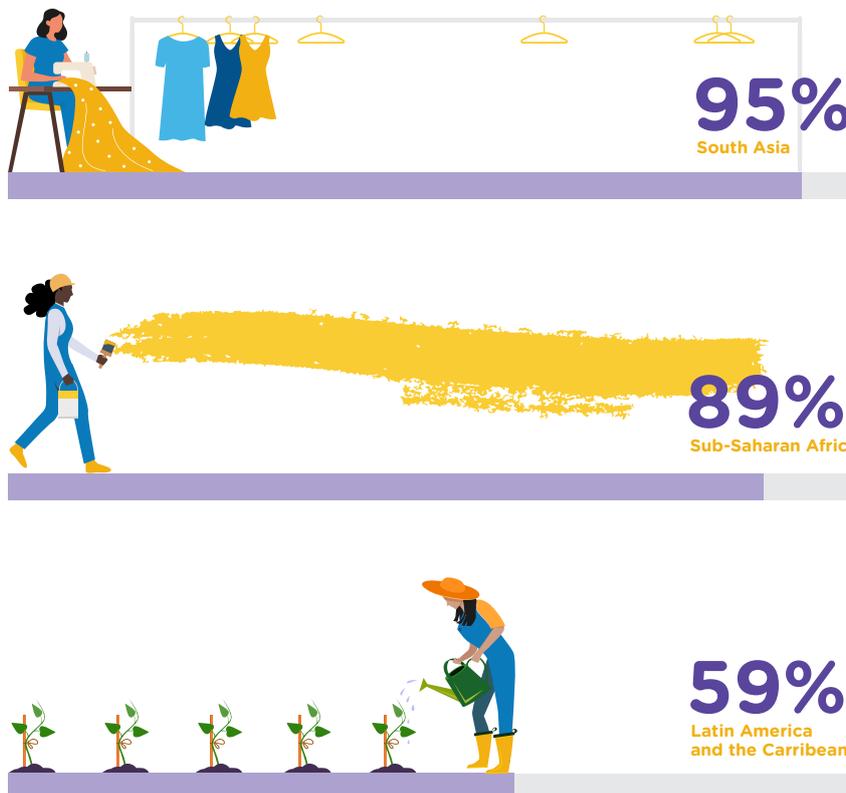
Women and men often enter the informal economy due to economic circumstances and a lack of opportunities in the formal sector. The informal sector can also offer flexibility around time constraints, particularly for women responsible for child rearing and household maintenance (SOFA Team 2011). However, the roughly 2 billion people working in the informal economy often lack coverage under working protections and are frequently denied suitable working conditions (International Labour Office 2018). Energy and cooling access are closely tied with SDG8, calling for full and productive employment and decent work for all women and men, including young people and persons with disabilities, and highlight the need for equal pay.

Globally, women make up an incredibly high rate of workers in the informal sector – 95 percent in South Asia, 89 percent in Sub-Saharan Africa, and 59 percent in Latin America and the Caribbean (Report of the Secretary-General 2016). With the exception of Asia, these rates are fairly comparable to men’s informal work. However, women working in informal settings can often be in

more vulnerable workplaces, such as domestic workers (International Labour Office 2018). Women working in outdoor street vending, domestic work and subsistence farming are at increased risk of heat stress on the job (Global Heat Health Information Network 2020).

Outdoor brick kilns in India informally employ roughly 50 percent women but these workers are often poor, infrequently given fair wages and are sometimes denied access to their own payment separate from a male relative (Chandran 2016). In these settings, women often do not have access to a restroom and will avoid drinking water throughout the high-temperature days to prevent losing work time or avoid being harassed for relieving themselves in less-private spaces (Venugopal et al. 2016). By virtue of their gender, women are forced to make this choice, which can cause dehydration, increased susceptibility to heat illness and longer-term genitourinary issues (Venugopal et al. 2016). Exploitation of workers in the informal sector is prevalent everywhere, but women can suffer additional burdens due to their gender. Their incredibly high representation in informal sectors demands consideration and inclusive planning to diminish workplace cooling gaps.

Women in informal employment as a percentage of total employment



INFORMAL WORKERS CAN INCLUDE



Street Vendors



Petty Goods and Service Traders



Subsistence Farmers



Seasonal Workers



Domestic Workers



Industrial Outworkers

Source: <https://www.unwomen.org/en/news/in-focus/csw61/women-in-informal-economy>

Domestic labour regulations must focus on cooling needs - Brazil, India and Bangladesh

Brazil and India have the most significant slum-dweller populations facing cooling access risks and liable to buy the cheapest and least-efficient appliances (SEforALL 2018). Both countries are affected by high temperatures and long periods of heatwaves. Megacities like Rio de Janeiro and New Delhi are considered to be urban heat islands (Peres et al. 2018) (Chandra 2019). Growing populations, increasingly dependent on air conditioners in high temperature environments, pose a new challenge for indoor labour in these countries with large cooling access gaps.

These conditions come together to offer special dangers for domestic work. Brazil has the highest number of housekeepers in the world and India is not far behind (Wentzel 2018). Combined, they account for more than 10 million women working in poor indoor environments with weak domestic work legislation and little to no access to cooling. Approximately 6 million Brazilian women are employed as housekeepers, representing nearly 15 percent of all female employment in the country, though only 28 percent have valid work permits granting them labour rights (Pinheiro et al. 2020). Despite the existence of a domestic labour law, it does not regulate the workspace environment, thereby leaving the need for ventilation and cooling in private homes unregulated. In India, 4.2 million women are employed in private households, which is roughly 1 percent of total national employment (International Labour Office 2013). However, unofficial estimates and surveys suggest numbers range from 2.5 million to 100 million given both the difficulty of finding reliable data and the prevalence of illegal work status. New Delhi has one of the worst outdoor pollution levels in the world, yet it is the most common destination of women seeking work in a country where domestic work is the second largest employment sector. The lack of regulation results in testimonies that housekeepers are often forced to work long hours, at risk of being locked in households and exposed to burning biomass as a result of cooking (International Labour Office 2015). The lack of mandated social protections subjects women to poor work conditions, exposes them to hazards, and exempts them from certain rights, such as paid leave and healthcare.

During the COVID-19 pandemic, domestic workers worldwide have been compelled to carry on their routines despite government restrictions and in fear of contracting the virus, to be able to afford basic needs. In countries where domestic work is unregistered and unregulated, women do not have access either to food packages or food programmes to compensate for their absence (Khullar 2020). The Government of India is currently considering a draft national policy on domestic workers, an effort that should be aligned with international instruments and consider working environment conditions that reflect cooling needs (Srivastava 2020).²

Improvements in labour regulation are also needed to upgrade work environments in Bangladesh. Although the garment industry has contributed to economically uplifting poor and vulnerable women, factories still present challenging conditions for the predominately female workforce (World Bank 2017). High temperatures from machinery within the workplace cause discomfort and health problems, hampering productivity and demonstrating the importance of enhancing ventilation indoors (Hossain, Ford and Lau 2014). Research shows that exchanging artificial luminaries and providing air changes with fans and air conditioners can reduce illnesses such as headaches, respiratory problems, vomiting and fatigue (Hossain, Ford and Lau 2014). In Bangladesh, similarly to India, Brazil and most emerging economies, women often bear the responsibility for their health and safety at the workplace. Low-cost cooling solution requirements are crucial additions to new labour regulations.

²This includes the ILO Convention 189 on domestic workers. Although the content of the Convention is very thorough, it does not allude to cooling or basic indoor environment requirements.

Paid employment

Within formal employment settings, women and men both face potentially dangerous exposure to heat and the impacts of heat stress in certain industries. An example is the textile, garment and footwear industry, which is thought to be made up of 80 percent women (World Bank 2017). In Bangladesh, where the garment sector accounts for more than 80 percent of total export earnings and nearly 10 percent of GDP, access to safe and healthy workplaces is a highly gendered issue (Hossain, Ford and Lau 2014). Notorious for poor working conditions, the industry has been a frequent target of popular campaigns calling for improved working conditions. Constant use of heavy machinery and the structure of factory settings often leads to extreme temperatures within the workplace. Hot and poorly ventilated factories result in women facing constant headaches, respiratory problems, vomiting, fatigue and fainting (Hossain, Ford and Lau 2014).

Heat is one factor of workplace safety but these conditions result in lower levels of productivity, serious illness and increased vulnerabilities for working women. Rising temperatures in the Asia-Pacific region, home to 75 percent of all garment workers, will further exacerbate unbearable and unsafe working environments for women whose livelihoods depend on this sector (International Labour Office 2020). However, studies show the garment industry is crucial to include women in the workforce, avoid early marriage and improve their decision-making power in households given their new earnings (World Bank 2017). Nonetheless, the inadequate environment women are working in urgently calls for enhanced ventilation and cooling policies that will directly contribute to productivity and health.

The construction sector provides another example of a highly gendered workforce at risk for heat-related

vulnerabilities. A recent survey of the gender gap across sectors indicates that men comprise 90 percent of the construction and extraction workforce (World Economic Forum 2016). Construction work often requires strenuous labour and performing these activities in high temperatures puts the workforce within elevated risk for heat stress and illness. Workers, particularly those specializing in roofing and road construction, have been shown to be 13 times more likely to die from illness related to heat stress (Acharya, Boggess and Zhang 2018).

The construction sector and workforce are highly varied in terms of projects and skill levels. International migrants leaving their home countries to work in developed or other developing nations can often face additional barriers to safe and cool workplaces. In one of the hottest nations in the world, workers in Qatar can face extreme and potentially fatal levels of heat stress, despite bans on working during certain times in summer months (Kelly, McIntyre and Pattisson 2019). Researchers studied deaths of young Nepali men in Qatar due to cardiovascular causes and determined them to be instigated by heat stroke (Kelly, McIntyre and Pattisson 2019). Other men interviewed complained of headaches, difficulty breathing, altered vision and light-headedness in temperatures as high as 45°C. This research found that 58 percent of summer-month deaths analysed could be attributed to heart attacks due to heat illness (Kelly, McIntyre and Pattisson 2019). Despite legislation and regulations for working in such high temperatures, workers complain that rules are being flouted by employers (Kelly, McIntyre and Pattisson 2019). As the share of industrializing countries' segment of the construction sector is anticipated to grow to 63 percent by 2025, it is essential that this highly gendered workforce has access to appropriate measures and protections on the job (Kelly, McIntyre and Pattisson 2019).

Recognizing opportunities for women in the cooling workforce - China and Indonesia

There is a growing representation of women in the cooling workforce, particularly in the refrigeration and air-conditioning industry. As the market leader in the production of air conditioners and with 22 percent of the installed cooling capacity in the world, China offers positions in the whole cooling supply chain, such as management, research, testing, assembly and servicing (International Energy Agency 2019a). In an International Institute of Refrigeration survey carried out in 2017, China had one of the highest percentages of women registered in national refrigeration associations, just under 20 percent (United Nations Environment Programme 2019). As a large portion of Indonesia's population gains access to electricity or increased incomes, the demand for household cooling technologies is expected to dramatically increase (SEforALL 2020). Indonesia could account for half of all air conditioner unit sales growth, from 40 million units in 2017 to 300 million in 2040 across Southeast Asia (International Energy Agency 2019b). Despite being a traditionally male-dominated sector, women are playing a greater role in the domestic refrigeration and air-conditioning industry and are being encouraged to pursue careers in this increasingly important field (United Nations Environment Programme 2019). For the women profiled in the UN Environment Programme's publication on women in the Refrigeration and Air-Conditioning (RAC) industry, their positions in this sector not only contribute to growing workforce equality but also to transforming the efficiency of the machines to support climate action (2019).



Recommendations to ensure safe and decent work through access to sustainable cooling

- Expand and enforce workplace protections, particularly for women-dominated occupations and sectors employing vulnerable populations, such as migrant workers.
- Increase investments in off-grid, solar-powered cold storage systems to reduce food waste and make more food available for subsistence and sales, ensuring food security and economic development while minimizing the adverse effects of conventional, fossil fuel-based agricultural value chains.
- Increase investment in sustainable cooling solutions that support both formal and informal workforces.

CALL TO ACTION AND RECOMMENDATIONS

Just as women and girls face challenges gaining access to education, healthcare and formal employment, their ability to access and benefit from the range of services that cooling provides is gendered. Policies, initiatives and investments to increase access to essential cooling services should include gender considerations to avoid perpetuating existing disparities.

Policymaking

To date, policy responses from national governments on the issue of access to cooling have been generally limited to the development of National Cooling Action Plans (NCAPs), regulatory measures with respect to the efficiency of cooling appliances, and implementation activities related to the Kigali Amendment to the Montreal Protocol. The degree to which gender considerations have been incorporated in these processes depends on several factors, predominantly institutional requirements for gender consideration, the gender makeup of those leading the development of the policies, and the availability of data to support sex-disaggregated outcomes.

At the city level, heat action plans typically address women and children as a vulnerable group that may be at greater risk and a priority for outreach and awareness programmes. The Ahmedabad Heat Action Plan for example has specific measures related to awareness raising and education for young girls, mothers and the elderly, conducted by Integrated Child Development Scheme (ICDS) workers (Ahmedabad Municipal Corporation 2019).

Gender-based analyses are valuable for supporting governments in developing access to cooling policy responses. Disaggregation of gender-based data, as done in Trinidad and Tobago's gender-sensitive market assessment of cooling appliance use, should be used to strengthen NCAPs and other cooling policies by conducting preliminary analyses of women

and men's cooling needs, then implementing gender-transformative policies, and documenting outcomes.

Outside of traditional cooling policies, the challenge of equitable access to cooling can be incorporated into national and local climate action plans, building codes, zoning standards or electrification plans to ensure that we do not leave anyone behind in the energy transition. Urban development planning and building codes can integrate insights from gender analyses to ease workplace and transportation cooling burdens for women and men. Agricultural planning at a national or local level has a critical role to play in the comfort of rural subsistence farmers and the development of cold chains for equitably distributed economic development. Labour protections and efforts to reduce poverty will also be more effective when addressing the barriers of women, men and vulnerable populations in accessing cooling to address deeply rooted economic and social inequalities. A gender-transformative approach, a step that is necessary to close gender gaps on many fronts, would support each of these policy and investment decisions.

Data collection & tracking

As seen in other gender-focused studies, persistent gaps in sex-disaggregated data collection increase the challenge of addressing the unequal impacts between genders. This lack of data certainly adds to the challenge associated with heat stress and a lack of access to sustainable cooling technologies and services for women and girls within the household, communities or the workplace.

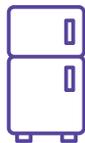
Some of this challenge is rooted in a lack of data on cooling services and appliance ownership broadly. There is also a persistent gap in data collected on lived experiences and unique inequalities impacting women. For topic areas characterized by informality, it is difficult to collect consistent information on groups such as

people living in urban slums or migrant construction and domestic workers.

To achieve access to sustainable cooling and to achieve SDG7, informed and thoughtful policies will require enhanced understanding of the challenges listed in this brief. Collecting and updating data would strengthen solutions that can benefit both women and men and support universal access to sustainable cooling and sustainable energy. Key data to collect and track include:



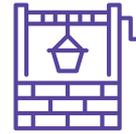
VULNERABILITY AND POVERTY DATA: Through work such as *Chilling Prospects*, we have an increasingly clearer view of the types of people facing a lack of access to cooling and their general economic situation. Sex-disaggregated data on poverty in rural and urban settings would greatly contribute to targeted actions to benefit the female rural and urban poor in accessing cooling technologies.



COOLING TECHNOLOGY AND SERVICE PURCHASE AND USE: To understand the impacts, gendered or not, of cooling solutions, data are needed on who has decision-making power to purchase cooling appliances, shading devices or cooling services within a household and who they ultimately benefit once installed.



WOMEN, HEALTHCARE AND COOLING: Sex-disaggregated health data from medical and biological studies related to heat and cooling can support policymakers to understand the impact that these challenges have on women due to their gender (Sorensen et al. 2018). These include but are not limited to women's susceptibility to increasing extreme heat events, availability and access to comfortable and reliable healthcare services, and impacts of indoor air pollution in homes or workplaces.



WOMEN IN THE INFORMAL SECTOR: Informality is both a problem of data and definition. Often, women's roles, such as caring for animals or collecting water on a farm, are not considered formal employment and are therefore excluded from economy-wide data collection exercises. This leads to an underestimation or misalignment of the needs of women or misunderstanding the contributions of cooling solutions to sustainable and economic development at local and national levels.



WOMEN IN THE WORKFORCE: The growing participation of women in the traditionally male-dominated energy workforce is a lever for incorporating gender-focused needs in delivering access to cooling. Data should track female representation in the energy industry, cooling industry and cooling-impacted industries, and the outcomes of their leadership.

Data collection is the first step in recognizing and developing appropriate solutions for addressing the challenge of bringing equitable access to sustainable cooling. Applying a gender lens to cooling policies and investment can support better understanding of how access to cooling, ownership of cooling solutions, and working in safe environments can impact traditional gender roles and relations. A comprehensive approach to driving progress on gender-equitable access to sustainable cooling will have resounding impacts on several sustainable development goals.

Key recommendations in Specific, Measurable, Achievable, Relevant, Timebound (SMART) indicators table

Recommendations What do we want to accomplish?	Activities How can the goal be accomplished?	SMART Indicators How will we know when it is accomplished?
Evidence: to better understand gender differences and impacts		
Conduct research and collect data and evidence that can be used to support tracking access to cooling and gender equality impacts	Gender-specific research and data to support tracking access to cooling	<ul style="list-style-type: none"> • Number of households connected to cooling energy services • Access to cooling solutions by employment type
Establish gender-differentiated measurement and evaluation of policies and initiatives	Gender-specific data and analysis specifications added to policy and initiative evaluation	Number of evaluations conducted collecting and analysing gender equality and access to cooling
Policies: to support workplace safety, community heat planning and personal comfort		
Implement building codes, product standards and labels to support gender equality in achieving access to cooling	Gender-transformative policies, codes, product standards and labels implemented to support gender equality in achieving access to cooling	Number of codes, product standards and labels developed by year that support gender equality through increased access to cooling
Implement heat action plans that support gender equality in achieving access to cooling in urban heat islands and extreme heat events	Gender-transformative plans and alert systems implemented to address heat stress in urban and informal communities	Number of heat action plans developed by year that support gender equality through increased access to cooling
Expand enforceable workplace protections, particularly for women-led occupations and sectors employing vulnerable populations, such as migrant workers	Gender-specific workplace safety regulations implemented for protection of heat-vulnerable workforces	Number of workplace safety regulations developed by year that support gender equality through increased access to cooling
Address gender equality and access to cooling in multilateral development programming	Sex-disaggregated data and evidence developed or activities and attention provided by global institutions and initiatives on cooling	Number of activities and initiatives taken that support gender equality through increased access to cooling
Drive employment gender equality to enable opportunities for women to be part of the solution and lead cooling progress	Policies and incentives implemented that encourage gender equality in cooling and energy industry employment	Sex-disaggregated employment by sector and segment that support access to cooling

Investment: to finance gender-sensitive solutions		
Invest in access to cooling solutions that remedy disparities considering gender impacts and vulnerabilities	Government and multilateral funds commit to investment in access to cooling solutions that improve gender equality	USD committed for solutions that remedy disparities considering gender impacts and vulnerabilities
Finance women-driven solutions, products, and business models	Government and multilateral funds commit to financing women-driven solutions, products and business models	USD committed for financing women-driven solutions, products, and business models
Invest in vaccine distribution and medical services, increase outreach to vulnerable populations, and utilize non-medical venues to serve patients with access constraints	Government and vaccine initiatives commit to ensuring cold chain reliability to deliver vaccines to women, children and vulnerable populations in the last mile	<ul style="list-style-type: none"> • USD committed for vaccine distribution and medical services in high-impact countries (HICs) • Number of non-medical venues established to serve patients with access constraints • Number and percentage of patients who have been vaccinated at non-medical venues by sex
Communications: to support attention and awareness raising		
Use #ThisIsCool to share information on sustainable cooling solutions that increase gender equality	Gender-specific posts to cooling solutions that would be improved by using the #ThisIsCool to share information on cooling solutions that minimize gender disparities/gender inequality	<ul style="list-style-type: none"> • Number of access to cooling solution stories that support gender equality developed and shared per year • Number of interactions on the stories in HICs • Sex-disaggregated participation of top influencers' interaction with stories
Support education of heat adaptability and communicate information to prevent impacts of extreme heat	Gender-specific communication material and education on heat adaptability for women and vulnerable populations	<ul style="list-style-type: none"> • Number of institutions in HICs who have implemented education of heat adaptability by year • Sex-disaggregated participation rate of youth and adults in formal education and training on heat adaptability and access to cooling • Sex-disaggregated share of enrolment in heat adaptability and access to cooling education

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