

Stepping Up Women's STEM Careers in Infrastructure

An Overview of
Promising Approaches

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1818 H Street NW | Washington DC 20433
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Attribution—Please cite the work as follows:

Schomer, Inka and Hammond, Alicia. 2020. “Stepping Up Women’s STEM Careers in Infrastructure: An Overview of Promising Approaches” ESMAP Paper. Washington, D.C.: World Bank.

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**AN OVERVIEW OF
PROMISING APPROACHES**





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ACKNOWLEDGMENTS

The preparation of this report was led by Inka Schomer, Lead, Gender and Energy Program, Energy Sector Management Assistance Program (ESMAP), and Alicia Hammond, Gender Specialist and Lead on Innovation & Technology, Gender Group of the World Bank Group. The project was initially developed as a product of the Gender Group, and was moved forward by ESMAP. Ursula Casabonne, Senior Gender Consultant, provided substantial technical and editorial contributions. The report was developed with input from Value for Women Ltd., led by Luis Marquez and Shelley Martin, along with Rebecca Fries, Stephanie Finigan, Daniela Moctezuma, and Celia Santillan. Mame Fatou Niasse, Operations Analyst, Gender Group, was a member of the core team, and provided critical coordination and procurement support. David Young, External Affairs Officer, External and Corporate Relations, provided invaluable communications guidance and insights. Special thanks to Rohit Khanna, Practice Manager, ESMAP, for his guidance and feedback throughout the process of preparing this report.

The team is grateful for the thoughtful feedback provided by the following colleagues: Diana Arango, Pamela Baldinger, Adriana Eftimi, Kwawu Mensan Gaba, Rahul Kitchlu, Elisabeth Maier, Alexandria Valerio, and Maheen Zehra. The report also benefited from guidance provided by a Technical Working Group: Sanola Daley, Karla Dominguez Gonzalez, Rebecca Gilsdorf, Nato Kurshitashvili, Vanessa Lopes

Janik, Oni Lusk-Stover, Rudaba Nasir, and Maria Beatriz Orlando of the World Bank Group.

Several colleagues provided extensive contributions that facilitated the development of the country case studies. For the Lao People's Democratic Republic, Phomma Veoravanh, Ministry of Public Works and Transport, Lao PDR, as well as Sonomi Tanaka and Anupma Jain from the Asian Development Bank (ADB); for Solomon Islands, Shabnam Hameed and Emmanouela Markoglou from the International Finance Corporation (IFC); for Panama, Vivian Roza, Inter-American Development Bank (IADB), and Hugo Wood, Panama Ministry of Foreign Affairs; for North Macedonia, Aneta Petrovska-Rusomarski (EVN Macedonia), as well as Corinne Hart and Amanda Valenta, United States Agency for International Development (USAID); and for Ethiopia, Inka Schomer, Lara Born, and Meskerem Mulatu Legesse of the World Bank Group.

Many other colleagues from the World Bank Group shared valuable insights and expertise: among them, Niki Angelou, Rosemary Atabug, Ezgi Canpolat, Sherry Goldberg, Gunjam Gautam, Katherine C. Heller, Jelena Lukic, Jennifer Scott, Yukari Shibuya, Ellen Maynes, and Nadia Taobane.

The team also wishes to thank the external partners who contributed to this report, including Comunidad Mujer; Corporación Nacional del Cobre de Chile (Codelco); Dalberg Global Advi-

sors; the Global Women's Network for Energy Transition; the International Center for Research on Women; the International Labour Organization (ILO); the International Union for the Conservation of Nature; Investing in Women; Newmont Mining Corporation; the United Nations Development Programme (UNDP); the United Nations Economic and Social Commission for Asia and the Pacific; the United Nations Educational, Scientific, and Cultural Organization (UNESCO); the UN Global Compact; the United Nations Entity for Gender Equality and the Empowerment of Women; the U.S. State Department's Institute of International Education (IIE); and the Wilson Center.

Special thanks also to Janet Hulstrand, Norma Adams, Sirisha Tumuluri, and George Williams for editorial support, as well as Ailsa Bristow and Sarah Turton from Weight Creative Communications Agency.

The team is grateful to Melina Rose Yingling for designing the report and Jonathan Davidar, Heather Austin, and Fernando Di Laudo for the publications support.

ESMAP is a global knowledge and technical assistance program administered by the World Bank. It provides analytical and advisory services to low- and middle-income countries to increase their know-how and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. ESMAP is funded by Australia, Austria, Canada, the ClimateWorks Foundation, Denmark, the European Commission, Finland, France, Germany, Iceland, Italy, Japan, Lithuania, Luxembourg, the Netherlands, Norway, the Rockefeller Foundation, Sweden, Switzerland, the United Kingdom, and the World Bank.





ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
AGI	Adolescent Girls Initiative
ASEAN	Association of Southeast Asian Nations
BWASA	Businesswomen's Association of South Africa
CSR	Corporate Social Responsibility
DECTech	Discover, Encourage, Create Technology (Colorado School of Mines)
DWS	Department of Water Supply
EBRD	European Bank for Reconstruction and Development
EDF	Électricité de France
EDGE	Economic Dividends for Gender Equality
EEU	Ethiopian Electric Utility
ELEAP	Ethiopia Electrification Program
ERB	Engineers Registration Board
ERG	Employee Resource Group
ESMAP	Energy Sector Management Assistance Program
EU	European Union
EVN	Energieversorgung Niederösterreich
EWL	Emerging Women Leaders
GBV	Gender-Based Violence
GDCF	Gender and Development Cooperation Fund
GDP	Gross Domestic Product
GEM	Gender Equity Model
GES	Gender Equality Seal
GRI	Global Reporting Initiative
GWNET	Global Women's Network for the Energy Transition
ICT	Information and Communication Technology

IDB	Inter-American Development Bank
IEEE	Institute of Engineering and Technology
IFC	International Finance Corporation
ILO	International Labour Organization
IRENA	International Renewable Energy Agency
IUCN	International Union for the Conservation of Nature
IWA	International Water Association
KPLC	Kenya Power and Lighting Company
LAC	Latin America and the Caribbean
Lao PDR	Lao People's Democratic Republic
MDB	Multilateral Development Bank
MoSHE	Ministry of Science and Higher Education (Ethiopia)
NARUC	National Association of Regulatory Utility Commissioners
NORAD	Norwegian Agency for Development Cooperation
OECD	Organisation for Economic Co-operation and Development
PETRONAS	Petroleum Nasional Berhad (State-Owned Enterprise in Malaysia)
PISA	Programme for International Student Assessment
PNP	Provincial Nam Papa Water Utilities
PPP	Public-Private Partnership
PROLEAD	Program for the Support of Women's Leadership and Representation
SAA	South African Airways
SAGE	South Asia Gender and Energy (World Bank initiative)
SDG	Sustainable Development Goal
SEAP	Structured Engineers Apprenticeship Program (NORAD-supported initiative in Tanzania)
SICCI	Solomon Islands Chamber of Commerce and Industry
SIWA	Solomon Islands Water Authority
SOE	State-Owned Enterprise
STEM	Science, Technology, Engineering, and Mathematics
TIMSS	Trends in International Mathematics and Science Study

TVET	Technical and Vocational Education and Training
UIS	UNESCO Institute for Statistics
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNICEF	United Nations Children’s Fund
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
UTE	Administración Nacional de Usinas y Trasmisiones Eléctricas (National Administration of Power Plants and Electrical Transmissions), Uruguay
VAWG	Violence Against Women and Girls
WBD	Women Board Directors
WCYAD	Women, Children and Youth Affairs Directorate
WEF	World Economic Forum
WHO	World Health Organization
WIE	Women in Engineering





EXECUTIVE SUMMARY

***Stepping Up Women’s STEM Careers in Infrastructure: An Overview of Promising Approaches* describes a variety of ways to level the pathway for women entering into and progressing in science, technology, engineering, and mathematics (STEM) employment within the infrastructure sectors—energy and extractives; water; transport; and digital development.**

The report distills the findings from an extensive literature review, a global stocktaking exercise, key informant interviews, and five case studies in order to provide World Bank Group project teams with insights that they can use to support women’s STEM careers in infrastructure at each stage of their careers—from initial attraction to the sectors and job recruitment, to retention within organizations, and advancement to managerial and leadership roles.

The expectation is that World Bank teams, and their public sector clients and partners, will continue to test and refine these approaches, thereby deepening the knowledge of what is effective, especially in low- and middle-income countries. The report also is intended to underpin and expand the existing knowledge on gender equality issues, under the World Bank’s Energy Sector Management Assistance Program (ESMAP).

WHAT ARE THE ADVANTAGES OF PROMOTING WOMEN’S STEM EMPLOYMENT IN INFRASTRUCTURE?

Increasing the employment and advancement of women in infrastructure organizations is a win-win proposition. For women, these sectors offer the potential to generate substantial income; the opportunity to design the infrastructure that spurs countries’ socioeconomic development; and the opportunity to serve as role models for future generations of young women who are interested in STEM-related careers. Equally important, infrastructure organizations that are committed to increasing the employment of women in STEM jobs helps to expand the talent pool, and potentially strengthens their organizational performance metrics.

Recent global studies indicate that women are underrepresented in the infrastructure sectors, particularly in STEM jobs. For example, a 2019 World Bank study that surveyed 64 water and sanitation utilities in 28 economies found that women comprise an average of only 18 percent of the water utility workforce, and a USAID study of electric power distribution companies in 14 countries found that women comprised an average of just 13 percent of the workforce, ranging from 1 percent in Pakistan to 30 percent in Ukraine. And in the European Union (EU), women account for an estimated 17.5 percent of the workforce in urban public transport, but they hold less than 10 percent of the technical and operational jobs.

Available data, mostly from middle- and high-income countries, suggest that women are also underrepresented at the senior management level of infrastructure industries.

WHAT ARE THE BARRIERS?

A metaphor frequently used to explain the fact that women are underrepresented in STEM careers is the “leaky pipeline.” Although girls often perform as well as or better than boys in math and science at the primary and secondary levels, they are underrepresented in some STEM subjects, particularly engineering and computer science, at the tertiary level.

Many girls who opt to study these subjects do not end up entering into related careers. Those who do often leave these careers due to dissatisfaction with the workplace culture, the lack of advancement opportunities, or the challenges presented by work-life balance and other issues.

Multiple overlapping dimensions that interact in complex ways also have an influence on women’s education, employment, and progression in STEM careers. Gender stereotypes and biases are present at all levels—across societies, in classrooms, and among families. Starting in primary school, and continuing through sec-

ondary and tertiary education, girls’ interest and confidence in STEM subjects is often shaped by social and gender norms that come into play when learning these subjects, as well as when they are choosing their careers.

During the school-to-work transition, information asymmetries and legal barriers may limit the share of young women who enter infrastructure industries, or occupy certain types of roles. Biases among employers also present barricades. Employers often hold biases about “masculine” and “feminine” work roles, as evidenced in prejudicial interview questions, or expectations about women’s future childcare or care responsibilities; this too may keep qualified women from being hired for STEM jobs.

Even when they are hired, women are likely to face additional challenges that may cause them to leave the sector. These challenges include time-intensive work pressures with limited flexibility; unwelcoming work environments; the biases of coworkers; and the risks of gender wage gaps, unaccommodating workplace facilities, and sexual harassment.

Finally, as they progress in their STEM careers, in addition to facing discrimination, additional institutional barriers—such as a lack of mentors, sponsors, professional networks, and quality training—can also limit the advancement of women.

WHAT HELPS TO LEVEL THE PATHWAY?

Leveling the pathway for women in infrastructure sectors requires changes at all levels of engagement—in national policies, within the educational system, at the sector and industry levels, and within workplaces. Multisector efforts and cooperation are therefore needed in order to spotlight the structural and systemic constraints that are embedded both within the sector and in society overall, and that are steering women away from STEM and related technical fields.

Start with Education

Removing gender biases in learning materials, and strengthening STEM curricula are critically important in attracting more women to STEM careers, particularly at the primary and secondary levels of education.

Curriculum designers should create content and resources that are suited to the learning styles and preferences of girls as well as boys: for example, the research suggests that STEM curricula are more appealing to girls when they are clearly relevant to real world situations.

Building interest and confidence in STEM subjects among young girls is also of key importance. Interactive, hands-on experiences, design-based learning, and extracurricular STEM activities specifically for girls offer promise. Schools and infrastructure organizations can collaborate to help expose younger girls to science, and capture their attention in diverse and creative ways. For example, the German utility E.ON engages children and youth from ages 5 to 18 in STEM-oriented thinking through its Energise Anything! Program, which offers inspiring interactive workshops.

Such programs can also provide an opportunity for students to interact with female role models. Female role models are especially salient in STEM, helping to build the aspirations and self-efficacy of young girls. For example, in New Zealand, the Ultimit Women in Infrastructure Network runs an annual Girls With Hi-Vis program to expose girls to women who are excelling in nontraditional roles.

As young women start to think about their career choices, it is important to also address common misperceptions among girls about their abilities for STEM employment, and provide them with information about STEM career paths. For example, WomEng, a nonprofit organization in South Africa, has developed booklets with information about engineering programs and scholarship opportunities, and answers to frequently

asked questions about careers in engineering, aimed at secondary school girls. Informing young women about salaries for STEM jobs in infrastructure can also help influence their career choices.

In tertiary education and technical schools, institutions can change their traditional practices in order to create more equitable outcomes. For example, they might make introductory STEM classes more accessible and engaging for women by emphasizing the broad utility of engineering skills and knowledge, and by incorporating hands-on practical learning into the curriculum by having young women work at a building site.

Public and private sector entities can be more proactive in engaging potential STEM talent by providing scholarships, internships, and apprenticeships. In the Lao People's Democratic Republic (Lao PDR), an Asian Development Bank (ADB) project with the provincial water utilities is providing scholarships for young women to study water-related STEM careers, and providing them with job opportunities when they graduate. And in Tanzania, the Structured Engineers Apprenticeship Program (SEAP) has supported 300 women in engineering apprenticeships by covering their living expenses and providing them with training and mentorship opportunities.

These connections can also facilitate young women's access to information and career opportunities through job matching and placement programs. In the Republic of North Macedonia, Energieversorgung Niederösterreich (EVN) provides a range of opportunities, including internships and engineering scholarships, to help young women gain professional experience, and eventually to join the company.

Remove Roadblocks to Recruitment

During the recruitment process, eliminating legal barriers that may be preventing women from working in specific sectors and occupations can help advance women's employment. In recent years, Bulgaria, Bosnia and Herzegovina, Kiribati, and Tajikistan have all moved to reform their labor laws in order to eliminate some of the restrictions on women's employment: for example, in jobs deemed arduous or hazardous, such as underground work.

Inclusive policies such as quotas and targets can also be effective, and can help to change the numbers quickly. When hiring, ensuring that merit as well as inclusion goals are considered in tandem can help to avoid backlash, stigmatization, and tokenism. However, opportunities to upskill should also be taken into account to help workplaces become more equitable. Steps taken to counter gender discrimination and bias during the hiring process are also helpful. For example, decision aids such as technical and cognitive tests, as well as structured interviews during which every candidate is asked the same questions in the same order, can help to stem implicit biases.

Design Policies and Workplaces that Encourage Retention

Globally, women remain the primary caregivers in the home: therefore, flexible work and part-time employment options may help to reduce attrition, and increase the number of women who enter and remain in the workforce over the long term. However, although such arrangements may help to retain women in the workforce, those who take advantage of them may also be overlooked for promotion, a situation that calls for increased attention.

Because of the nature of the work, practices that seek to address issues of work-life balance may be limited for infrastructure profession-

als. For example, telecommuting options and mobile work may be difficult if not impossible for employees engaged in construction work or utilities. However, even when organizations cannot offer such options, they can offer a variety of other flexible working arrangements, such as staggered working hours, compressed work schedules, or breaks to allow for extended learning and training.

Paid family leave and childcare solutions further support the retention of women, and have demonstrated positive benefits for businesses. In Brazil, childcare provided by the public sector increased maternal employment by 10 percentage points. And in rural Mozambique, the availability of preschool enabled caregivers (primarily women) to save 15 hours per week on their care responsibilities.

Addressing sexual harassment in the workplace by developing complaint and redress mechanisms, antiharassment and nondiscrimination policies, and sanctions for those who breach them, is of critical importance. The Solomon Islands Water Authority (SIWA) (referred to also as Solomon Water), provides one good-practice example. With guidance from IFC, this utility has developed policies to prevent and counteract bullying and sexual harassment in the workplace, as well as to address cases of domestic violence among their employees. These policies also ensure that employees are provided with helpful information, and referrals to community support services.

Simple measures like providing appropriate facilities for women can foster a more inclusive work environment. Infrastructure organizations should consider women's preferences and needs when designing work and living spaces for women in the field: this includes ensuring that there is adequate lighting, separate toilets, uniforms that are appropriate for women, and on-site health facilities.

Infrastructure entities can work with trade unions to develop gender equality strategies, and to

enhance the participation of women in STEM, including in leadership roles. Électricité de France (EDF) and ENGIE have established collective agreements on gender-equality targeting by balancing the number of women and men in management and technical positions; enhancing women's empowerment and agency; combating stereotypes and sexism in the workplace; and highlighting gender-equality achievements. And at the Ethiopian Electric Utility (EEU), the labor union offers protection for women's rights in the workplace, particularly concerning maternity leave.

Support Women as They Climb the Ladder

Mentoring and sponsorship programs are promising professional development strategies for women in STEM, and they can be supported at the workplace level as well as across industries. A variety of infrastructure sector mentoring programs are focused on empowering and promoting women. For example, the Global Women's Network for Energy Transition (GWNET) designed and implements a well-structured, 12-month mentoring program especially targeted at emerging leaders in the Middle East and North Africa and Sub-Saharan Africa Regions, as well as in China, the Americas, and Europe. This program connects young energy professionals in the renewable energy sector with experienced senior leaders who provide them with advice and guidance through one-on-one remote working sessions.

Sponsorship—which involves the active support of someone who has considerable influence on decision-making processes or structures—is even more effective than mentoring. Research by the Center for Talent Innovation found that men and women with sponsors are more likely to ask for pay raises (and get them), as well as more likely to request to join high-visibility teams, and to experience greater career satisfaction.

Male mentors could also play an important role in women's career advancement. Women in male-dominated industries such as engineering can benefit from having a senior male mentor: those who have had such mentors report a higher level of satisfaction with the progression of their careers, and were more likely to be partners or senior executives than male employees with senior male mentors. Male mentors play an important role in the Emerging Women Leaders (EWL) program in Panama. This program actively shapes the mentor-mentee relationships with the use of a guide that illuminates issues of gender and power dynamics, and works to mitigate the risks of sexual harassment. Many senior managers, and even vice-ministers, have participated in this program as mentors.

Another key strategy is facilitating access to professional networks: here, sector-specific, international networks can help guide women in STEM, as well as infrastructure entities that are seeking to retain, support, and advance women's careers. Despite the increasing use of women's networks within organizations and companies, there has been relatively little research to examine their potential impact on women's career advancement, and the available research is mixed. In fact, one study found that a women's network in a Fortune 500 company failed because it simply replicated the organization's patriarchal culture—the very culture that was already hindering the career advancement of women.

Make the Transition from Insights to Implementation

Stepping up women's careers in the infrastructure sectors requires a wide range of practical actions within organizations. The first crucial steps in beginning the change process by initiating dialogue and building buy-in within the organizational leadership. Leaders who demonstrate a genuine understanding of the importance of women's participation in the workforce can encourage others to take the goal of gender

equality seriously. Transformational leaders can articulate clear and meaningful goals; encourage employees to rise above their self-interest to support collective goals; and communicate this vision to a broad set of stakeholders. It is important to engage other decision makers and champions too, since while senior leaders can make institutional commitments, it is in the departments and among employees that day-to-day change will actually happen.

The next steps are to gather sex-disaggregated data, conduct analyses, and develop an evidence base. These data will provide insight into the areas of challenge, as well as those areas best suited for intervention. Hiring gender experts, reviewing secondary data sources on gender equality, gathering sex-disaggregated institutional data on women's participation at all job levels, and digging deeper with the use of qualitative interviews are all strategies that infrastructure organizations can use to help advance women's employment. An important next step is using this information to shape an action plan with specific objectives and targets.

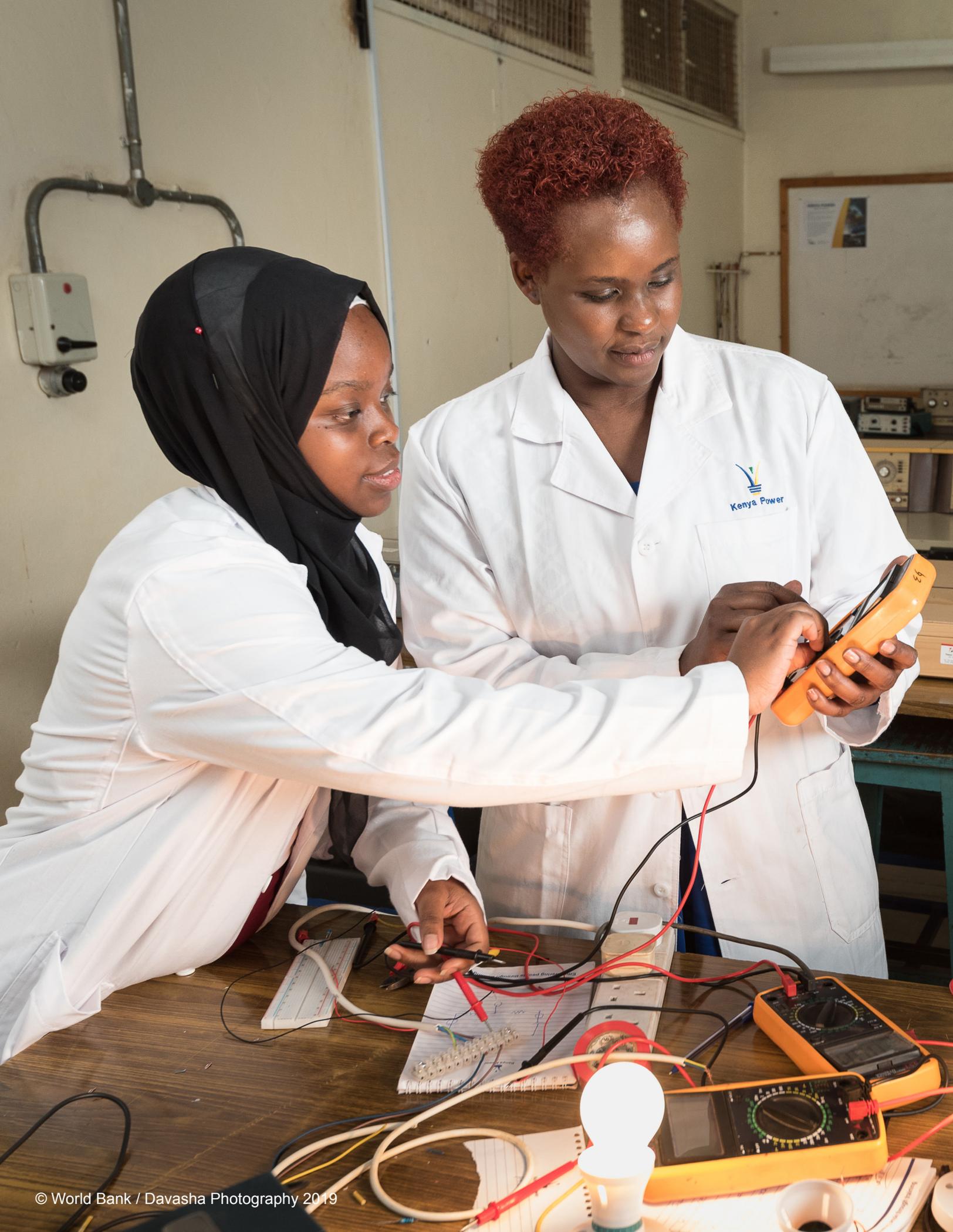
Closing large employment gender gaps takes time, and requires resources. The costs include hiring experts or consultants to deliver

a baseline assessment; designing mentorship programs; earmarking funds for STEM scholarships; building or installing new facilities; and purchasing additional gear for women, among other measures. Capturing the results achieved, with a particular focus on the effect on women's employment, promotes accountability and should be considered.

STEPPING UP TO THE CHALLENGE

Around the world, infrastructure organizations that are engaged in opening up opportunities for women in STEM jobs and leadership positions are making a commitment to transforming their overall policies, and adopting comprehensive measures to fundamentally change their structure and culture.

These changes can create better and more fair working conditions for both women and men, and can have broad positive effects on performance—enabling women and men in infrastructure employment to finally compete on an equal footing—bringing about widespread benefits for employers, employees, and society overall as well.



CHAPTER 1

LAYING THE FOUNDATION

Infrastructure provides the vital support needed for the socioeconomic development of countries: indeed, it is the very backbone of development. Roads and railways give people a way to travel to work, go to school, and access health services. Electricity allows people to power, heat, and cool their homes; the water infrastructure provides access to safe sanitation; and telecommunications infrastructures give them access to the Internet. Developing, operating, and upgrading infrastructure can increase economic activity in many ways, including job creation. And once in place, a functioning infrastructure supports economic productivity by enabling the efficient exchange of goods and services.

Increasingly, infrastructure entities are recognizing that promoting greater gender equality in the workplace can result in multiple benefits for their businesses, including improvements in financial performance, innovative capacity, operating efficiency, and community relations.

And yet, the workforce in the infrastructure industries remains highly male-dominated.

Occupational sex segregation contributes to gaps in economic opportunities between women and men. Women are overrepresented in fields like health and education, and underrepresented in fields such as science, engineering, technology, manufacturing, and construction. They are also underrepresented in senior management:

they are more likely to work in administrative and support departments like customer service and human resources. This often results in women holding jobs that pay less, and that offer fewer benefits, and opportunities for advancement. Indeed, the data show that while women often have higher levels of education than men, they tend to earn less on average (Das and Kotikula 2019).

Employment in skilled jobs in the infrastructure sectors typically offers competitive salaries, benefits, and a discernible career path. These jobs are generally higher-paying, with lower unemployment rates than other jobs that require a similar level of education; and they are more widely distributed geographically. Creating a better balance in the labor market by reducing occupational sex segregation can create a “virtuous cycle,” in which increased levels of female participation in male-dominated sectors can expand women’s networks and shift institutional norms. Getting more women in the door can also change societal gender norms about the kinds of careers that are “appropriate” for women, and those in which women can excel (Das and Kotikula 2019).

This section reviews the data, and the business case for advancing women’s STEM employment in infrastructure, and presents the analytical framework for this study.

WHY PROMOTE WOMEN'S STEM EMPLOYMENT IN INFRASTRUCTURE?

The infrastructure sectors employ many people both directly and indirectly. Investment in infrastructure represents approximately 3 percent of the global gross domestic product (GDP), driven mainly by spending on electricity and roads. If

current trends continue, investment in global infrastructure is projected to reach US\$3.8 trillion by 2040 (Global Infrastructure Hub 2018). An International Finance Corporation (IFC) analysis found that 6.6 percent of the labor force in low- and middle-income countries is employed in transport and communications, while approximately 1.1 percent is in electricity and water (IFC 2012).

What Do the Data Tell Us?

Global studies indicate that women are underrepresented in the infrastructure sectors, particularly in STEM occupations. Studies in the water, energy, transport, and mining sectors have shed light on the share of women's workforce participation in infrastructure industries, as follows:



Water. An International Water Association (IWA) study on water utilities in 15 low- and middle-income countries found that, on average, only 17 percent of staff in the water sector is female (IWA 2014). Similarly, a 2019 World Bank study that surveyed 64 water and sanitation utilities in 28 economies found that women comprise an average of only 18 percent of the workforce in water utilities (World Bank 2019c). In addition, 2015 data of the International Benchmarking Network for Water and Sanitation Utilities, which includes 222 water utilities, show that only 24.5 percent of the workforce is women.



Energy distribution. An energy distribution study conducted by the United States Agency for International Development (USAID), which covered 14 utilities, found that women comprise an average of just 13 percent of the workforce, ranging from 1 percent in Pakistan to 30 percent in Ukraine (USAID 2016a).



Renewable energy. An online survey of wind, solar, and wave-power companies conducted by the International Renewable Energy Agency (IRENA) found that for the nearly 90 respondent companies from more than 40 countries, women represent 32 percent of the workforce (IRENA 2016).



Urban public transport. In the European Union (EU), women account for an estimated 17.5 percent of the workforce in urban public transport; however, they hold less than 10 percent of the technical and operational jobs (Women Employment in Urban Public Transport Sector 2012).



Airlines. Although their participation rate varies, women tend to be underrepresented in STEM jobs in the airline industry (pilots, technicians, engineers). For state-owned airlines in Singapore, South Africa, and Ethiopia, women's workforce participation is 52 percent, 50 percent, and 30 percent, respectively (Singapore Airways 2018; South African Airways 2017; Ethiopian Airlines 2017). Data for the United Kingdom and the United States indicate that just over 4 percent of airline pilots are women; this share is growing, but quite slowly. According to the International Society of Women

Airline Pilots, the three largest airline companies in the U.S. have the highest number of women pilots, while India's low-cost carrier IndiGo has the highest proportion (13.9 percent) (Centre for Aviation 2018). However, consistent global data on women airline pilots do not exist. And as of 2014, women comprised only 25 percent of aerospace engineers (Marcus 2014).



Maritime sector. The gender gaps are even more pronounced in the maritime sector, where women comprise just 2 percent of the global workforce (International Transport Workers Federation n.d.).



Oil and gas. A recent global study covering 38 companies with a collective revenue of US\$1.9 trillion found that only 22 percent of jobs in the oil and gas industry are held by women, even though the overall rates of female labor force participation in the countries studied far exceeded this percentage (Rick, Marten, and Von Lonski 2017). In the United States, women hold 30 percent of STEM degrees, but constitute only 14.5 percent of the labor force in oil and gas (DePillis 2017).



Mining and extractives. Recent studies show that women are underrepresented in the mining and extractives sector as well, at just 17.9 percent for Canada (in 2018), 14.3 percent for Australia (in 2015), and 13.8 percent for the United States (in 2018) (Catalyst 2019; The Advocates for Human Rights 2019).

Available data, mostly from middle- and high-income countries, suggest that women are also underrepresented at the senior management level of infrastructure industries. In middle- and high-income economies, women account for about 35 percent of staff roles across all sectors, with the highest share working in transport. The transport sector also has the highest share of women working in senior roles (13 percent), and as chief executive officers (CEOs) (9 percent); however, these figures also show that women's advancement in the transport sector remains a challenge. Information and Communication Technology (ICT) has the highest share of women working in junior roles (32 percent), while energy has a relatively high share of female board members (32 percent). although there were no female CEOs represented in the sample (Table 1).

Women's representation in leadership positions varies by region as well as by industry. Across 14 African countries, women account for the highest share of senior managers in telecommunications, media, and technology (33 per-

cent), and the lowest share in heavy industry (9 percent); in fact, in middle-management roles, women had zero percent representation in heavy industry (WEF 2016) (Figure 1).

In the power and utility industry, women's representation in leadership positions has improved in recent years, but the amount of improvement varies from region to region. The Index of Women in Power and Utilities, which is based on a survey of the top 100 power and utility companies by revenue, found that the percentage of women in senior management teams rose from 3 percent in 2009 to 15 percent in 2014 (EY Global 2019); yet across regions, women were still underrepresented (Figure 2).

Overall, women hold fewer technical STEM jobs in large economies; but they may outnumber men in certain countries or sectors. In Brazil, China, and India, the data show that women are disadvantaged when it comes to jobs in engineering and research and development. In information technology, they are also disadvantaged

Table 1 Women's Percentage Share in the Infrastructure Workforce, by Industry

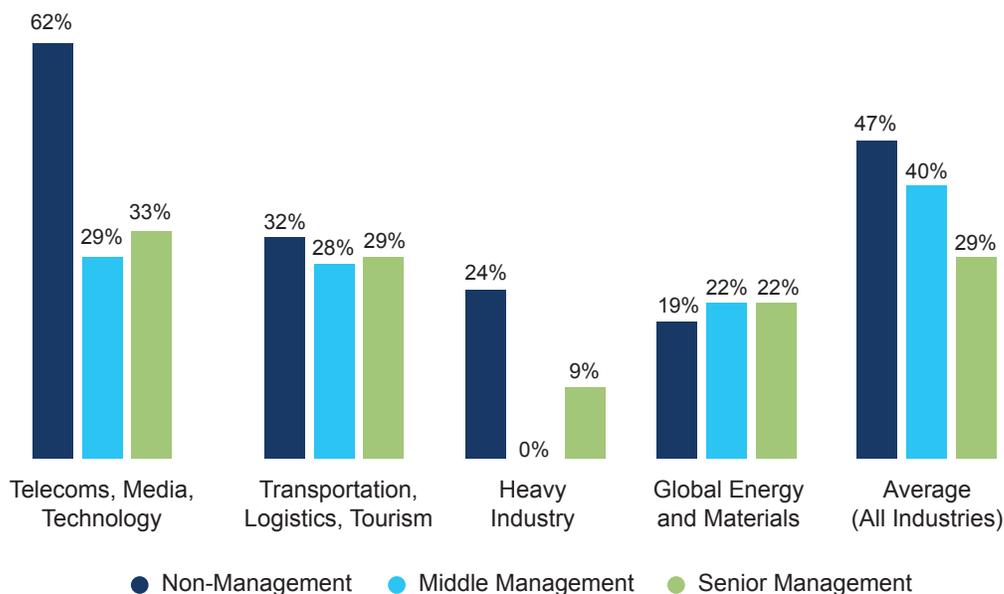
Industry Group	CEO	Board Member	Senior Role	Mid-Level Role	Junior Role	Line Role	Staff Role
Basic and Infrastructure ^a	2	35	9	13	22	14	20
Energy ^b	0	32	11	19	24	19	22
ICT ^c	5	19	11	21	32	23	33
Mobility ^d	9	17	13	21	28	25	34
Industries Overall	9	28	15	24	33	30	35

Source: World Economic Forum 2016.

Note: The dataset is from a 2015 survey with chief human resource officers of 371 companies representing more than 13 million employees in 15 middle- and high-income economies. The countries and regions covered in-depth included the Association of Southeast Asian Nations (ASEAN), Australia, Brazil, China, France, Germany, the Gulf Cooperation Council (GCC), India, Italy, Japan, Mexico, South Africa, Turkey, the United Kingdom, and the United States.

- a. Refers to Chemicals, Mining and Metals, Infrastructure, and Urban Development.
- b. Refers to Energy Utilities and Technology, Oil and Gas, and Renewable Energy.
- c. ICT = Information and Communication Technology.
- d. Refers to Aviation and Travel, Automotive, and Supply Chain and Transportation.

Figure 1 Women's Representation in Selected Infrastructure Industries in 14 African Countries



Source: Moodley et al 2016.

Note: Heavy industry refers to construction, heavy equipment, and automotive manufacturing.

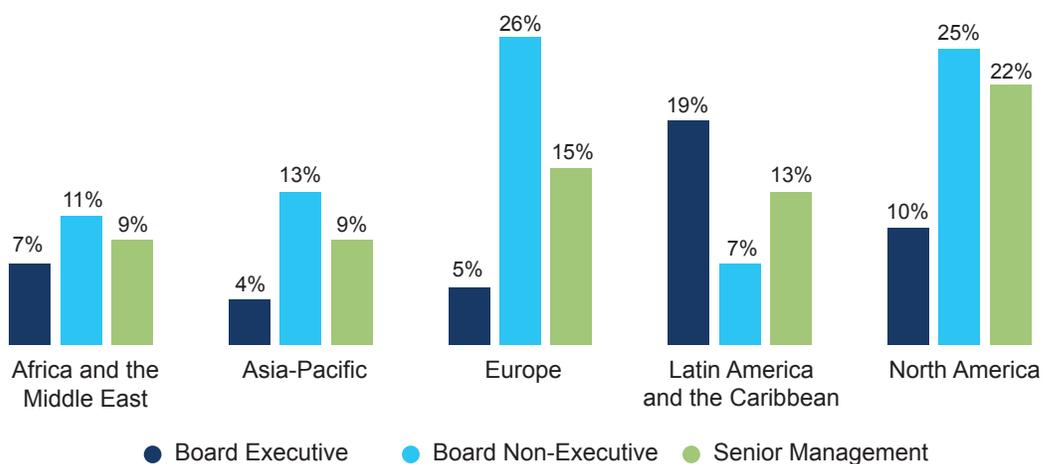
in Brazil and China; but they vastly outnumber men in India, according to the Mercer data sample (Figure 3).

What is the Business Case for Gender Equality?

Mounting evidence suggests that removing constraints to better jobs for women has transfor-

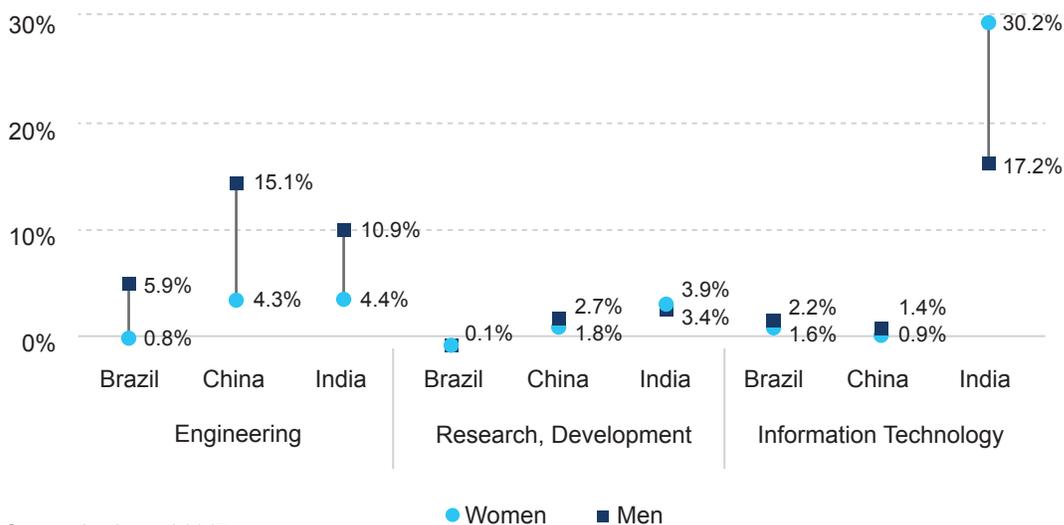
mative social, economic, and financial benefits. Economies are more likely to grow when women and men fully participate as employees, entrepreneurs, consumers, caregivers, and leaders (World Bank 2015b). A 2018 report covering 141 countries found that the loss in human capital wealth due to gender inequality was approximately US\$160.2 trillion, assuming that women would earn as much as men (Wodon and de la

Figure 2 Women’s Share of Leadership Positions in the Power and Utility Industry by Region, 2019



Source: EY Global 2019.

Figure 3 Women’s Share of Job Family, by Country



Source: Levin et al 2017.

Brière 2018). Studies have also shown that with greater female participation in the workforce, GDP increases. The McKinsey Global Institute has calculated that if women's participation in the economy were on par with that of men, annual GDP would increase by 26 percent in 2025 as compared to a 2015 baseline (McKinsey Global Institute 2015). Furthermore, enhancing women's

control over their resources, whether household resources or their own earnings, helps improve outcomes for the next generation through spending that benefits children (World Bank 2012b).

A growing body of literature strongly supports the business case for gender equality in the workplace. There are many benefits to companies and institutions, including the following:



Better financial performance. Firms with more women in leadership roles often demonstrate better performance, especially during periods of economic volatility; they also show a greater ability to minimize high-risk transactions and serve markets dominated by women. A 2011 study of Fortune 500 firms found that in terms of return on sales, companies with a sustained high level of representation of women board directors outperformed those that had sustained low representation, by 84 percent; they also outperformed 60 percent for return on invested capital; and 46 percent for return on equity (Wagner 2011).¹ A McKinsey & Company study of 345 firms across six countries in Latin America and the Caribbean (LAC) found that firms with one or more women on the executive committee had 44 percent higher returns on equity than those without women (McKinsey & Company 2013). A study of 14 African countries found that companies with at least 25 percent women board directors had an earnings before interest and taxes margin—a key indicator of profitability—that was 20 percent higher on average (Moodley et al 2016). And in the energy sector, utilities with a larger share of women board directors have a higher return on equity than those with less diversity (Ernst and Young 2016).



Greater innovation. A study of 4,277 companies in Spain found that companies with more women were more likely to introduce innovations in the market over a two-year period (Díaz-García, González-Moreno, and Sáez-Martínez 2013). The research also suggests that women score as well or better than men on key innovation capacities, including in taking initiative; inspiring and motivating others; and championing change (Folkman 2015).



Improved employee retention. McKinsey & Company found that among companies that invested in attracting, retaining, and developing female talent, 64 percent reported increased employee productivity and retention, and 57 percent reported a greater ability to attract talent (McKinsey & Company 2010). And because recruiting and training new employees is costly for companies, a lower rate of employee turnover can lead to both savings and improved productivity.



Improved service delivery. A study by the Organisation for Economic Co-operation and Development (OECD) on the public sectors of 26 EU countries found that workforce diversity can improve public-service quality and efficiency gains; increase policy effectiveness; enhance social mobility; and contribute to advancing the reform agenda (OECD 2009).



Safer operating environment. Studies have demonstrated that female employees are often more likely to follow safety protocols, treat equipment responsibly, and safely operate equipment (IFC 2013).

1. Firms with with three or more women board directors in at least four out of five years.



Better outcomes for sustainability and compliance. Companies with more gender-balanced senior leadership— particularly women-owned businesses—often rank higher on key environmental, social, and governance risk management indicators (OECD 2016a). Companies with more gender-balanced senior management also tend to have greater public accountability and compliance with international conventions or national legislation (IFC 2018).



Improved community relations. Gender equality in the workforce is correlated with improved community relations (Di Miceli and Donaggio 2018). A Catalyst and Harvard Business School study of Fortune 500 boardrooms found that companies with gender-inclusive teams contributed more charitable funds, on average, than companies without such teams (Soares, Marquis, and Lee 2011).

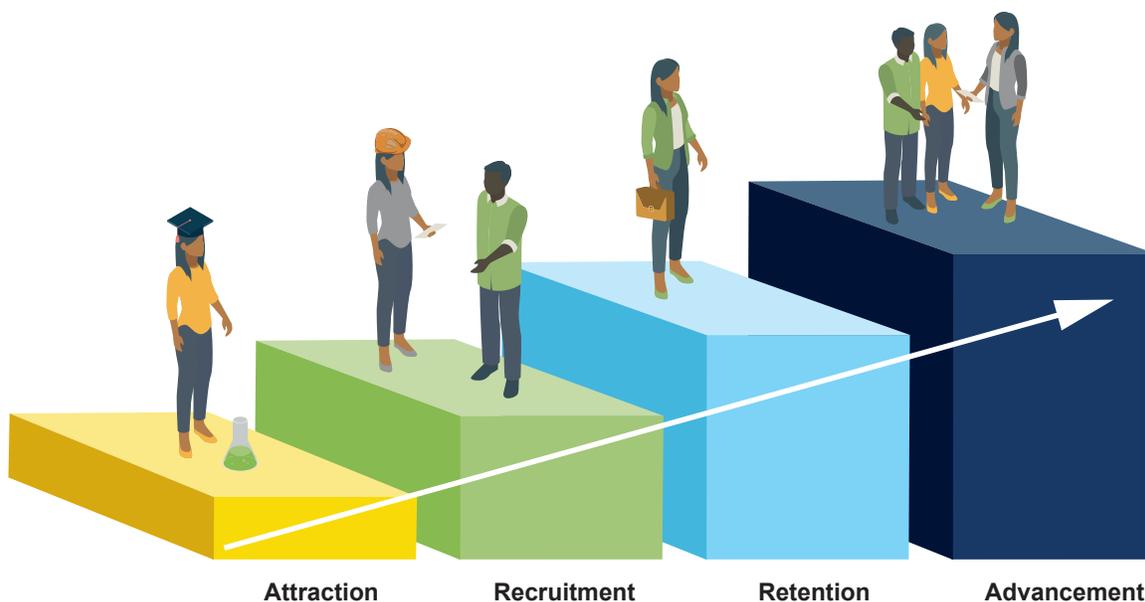
PURPOSE AND FRAMEWORK

This report provides the World Bank Group’s operational staff, clients, and partners with a global review of a variety of promising approaches that are currently being used to advance women’s employment in STEM occupations in the infrastructure sectors. The

approaches are organized into four stages along the career pathway: (i) attracting candidates to the sectors; (ii) recruiting the best possible talent; (iii) ensuring employee retention; and (iv) providing female employees with opportunities for career advancement (Figure 4).

The report casts a wide net in order to learn from good practices being used in a variety of

Figure 4 Framework to Address Barriers to Women’s STEM Employment in Infrastructure Sectors



infrastructure sectors that share common organizational, institutional, and operational characteristics. Led by the Energy Sector Management Assistance Program (ESMAP) (Box 1), the report does not limit its analysis to the energy sector alone. Rather, it explores a range of infrastructure sectors that fulfill basic human needs—for example, drinking water, communication, and transport—and that are classified as services provided or mandated by public authorities, of municipalities, or of the state. These services are characterized by a high degree of regulation, which is often the dominant role of the public sector.

A large proportion of the workforce in these sectors consists of engineering and other STEM-based jobs (Table 2). Given that these occupations are highly male-dominated, the barriers to attracting, recruiting, and retaining talented women in the full range of roles at all levels share some elements across the infrastructure sectors, and thus require similar approaches.

This report is not intended to serve as an operational guidance note; rather, it sets the stage for World Bank project teams and country counterparts to test, refine, and evaluate the

BOX 1 ESMAP's Gender and Energy Program



The ESMAP Gender and Energy Program is helping to strengthen women's roles as consumers, employees, and entrepreneurs in the energy sector. Aligned with the World Bank Group's Gender Strategy, ESMAP works with countries to design interventions and generate crucial knowledge of the actions needed to close gender gaps in the energy sector, and improve development outcomes.

Six regional programs have been established to enable the World Bank to better respond to the specific gender equality challenges and opportunities of each region. A focus on gender equality has also been integrated across ESMAP's other work areas, including geothermal energy; mini-grids; energy efficiency and behavior change; clean cooking; and battery storage. To achieve such results, ESMAP combines global knowledge work with support for country activities such as:

- Collecting and generating data on key gender gaps, in order to strengthen the analysis and design of actions and indicators (for example, energy-access rates by household heads, and rates of labor force participation).
- Testing innovative approaches, and providing technical support for the advancement of women's employment, and the productive use of energy.
- Designing approaches for closing gender gaps through World Bank policy dialogue and lending.
- Capturing and disseminating lessons learned from the knowledge work, to improve the design of future energy projects.
- Building a network of strong partnerships across sectors and external stakeholders, to enhance the impact of work on gender equality.

Table 2 Indicative STEM and Related Occupations in the Infrastructure Sectors

Infrastructure Sector	Occupations that Use Science and Engineering Skills	Related Occupations
General	<p>Technicians: Chemical and Physical Sciences; Civil, Electrical, Electronics, Mechanical, Mining and Metallurgy, and Industrial and Production Engineering</p> <p>ICT Technicians: Operations, User Support, Computer Network and Systems</p> <p>Other ICT Specialists: Systems Analysis, Software Development, Web and Multimedia Development, Applications Programming, Database Design and Administration, Computer Programming</p> <p>Other Disciplines: Physics; Chemistry; Mathematics, Actuarial Science and Statistics; Biology, Botany, and Zoology; Farming, Forestry, and Fisheries; Other Sciences</p>	<p>Technicians: Process Controllers; Life Scientists; Metal Production Process Controllers; Safety, Health, and Quality Inspectors</p>
Management	<p>Managers: Research and Development (R&D), Agricultural and Forestry Production, Mining, ICT Services, Engineering</p>	<p>Senior Government Officials, Managing Directors, Chief Executives</p>
Energy & Extractives	<p>Professions: Renewable Energy Engineering, Material Sciences R&D, Modeling, Physics, Geology, Geophysics</p>	<p>Operators: Power Production, Petroleum and Natural Gas Refining Plants, Control Rooms, Geographical Information Systems</p>
Transport	<p>Professions: Engineering, Ship Engineering, Aircraft Piloting, Air Traffic Control, Air Traffic Safety, Electronics, Telecommunications, Ship and Aircraft Control</p>	<p>Operators: Railroads, Ports</p>
Water	<p>Professions: Drafting, Water Quality, Hydrology</p>	<p>Operators: Incinerator and Water Treatment Plants</p>

Source: Draws from ILO 2012.

Note: This list of occupations is not exhaustive.

approaches presented here. The report gathers insights from the low- and middle-income countries that fall within the World Bank Group's operational purview, and focuses on public sector entities, which are often World Bank clients; these entities include state-owned enterprises (SOEs), utilities, and road authorities, as well as ministries of public works, communications, transport, urban development, energy, the environment, and water, among others. In cases where public sector insights are lacking, the report describes experiences from the private sector. Similarly, approaches from high-income countries have been included when examples from low- and middle-income countries are limited.

We have drawn on a wide range of sources, including a comprehensive literature review; a stocktaking exercise of initiatives by a diverse set of organizations; interviews with field experts; and detailed case studies. Our extensive desk review included more than 300 documents and papers. Peer-reviewed articles were included

when available. In cases where the academic literature is lacking, we have used reports and studies to fill the gaps. The overall goal of this report is to provide a springboard for building a more rigorous evidence base moving forward.

Our global stocktaking exercise mapped more than 150 initiatives and organizations. Interviews were conducted with 28 global experts, and staff from international development organizations.

Finally, a set of five case studies provides detailed accounts of some of the initiatives that infrastructure entities have undertaken in order to address key barriers to women's STEM employment (Box 2).

Globally speaking, it is clear that few systematic measures are being undertaken to close the gender gaps explored in this report. Many of the case studies featured in this report are only at the pilot stage, or are still under implementation. With only preliminary results in, it is difficult to predict what the effectiveness of these early initiatives will be when brought to scale. However,

Box 2 Case Studies on Promoting Women's STEM Employment Along the Career Pathway



Attraction, Recruitment, Retention, and Advancement: Energizing Equity in Talent: The Case of Equal Opportunities in EVN Macedonia, A Partner of Engendering Utilities, USAID (See Box 4)

Recruitment: Bridging the Skills Gap in the Water Sector: Women's Scholarship Pilot in Lao PDR, Lao People's Democratic Republic, Department of Water Supply (See Box 7)

Retention: Addressing Domestic Violence in the Workplace to Improve Business Outcomes: The Case of Solomon Water, Member of the IFC-led Waka Mere Commitment to Action (See Box 11)

Recruitment, Retention, and Advancement: Institutionalizing Gender Equality in Project Design: The Case of the Ethiopian Electric Utility (See Box 15)

Advancement: Investing in Women's Leadership in Male-Dominated Sectors: Panama's Emerging Women Leaders Program, IDB-supported PROLEAD network (See Box 18)

this report, which describes both the challenges encountered, and promising practices being discovered, including ways to mobilize resources, can help to establish the foundation for more rigorous future research.

ORGANIZATION OF THIS REPORT

This report is divided into four sections. Drawing on our extensive literature review, Section 2 dis-

cusses the main barriers and bottlenecks that women in infrastructure sectors face at each stage of their career pathways. Section 3 presents some of the promising interventions and approaches for overcoming these barriers. And Section 4 offers practical guidance for infrastructure organizations and World Bank project teams who are seeking to advance women's STEM employment in the infrastructure sectors.



CHAPTER 2

BARRIERS ALONG THE PATHWAY

The pathway to women's employment in STEM careers within the infrastructure sectors includes four main stages: attraction, recruitment, retention, and advancement.

- **Attraction** refers to the early-stage processes that help to build women's interest, aspirations, and self-efficacy in developing STEM skills. The quality of girls' educational experiences are critical for encouraging their participation in STEM careers and jobs in the infrastructure sectors later on.
- **Recruitment** refers to both the formal and informal procedures used by an organization to find and hire employees and firm contractors with the desired qualifications.
- **Retention** refers to the ability of an organization or sector to keep its female recruits, and help them thrive.
- **Advancement** refers to the progression from jobs to careers—and often into meaningful leadership roles—and to the ability of employees to realize their full potential within an organization.

A metaphor frequently used to describe the fact that women are underrepresented in STEM careers is the “leaky pipeline.” Although girls often perform as well as or better than boys in math and science at the primary and secondary levels, by the tertiary level they are underrepre-

sented in some STEM subjects, particularly in engineering and computer science. Many who opt to study these subjects do not ultimately work in these fields. And those who do sometimes leave their careers due to dissatisfaction with the workplace culture, the lack of advancement opportunities, or work-life balance issues, among others.

Multiple overlapping dimensions that interact in complex ways influence women's education, employment, and their progression in STEM careers. These factors can be broadly divided into three levels: individual; institutional; and societal.

Individual-level factors encompass psychological factors like self-efficacy, interest, and aspirations; human capital barriers (life and professional skills); socioeconomic dimensions (parental levels of education and occupations); and social factors (for example, peer influences).

Institutional-level factors pertain to the formal structures within which individuals operate, such as learning environments, including curricula and teaching strategies; formal workplace policies; and the gender biases and norms within organizations.

Societal-level barriers include laws and policies, as well as broader social and gender norms, such as attitudes and gender stereotypes.

These three types of factors often overlap and interact with, influence, and reinforce each other, producing cumulative effects.

This section discusses the main barriers and bottlenecks that women face at each stage of the STEM career pathway in the infrastructure sectors (Table 3).

ATTRACTION

Since the 1990s, the world has made good progress in closing gender gaps in education. At the primary level, girls and boys now complete school at about the same rate, with similar

Table 3 Barriers to Women’s STEM Employment in Infrastructure along the Career Pathway

	Type of Barrier	Societal	Institutional	Individual
Attraction	Gender stereotypes and biases, including among educators and in educational materials	X	X	
	Lack of self-efficacy, interest, and aspirations			X
Recruitment	Legal barriers to the nature and type of work	X		
	Gender biases in the hiring process		X	
Retention	Lack of flexible work arrangements	X	X	
	Care responsibilities	X	X	
	Gender wage gaps	X	X	
	Biases in the workplace		X	
	Sexual harassment risks	X	X	
	Workplace facilities unfit for meeting the needs and occupational safety of female workers		X	
Advancement	Lack of sponsors and mentors		X	
	Limited professional networks		X	
	Few opportunities for effective training		X	
	Exclusion from opportunities for advancement and leadership		X	

Note: These barriers are not comprehensive, and can vary by country, sector, industry, and infrastructure organization.

trends at the secondary level.² At the tertiary level, women actually outnumber men, with gross enrollment rates of 40.6 percent for females, compared to 35.6 percent for males (World Development Indicators, 2018 figures).

Yet, despite this progress, women are still underrepresented in some STEM subjects. Data collected by the UNESCO Institute for Statistics for 115 countries and dependent territories revealed that only 30 percent of female students in higher education were choosing STEM-related subjects (UNESCO 2017). However, these global aggregates mask country differences (Figure 5).

Overall, educational streaming is evident, with women overrepresented in health and education, and men dominating in the engineering and technology fields. In the subfield of engineering, manufacturing, and construction, female student enrollment is just 7 percent, compared to 22 percent for men. In information and communication technology, these figures stand at 3 percent for women versus 8 percent for men (UNESCO 2017) (Figure 6).

Although technical and vocational education and training (TVET) is largely outside the scope of this study, it should be noted that young women are sometimes underrepresented in these training programs. Available data suggest that the South Asia and Middle East and North Africa regions have the largest gender gaps, with young women representing 22 percent and 41 percent of students, respectively.³

There is also occupational segregation within TVET fields, with men dominating higher-paying fields like mechanics, construction, and electronics, and women participating at higher rates in tailoring, business studies, and food services. Despite the promise TVET offers for improving

productivity, labor market inclusion, and support for the school-to-work transition, the success of these programs varies widely. Evidence from the Africa region shows that challenges related to quality, lack of practical training, outdated technology, and limited labor market demand remain (Arias et al 2019).

Unfortunately, efforts to close gender gaps in education and to increase girls' enrollment as STEM majors have not yet translated into higher labor force participation by women in STEM infrastructure fields. One study in the United States found that women comprise 20 percent of engineering graduates but account for only 11 percent of the engineering workforce (Fouad and Singh 2011). Similarly, in Canada less than half of women graduates with a STEM degree go on to work in STEM-intensive occupations (Council of Canadian Academies 2015).

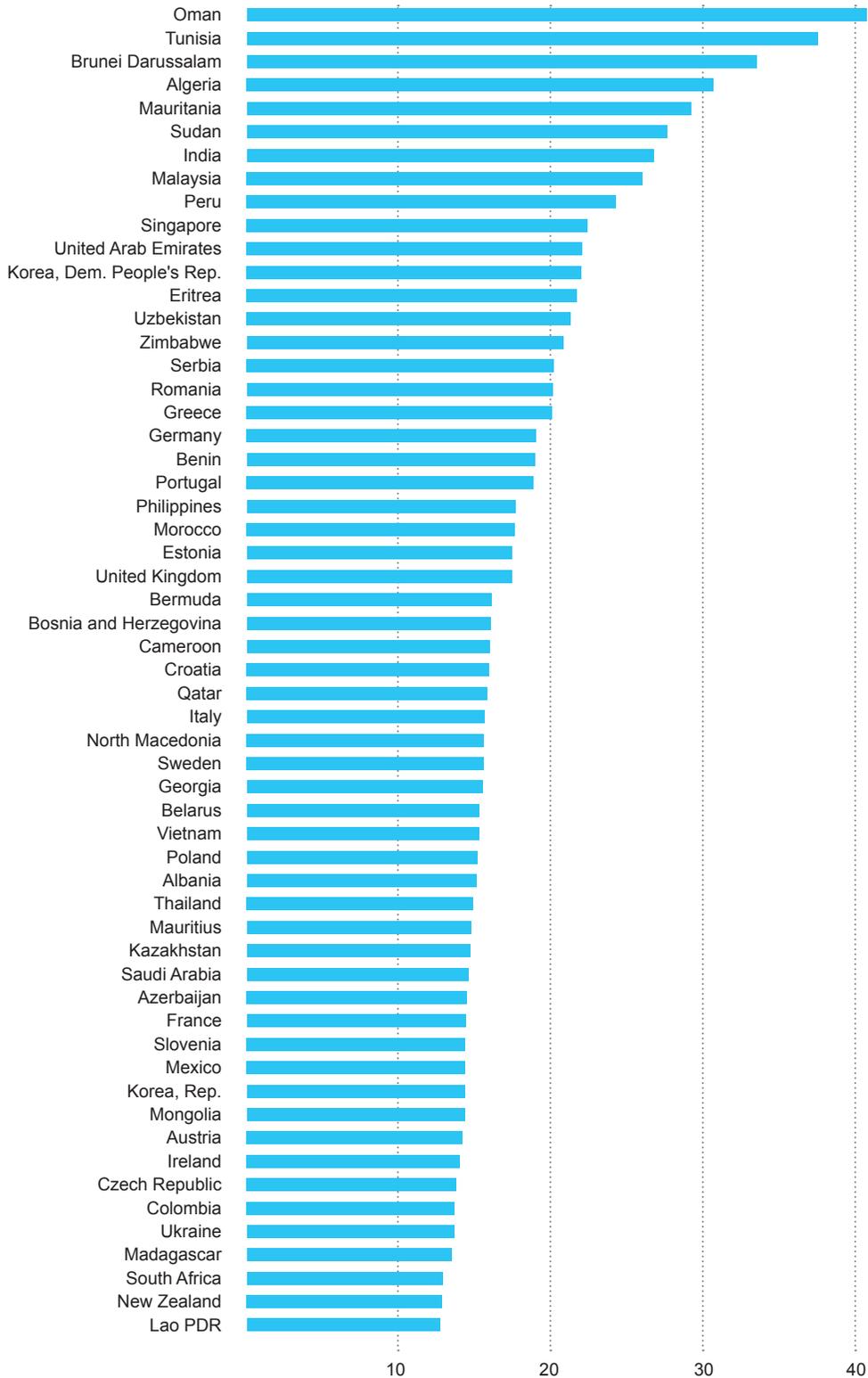
For this report we have summarized the barriers to attracting women to STEM fields in three main areas: (i) gender stereotypes and biases; (ii) self-efficacy, aspirations, and interests (which are often influenced by gender stereotypes); and (iii) educational system and school-level factors (teachers, teaching strategies and practices, and curricula and learning materials).

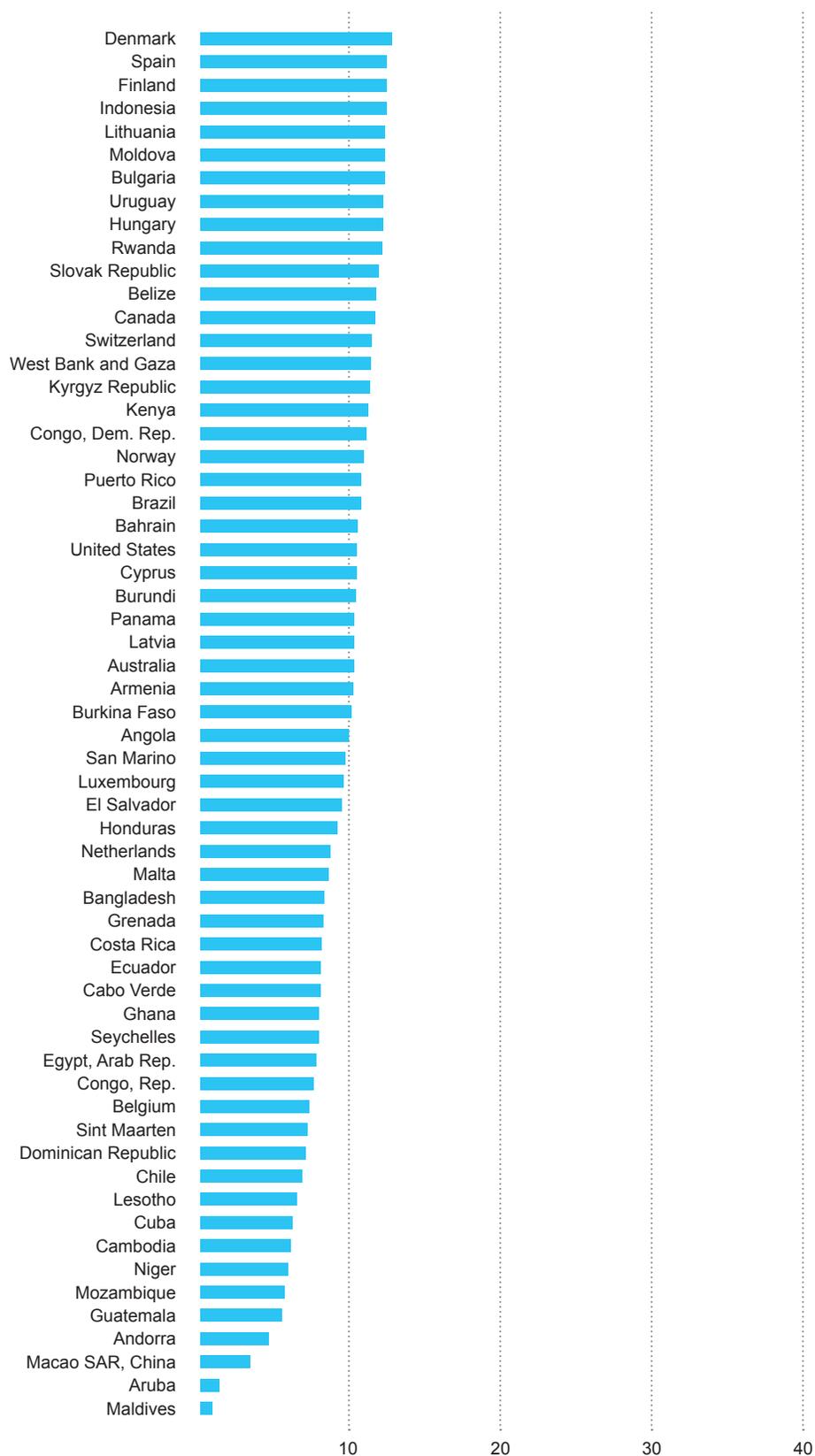
Gender Stereotypes and Biases

Gender stereotypes and biases are strongly associated with the gender gap in STEM careers. While individual differences in the preference for certain types of work certainly play a role in career decisions, gender norms also affect peoples' opinions about which jobs are appropriate and suitable for women. Gender stereotypes often perpetuate the notion that infrastructure work is unsuitable for women, or that

2. Primary level completion rates: 89.3 percent for girls, and 89.9 percent for boys. Lower secondary completion rates: 76.0 percent for females; 75.3 percent for males. World Development Indicators. 2018 figures.
3. Percentage of Students In Upper Secondary Vocational Education Who Are Female. 2017 figures. East Asia and the Pacific (43 percent); Europe and Central Asia (45 percent); Latin America and the Caribbean (50 percent); Sub-Saharan Africa (43 percent). World Bank Gender Data Portal. <https://datatopics.worldbank.org/gender/>

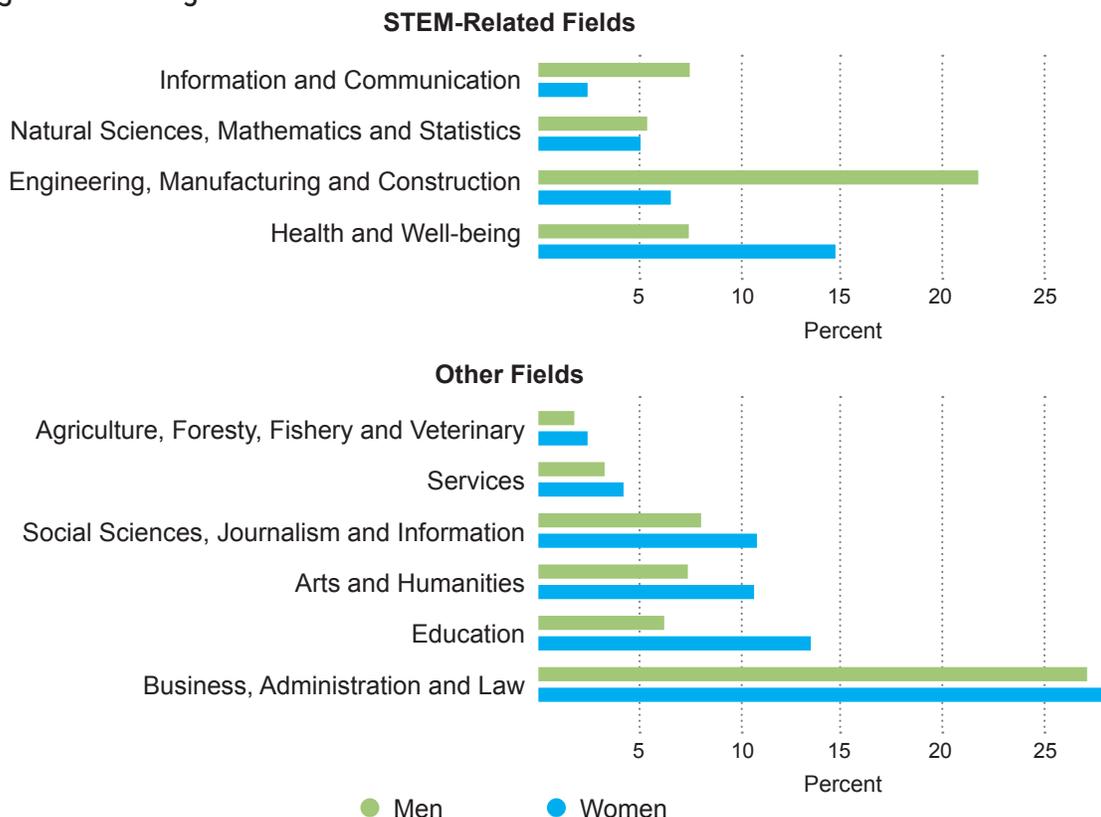
Figure 5 Percentage of Female Graduates from STEM Programs in Tertiary Education, 2015-2018





Source: World Bank Gender Data Portal

Figure 6 Distribution of Male and Female Students Enrolled in Higher Education by Field of Study



Source: UNESCO Institute for Statistics data for 2014–16 (UNESCO 2017).
 Note: 110 countries and dependent territories.

they are incapable of performing well in it; and the nature of the work in infrastructure-heavy industries is often perceived as too dirty or too dangerous for women. These designations have been assigned, in part, by the presumed roles and abilities of women and men; and these associations tend to affirm stereotypes concerning the roles of women and men in society (Akerlof and Kranton 2010).

These stereotypes are evident across societies. Half a million Implicit Association Tests taken by individuals at an average age of 27 across 34 countries showed that 70 percent of the test takers demonstrated a tendency to associate “male” with science and “female” with liberal arts: and in countries where this stereotype was prevalent, boys tended to perform better in math

and science at the secondary level (Nosek, Smyth et al 2009).

Parents also contribute to gender stereotyping. For example, data on parents’ attitudes and perceptions from a variety of countries, including Chile, Croatia, Germany, Hungary, Italy, Korea, Mexico, and Portugal reveal that in all of these economies, parents were more likely to expect their sons rather than their daughters to work in a STEM field (OECD 2015).⁴

The dearth of female role models in STEM occupations can reinforce gender stereotypes, and further reduce young women’s interest in pursuing STEM careers. This is particularly pronounced in technical infrastructure occupations, which are filled by very few women overall

4. Program for International Student Assessment (PISA) 2012 figures.

(Jalal 2014; Turnbull 2013). And without early support focused on STEM subjects from female teachers, female role models, and the broader learning environment, secondary-age girls are unlikely to choose nontraditional educational pathways, or occupations that are perceived as conflicting with family life (OECD 2015). At the tertiary level, the absence of female faculty and researchers may also influence young women's interest and educational outcomes in STEM (UNESCO 2017).

Exposure to female experts can have a positive impact on women's attitudes toward STEM careers (Stout et al 2011). In a global survey of 500 members of the Information Systems Audit and Control Association, 48 percent of the women identified an absence of female mentors as the main reason for a lack of women in technology jobs (ISACA 2016). Yet male role models can often play an important role as well, by encouraging women to enter and stay in male-dominated sectors thereby enabling higher earnings (Campos et al 2014; Alibhai et al 2017).

Self-Efficacy, Interest, and Aspirations

The internalization of stereotypes can also influence self-efficacy, which refers to an individual's judgment of one's ability to accomplish a specific task (Bong and Skaalvik 2003; Dasgupta et al 2015). This can play an important role in educational and career choices.

While the data overwhelmingly show that gender differences in math and science performance have converged, or even closed, women and girls still often underestimate their capabilities due, in part, to internalized perceptions about their competence in these subjects (Brown 2010). At the tertiary level of education, women have been found to underestimate their competence in math and, as a result, to opt out of quantitative majors (Correll 2001). And a study of American academics across the spectrum of disciplines found that women are underrepre-

sented in fields whose practitioners believe that innate talent is the main requirement for success, because many women do not believe they possess such talent (Leslie et al 2015).

Some researchers have found that male engineers have higher measures of self-efficacy than women (Vogt, Hocevar, and Hagedorn 2007). However, this is not always the case: other findings have identified no statistically significant difference between female and male engineers in this regard (Concannon and Barrow 2009).

A sense of belonging also influences self-efficacy. One study that focused on the representation of women in mathematics found that a lack of feeling a sense of membership and acceptance in this field acts as a critical driver of the gender gap (Ellis, Fosdick, and Rasmussen 2016).

While not all young girls are deterred or influenced by these challenges, those who internalize widely-held stereotypes may have lower levels of confidence in their science and math abilities than boys, and may feel out of place in STEM subjects (UNESCO 2017). Not surprisingly, when classrooms have roughly equal numbers of women and men, or more women than men, female engineering students have higher levels of self-efficacy (Dasgupta, McManus Scircle, and Hunsinger 2015).

The classroom environment can also convey a sense of inclusion; girls reported higher levels of interest in enrolling in computer science classes when the academic environment did not reinforce gender stereotypes. In one experiment, a "stereotypical" classroom included Star Wars and Star Trek items, computer parts, and video games, while the "non-stereotypical" classroom included pictures of nature and art (Master, Sapna, and Meltzoff 2016).

Studies have shown that beliefs about individual capabilities are formed at an early age and continue into adulthood, and that they shape women's perceptions of their abilities in science,

math, economics, and physics (Nissen and Shemwell 2016). A small-scale longitudinal study in Sweden found that the career aspirations of youth were largely formed by age 13: this confirms the results of other research showing that it is progressively more difficult to engage students in science, or alter their perceptions of self-efficacy in specific subject areas as they grow older (Ardies and Gijbels 2015; Bandura et al 2001; Lindahl 2007).

Both families and peers play an important role in shaping girls' interest in STEM subjects, and this later influences the subjects they choose to study, as well as their career plans. A meta-analysis of gender differences in occupational interests that synthesized more than 40 years of evidence shows that consistently, over time and across age groups, men prefer working with things and women prefer working with people (Su, Rounds, and Armstrong 2009). Girls' interest in STEM fields is heavily influenced by their parents' expectations as well as those of their female peers. For example, in some contexts, parents have lower expectations of girls' abilities in mathematics, and place less value on their participation in science and mathematics (Stoet et al 2016; Tenenbaum and Leaper 2003). The presence of family members with STEM careers has also been shown to influence girls' pursuit of STEM studies (Tan et al 2013). Parents who are involved in STEM fields are likely to familiarize girls with STEM careers in ways that other role models cannot, and to debunk the perception that STEM occupations are difficult to combine with family life (Tenenbaum and Leaper 2003).

Peer relationships also affect children's beliefs, behaviors, academic achievements, and motivation, especially during adolescence. Studies have shown that the attitudes of girls' peers can significantly predict their own interest and confidence in both mathematics and science (Dasgupta and Stout 2014; Robnett 2013). Similarly, they might be discouraged from taking STEM subjects if their peers view these subjects as inappropriate for girls (Robnett and Leaper 2013).

Women sometimes choose not to enter STEM fields even when they perform well in science and math. A large international study found that in two-thirds of the countries with data, adolescent girls performed as well as or better than boys in science and math. Yet, in nearly all of the countries studied, among girls who appeared capable of college-level STEM study, few enrolled in it, opting instead for other tracks (Stoet and Geary 2018). Interestingly, the countries that are less gender-equal—as measured by the World Economic Forum's Global Gender Gap Index—had relatively higher shares of female graduates in STEM programs than those with greater gender equality (Stoet and Geary 2018). The authors hypothesize that in countries where economic pressures are more pervasive, girls are motivated to pursue relatively high-paying STEM occupations as a source of greater economic security. However, some researchers have challenged the findings of the study—the debate remains unresolved.

Within science-related fields, the career aspirations of girls and boys are different. A 2015 PISA study for OECD countries found that at age 15, 24 percent of girls and 25 percent of boys anticipated a career in science (OECD 2018). However, in a related study girls were three times more likely than boys to see themselves working as health professionals, while boys were twice as likely as girls to aspire to careers as engineers, scientists, or architects (OECD 2017).

The Role of Educators

At the primary and secondary levels of education, the quality of teachers is considered to be the single most important in-school factor in determining students' overall academic achievement (OECD 2005). In a meta-analysis of research in the United States, higher achievement in science and math was found to be correlated with teachers who had more teaching experience, more confidence in teaching these subjects, and higher overall career satisfaction (Mullis et al 2012).

Teachers sometimes hold gender biases that manifest in a variety of ways (Lavy and Megalokonomou 2019; Terrier 2015; Lavy and Sand 2018; Brown 2010; Mutekwe and Modiba 2012). Even in primary school, where science and mathematics are part of the core curriculum for both girls and boys, gender stereotyping is frequently reinforced (Maltese and Tai 2010). Findings also suggest that gender biases are found among both male and female teachers. For example, one experiment showed that when professors were asked to rate the competence and suitability of candidates for a laboratory job, female applicants were rated lower than their male counterparts, even when the application materials were identical (Moss-Racusin 2012).

Female teachers can positively influence the quality of girls' STEM education by dispelling myths about sex-based, innate abilities among boys, and by acting as role models for girls (Baker 2013; Carrel 2009; Betz and Sekaquaptewa 2012). In some cases, girls were more likely to declare, and graduate with, a STEM major when they had had female math and science teachers in high school (Bottia 2015).

Effective teaching practices, as well as the availability of equipment and materials, can cultivate a learning environment that motivates and engages girls in STEM classes (Jensen et al 2016; Spearman and Watt 2013). A 2015 OECD study found that where teachers used “cognitive-activation” strategies in teaching mathematics—encouraging students to think and reflect; use their own procedures to solve problems; explore multiple solutions; learn from mistakes; ask for explanations; and apply learning in different contexts—performance improved (OECD 2015; Baker 2013). Access to resources for scientific experiments has also been associated with a higher level of achievement in science, and interest in science subjects among girls (Simpkins et al 2015).

Curricula, Teaching Materials, and Educational Environment

Curricula and teaching materials are central to the educational process. A curriculum that has a strong conceptual framework, and that features real-world problems can enhance girls' interest in science (Hazari et al 2010; Kelly and Knowles 2016). Unfortunately, educational materials often perpetuate gender stereotypes and biases. For example, there may be many more pictures of men than women in educational materials, sending a message that they are more suited to these professions (Kerkhoven et al 2016). Men and women are also often portrayed as playing stereotypical roles within the household and at the workplace. A recent review by UNESCO of more than 110 national curriculum frameworks for primary and secondary education in 78 countries found that many mathematics and science textbooks and learning materials were conveying gender biases (Benavot 2016).

Others have argued that the environment in the college classroom is not the same for men and women. Sandler and Hall coined the term “chilly climate”⁵ to describe the differential treatment of women in the classroom. This treatment can range from overt behaviors, such as encouraging women to switch majors or discrediting their intellectual abilities, to less overt ones, such as interrupting them when they speak, or calling on men more often than on women (Sandler and Hall 1982). Despite decreases in overt sexism over the past few decades, women continue to be subjected to subtler forms of gender biases (Jensen and Deemer 2019). Male peers also often demonstrate biases against female students (Moss-Racusin et al 2012; Grunspan, Eddy and Brownell 2016).

5. The term “chilly climate” is used by various researchers to refer to unwelcoming social factors for women in male-dominated engineering and other STEM fields.

These factors are all likely to negatively influence women's sense of belonging in STEM fields (Ayre et al 2013; Faulkner 2009). Research shows that even among first-year engineering students, women are less likely to perceive engineering as the right career for them (Cech, Rubineau et al 2011). This is important, because a sense of belonging in a particular setting or broader field is associated with a variety of positive outcomes for individuals (Walton, Cohen et al 2012; Walton and Cohen 2007). For example, a brief intervention aimed at increasing first-year college students' sense of social belonging was found to positively affect the grade point averages (GPAs) of participants, as well as self-reported general health and well-being (Walton and Cohen 2011). Even more relevant, in one intervention, women who learned that adversities and worries about belonging in the field were common for all engineering students raised their engineering GPAs, improved their academic attitudes, and viewed their daily adversities as more manageable (Walton 2014).⁶

RECRUITMENT

Recruitment refers to both the formal and informal procedures used by an organization in seeking and hiring employees or firm contractors. The process of recruitment involves a wide range of issues, including legal barriers that can limit women's participation in certain roles, as well as recruitment practices that may have embedded gender biases.

Legal Barriers to the Nature and Type of Work

There has been meaningful progress in addressing gender-related legal barriers in the last fifty years, but the progress has been uneven. Today, globally women have on average only

three quarters of the rights of men. In fact, only eight countries currently have no legal differences between men and women: Belgium, Canada, Denmark, France, Iceland, Latvia, Luxembourg, and Sweden (World Bank 2020). Women face the greatest inequality when it comes to having children, with a great deal of variation in the policies for paid maternity leave, paternity and parental leave, and the treatment of pregnant workers (Hyland, Djankov, and Goldberg 2020).

While legal barriers to women's employment have decreased globally in recent years, many explicit industry-specific barriers remain embedded in legal codes. Discriminatory restrictions are still imposed on such industries as mining (in 60 countries), manufacturing (48 countries), construction (35 countries), energy (26 countries), agriculture (21 countries), water (23 countries), and transportation (16 countries). And even though more than 80 percent of the world's countries now prohibit gender discrimination in employment, only 46 percent of them mandate equal remuneration for work of equal value (World Bank 2020).

Gender Biases in the Hiring Process

One of the main challenges that women face in acquiring STEM jobs is encountering gender bias during the hiring process. Infrastructure jobs are often thought of as being dirty, physically demanding, or dangerous (Orlando et al 2018; World Bank 2019c). As a result, potential employers may doubt that women have the ability to work effectively in them. For example, private sector employers in the West Bank and Gaza who were interviewed said they feared that maternity might interrupt women's ability to work; they also had doubts about the reliability, productivity, and commitment of women in

6. This section draws on a comprehensive literature review focused on women and girls in STEM: Hammond, Alicia; Rubiano Matulevich, Eliana Carolina; Kumaraswamy, Sai Krishna. 2020. *Breaking Bias: Addressing Barriers to the Participation of Women and Girls in Science, Technology, Engineering and Mathematics*. Washington, D.C.: World Bank. For more information consult Hammond, A.

the workplace, given their competing demands at home (World Bank 2017). Experimental research has also shown that for jobs requiring arithmetic tasks, despite both sexes performing equally well, male candidates are twice as likely as female candidates to get hired (Reuben, Sapienza, and Zingales 2014).

In male-dominated industries, job postings often use words that imply stereotypically “masculine” strengths and skill sets, for example, “dominant” and “competitive” (See Box 6) (Gaugher, Friesen, and Kay 2011). In addition, the interview process may reflect both implicit and explicit biases, for example by including questions about physical strength for jobs that do not require such abilities.

Without sufficient social and professional capital, which is often acquired through unpaid internship experiences or costly certifications, qualified female engineers may also struggle to secure an entry point, or “foot in the door.” In the United Kingdom, an assessment of more than 90,000 work experience placements for upper secondary school found that girls comprised only 5 percent of the placements in mechanical, construction, and engineering internships (Francis et al 2005). It also found that 36 percent of girls would have opted for a nontraditional placement, but only 15 percent of girls and boys in the sample reported receiving information about such placements (Francis et al 2005). And while postacademic apprenticeships may be offered to qualified women and men in many countries, women often have greater domestic responsibilities and fewer options for financial support during unpaid training periods (World Bank 2014).

RETENTION

Retention refers to the ability of an organization or sector to keep its female recruits, and help them thrive. A low level of retention is likely linked to poor working conditions; an unwelcom-

ing workplace environment; and/or insufficient flexibility of working arrangements, which can make it difficult for women to reconcile their work and family lives (Project Wise 2009; Shah et al 2007).

Women’s concerns commonly include the absence of basic amenities like separate toilets, changing rooms, and sanitary facilities, and insufficient attention paid to matters of employee health, well-being, safety, and security (Turnbull 2013). In addition, the heavy dominance of men in certain roles can cause women to feel isolated in the workplace, particularly if they experience sexist attitudes there (EC 2016).

The risks of violence against women and sexual harassment are among the most critical factors that limit women’s attraction to infrastructure jobs in the first place, as well as retention of those who are employed in these sectors. Unequal pay, and unequal access to premium wage rates are also concerns: for example, it is often difficult for women to reconcile overtime or weekend work with their family commitments.

Lack of Flexible Work Arrangements

The evidence suggests that because women take on the majority of domestic and care responsibilities for children, aging parents, and other family members, the lack of work-life balance in infrastructure-sector jobs makes it difficult to retain them as employees. Multiple studies have found that the main reason for women leaving their infrastructure jobs, particularly in engineering, is inflexible working hours, or a “culture of overwork” that makes it difficult to balance work and family obligations (Corbett and Hill 2015; Fouad and Singh 2011; Fouad et al 2017). An International Labour Organization (ILO) study of 149,000 men and women in 142 countries found that both men and women perceive work-home-life balance as the top challenge facing working women in their countries (Gallup and ILO 2017).

However, the nature of infrastructure work makes the establishment of policies that support work-life balance challenging (Eurofound and ILO 2017). For example, telecommuting options and mobile work may be more limited for employees in construction or utilities organizations. However, even when they cannot offer such options, employers can offer a variety of other flexible working arrangements, including staggered working hours, compressed work schedules, or scheduled breaks for extended learning and training.

Flexible working arrangements can increase worker safety and productivity and lower operating costs, while also attracting and retaining a more diverse and talented workforce. Even when they are in place, however, staff do not always feel comfortable using them. Fear of stigma, confusion about how to use them, or resistance by supervisors, can keep employees from availing themselves of the options for workplace flexibility that are available to them (UNECE 2019). It is important for managers to engage in meaningful dialogue with their employees in order to understand what flexible working arrangements mean to them, and find ways to use them to the benefit of both employees and employers (UNECE 2019; Abele and Volmer 2011).

Care Responsibilities

Care duties may prevent women from being based at remote sites for long periods of time, or from taking higher paying jobs that require relocating. This can negatively affect their career prospects over time. In addition, cultural expectations that women should shoulder a disproportionate share of unpaid care work may lead employers to prejudge their capacities and/or level of commitment to work (World Bank 2012b). As a result of their care-related role expectations, women may be more likely to seek

flexible arrangements in which they work fewer hours on average than men. This puts them at risk of being channeled into lower-level jobs, and limits their potential for upward mobility.

For example, in Pakistan women who work in the energy sector mostly hold non-STEM jobs; plant operations and maintenance activities are an exclusively male domain, leaving women to fill primarily administrative positions (Barnabas, Anbarasu, and Clifford 2009). These challenges are exacerbated by the fact that much of the STEM and technical work in infrastructure organizations takes place in remote rural regions with poor educational systems, few or no job opportunities for working spouses, and a lower quality of life than in major cities. These are not easy challenges to overcome for anyone, but especially for women, who still are expected to put their family's needs first.

Gender Wage Gaps

The ILO estimates that globally, women are paid 20 percent less than men, with large variations across countries (ILO 2019). Identifying unexplained wage gaps by sex is a complex issue. Many factors determine wages, including age, experience, and education. Therefore, determining the role one's sex plays in the level of pay requires careful analysis at the organizational or firm level. A Mercer study of gender pay gaps in 11 countries⁷ found that even after controlling for employee attributes (age, tenure, experience, and performance), gender gaps remained, albeit to a lesser degree. These gaps ranged from 3.8 percent in India to 12.2 percent in Japan (Levine et al 2017).

While evidence from the infrastructure sectors is scant, some recent studies do point to gender wage gaps in STEM jobs. A global survey

7. The Mercer study, which drew on detailed data for 2.5 million employees from 5,451 companies, included mainly OECD countries, as well as Brazil, India, and China.

of 371 chief human resource officers found that respondents in the consumer goods and infrastructure-related industries were some of the most likely to report wage gaps between women and men performing the same role, with 39 percent of respondents in the mobility sector, and 31 percent in the energy sector reporting such gaps (WEF 2016). Global data also suggest that women face a median pay gap of 21 percent in information and technology jobs (ILO 2019).

In the United States, a study using 2003 and 2010 data from the National Survey of College Graduates found that the higher exit rate of women from engineering jobs relative to other fields was explained by women's dissatisfaction with pay and promotion opportunities in the workplace (Hunt 2016). Yet when compared to other fields, STEM careers are often considered more financially secure (Stoet and Geary 2018).

Workplace Biases, and Hostile Working Environments

When women feel undervalued in male-dominated workplaces, they may feel the need to expend energy trying to “fit in,” undermining their confidence in the process (Faulkner 2009). An unwelcoming workplace environment, where women are treated in a condescending, patronizing, or discourteous manner by supervisors, senior managers, or coworkers can negatively affect their job satisfaction, and thus the ability to retain them as employees.

“Micro-inequities” are the small, everyday ways in which individuals are treated differently and marginalized because of their gender, race, age, or other “outsider” status (Rowe and Giraldo-Kerr 2017). Over time, these behaviors can have a damaging cumulative effect, creating an environment that dampens women's self-esteem, confidence, and aspirations, and keeps them from fully participating in the workplace

(Sandler, Silverberg, and Hall 1996; Stephen 2015).

Such challenges, if they occur early in women's careers, can lead to the loss of valuable employees. A survey of more than 3,700 female engineers in the United States found that workplace climate and culture were among the most common factors for women leaving the field (Fouad and Singh 2011). Similarly, a study of women in STEM fields found that 32 percent of women in the United States, 30 percent in China, 22 percent in Brazil, and 20 percent in India are likely to quit within the first year of being hired. And the Center for Talent and Innovation found that a third of women with STEM credentials who are working in the private sector reported having experienced isolating dynamics in their workplaces (Hewlett et al 2014).⁸ The research also points to organizations that are implicitly, yet distinctly, male-centered, and that have practices that are unfavorable for women; for example, they may be slow to grant women access to prestigious positions, or they may expect their employees to rely on “spousal ‘backstage’ support” for career advancement (Sassler et al 2017).

Despite these challenges, the strong desire and commitment of women to enter STEM fields presents a momentous opportunity for infrastructure entities to retain and develop high-potential talent by addressing the barriers women face once employed. Though they often feel stalled in their jobs, many women in STEM fields remain dedicated to their professions (Hewlett et al 2014). In India, China, Brazil, and the United States, the vast majority of women in STEM fields report that they “love their work” (at 93 percent, 90 percent, 87 percent, and 80 percent, respectively) (Hewlett et al 2014).

8. The research consists of four surveys (one U.S. survey, and three company surveys); 28 focus groups; and numerous one-on-one interviews. The survey encompassed a total of 4,349 female employees in science, engineering, and technology.

Sexual Harassment in the Workplace

Sexual harassment encompasses more than physical and sexual abuse. For example, it also includes verbal and nonverbal harassment; and studies suggest that it is particularly pervasive in STEM and other male-dominated fields (Shaw, Hegewisch, and Hess 2018). One study of women with STEM degrees working in the private sector found that 63 percent of those who were in engineering had experienced sexual harassment (Corbett and Hill 2015).

A high prevalence of sexual harassment has high costs. For the individual, it can cause physical and mental harm, as well as possible damage to career advancement. For the company, it can mean lower productivity, higher absenteeism, and increased employee turnover (Shaw, Hegewisch, and Hess 2018).

National statistics on the prevalence of sexual harassment in the workplace sheds light on the pervasiveness of this problem. In Australia, 20 percent of employees reported that they had experienced sexual harassment in the workplace in the past five years. In Nepal, 53 percent of female workers reported sexual harassment in the workplace. In South Africa, 77 percent of women reported that they had experienced sexual harassment at some point in their working lives (IFC 2016). In the EU, 40–50 percent of women reported unwanted sexual advances, physical contact, or other forms of sexual harassment (WHO 2012). And in Ethiopia, a nationwide assessment on the prevalence of violence against women found that 49.6 percent of female employees working in the public or private sectors had experienced at least one type of violence in their workplace (Ministry of Women, Children and Youth Affairs 2013).

Though men can experience sexual harassment in the workplace, it is most often experienced by women. They may experience sexual harassment when they are told that a benefit,

promotion, or even continued employment is contingent on their “acceding to demands to engage in some form of sexual behavior” (ILO n.d.). Women who endure such harassment are subjected to power dynamics that limit their potential to advance and thrive in their careers (IFC 2016).

Another form of sexual harassment involves hostile working environments, in which the conduct of coworkers or supervisors creates conditions that are intimidating or humiliating for women, and that prevent their full participation in the endeavor (ILO n.d.).

The actual levels of sexual harassment and violence in the workplace are likely higher than reported: research by the Australian Human Rights Commission found that although nearly half of workplace offenses stop after a complaint is made, only an estimated 20 percent of survivors file a formal report (Australian Human Rights Commission 2008).

Underreporting occurs in situations where women think it is easier to resign from their jobs than face humiliation; or they may fear losing their jobs, or simply dread facing an uncomfortable confrontation. They might also lack confidence in the available redress or response mechanisms. Women may be intimidated into silence; they may be afraid they won't be able to substantiate their claims with evidence; or they may simply not realize that a particular behavior is a form of sexual harassment, and that their rights have been breached (IFC 2016).

The lack of legal and policy mechanisms for addressing sexual harassment in the workplace enables it to flourish: and out of 190 economies, 50 have no laws at all that address this problem. Thirty-five countries have no laws addressing domestic violence, or aggravated penalties for violence at home; 18 of these are in Sub-Saharan Africa, and 10 are in the Middle East and North Africa (World Bank 2020).

Women in male-dominated fields like infrastructure are put at heightened risk when there are no systems established to prevent and respond to cases of sexual harassment, physical abuse, or compounding issues like alcoholism and drug abuse. The threat is even more pervasive in remote locations, where supervision and feedback mechanisms are limited. It is therefore unsurprising that many women who work in the infrastructure sector are unwilling to move to areas they deem unsafe, even if the job is well paid. Until and unless there are security policies that consider women's needs by establishing reporting mechanisms for harassment, whistleblower protections, and punitive measures for aggressors, working conditions will remain unsafe for women, and they will continue to be reluctant to join infrastructure sectors altogether (Ceci and Williams 2011).

Failure to Address the Needs of Female Workers

Another effect of the male-dominated infrastructure culture is that too often work facilities, amenities, equipment, and transportation fail to meet women's needs, and thus may discourage them from employment. Separate sanitation facilities for men and women; provisions for proper menstrual hygiene management (including locks on restroom doors, disposal bins, and handwashing facilities); separate housing facilities for women at project sites; and personal protective gear designed for women can all help women feel more comfortable in the workplace (Orlando et al 2018; UNECE 2019).

Occupational safety is another concern for women who are considering jobs in infrastructure: in this regard, regulations and environmental guidelines at construction sites; appropriate healthcare provisions; and prevention and response mechanisms to prevent and appropriately deal with sexual harassment are all important.

Recognizing gender differences in the workforce is essential in order to ensure the safety and health of both male and female workers: these differences should be considered when developing policies for addressing occupational safety and health hazards in the workplace (EU-OSHA 2014; ILO 2013). In the past, the effects of occupational safety and health hazards on women were underestimated, because the standards and exposure limits to hazardous substances were based on male populations and laboratory tests (Forastieri 2010). Today there is growing recognition of sex differences in terms of occupational safety and health hazards in the workplace: for example, the impact on women's reproductive health from exposure to chemicals or biological agents; the physical demands of heavy work; the ergonomic design of workplaces; and the length of the working day when domestic duties are also considered are all being given more scrutiny (Forastieri 2000; Peters and Demers 2009; Sorrentino et al 2016).

A safe, accessible, and affordable transport infrastructure is also essential in order for women to be able to access jobs and other economic opportunities. According to the ILO, a lack of safe and accessible transportation is the greatest obstacle to women's labor force participation in low- and middle-income countries, reducing their participation probability by 16.5 percentage points (ILO 2017b). And since large-scale infrastructure projects are often implemented in remote areas, frequent travel and relocation may be required, especially for projects focused on rural electrification, water infrastructure, and rural road construction.

ADVANCEMENT

Advancement refers to the progression from jobs to careers—often into meaningful leadership roles—as well as to employees realizing their full potential within an organization.

Various forms of segregation can limit women's progression in their careers. For example, their careers might never “get off the ground” because their jobs are confined to feminized roles, with limited training or career opportunities. And even when they secure entry into male-dominated sectors and occupations, women are typically excluded from tasks that are considered to be “too masculine” for them; this is often technical, or physically dangerous, work. This type of exclusion, which can stall, or even curtail, women's prospects for promotion, is called horizontal segregation (Turnbull 2013).

Horizontal segregation is often compounded by vertical segregation, sometimes called the “glass ceiling,” where there are few opportunities for women to progress due to range of factors, including biases in the workplace, lack of training and skills development opportunities, and limited numbers of female role models or mentors—both male and female—who are willing to support them in the advancement of their careers.

Lack of Mentors and Sponsors for Women

Mentoring is important for leadership development, but it is not enough to help women to advance to the highest levels; recent research suggests that they also need sponsorship.

Sponsorship refers to the active support of someone who is appropriately placed within the organization; who has substantial influence over decision making; and who advocates, protects, and will even fight for the career advancement of an individual (Ibarra, Carter, and Silva 2010). A McKinsey study found that employees with sponsors are 1.4 times more likely to say they have had a meaningful interaction with a senior leader, and 1.5 times more likely to aspire to become a top executive—and this is especially true for women (McKinsey & Company 2018b).

Many women in STEM-related fields in infrastructure lack female sponsors and mentors to guide them along their career path. However, they can still benefit from male sponsors and mentors in order to learn from senior professionals and have their accomplishments made more visible by individuals who have ample experience and influence in the workplace.

One study in the United States found that 84–88 percent of women in STEM-related jobs lacked sponsors, or someone of influence to advocate for them within their organization; nearly half lacked mentors; and 25–40 percent had no role models within their institutions (Hewlett et al 2008). McKinsey research has also found that fewer than one in four female employees has a sponsor (McKinsey & Company 2018b).

The combination of a dearth of female colleagues; unwelcoming work cultures; and other corporate constraints for female talent has been linked to one-third of U.S. women in STEM-related, private sector jobs feeling isolated at work. This isolation is both a cause and a consequence of the lack of female sponsors, mentors, and role models; because it degrades job satisfaction and creates a “flight risk” for female STEM professionals (Hewlett et al 2008).

Even in professional contexts where women do have sponsors, the “sponsor effect” may not be as strong for women as it is for men. One large-scale study in the U.S. found that women in STEM-related, private sector jobs who had sponsors reaped fewer benefits and job satisfaction than their male counterparts did. Men with sponsors were 32 percent more satisfied with their career progression than men without sponsors, while women with sponsors were only 22 percent more satisfied. These differentials were even greater in Brazil and China. In China, men with sponsors were 58 percent more satisfied with their career progression, compared to 21 percent for women; while the corresponding figures for Brazil were 42 percent for men and 19 percent for women (Hewlett et al 2014).

Limited Professional Networks

Women also tend to lack access to both formal and informal professional networks, and contacts that can help them develop their careers. Some of the literature suggests that the existing social networks and mentorship structures in engineering are dominated by powerful men, and that without access to these connections, women face barriers in advancing in their careers (Corbett and Hill 2015). And they do have difficulty gaining access to these networks, since the networks are both homogenous and longstanding; and women are often uncomfortable networking in the social context of these settings (Davies-Netzley 1998; Broughton and Miller 2009; Durbin 2011).

A series of studies suggests that women have less access to influential individuals, and that they tend to build their networks with individuals who have a lower status than those in men's networks (Brass 1984; Burke et al 1995; Dreher and Cox 1996; Linehan and Scullion 2008; Wang 2009). For example, one study of male and female managers in three large organizations found that women had more women, and men had more men, in their networks (Burke et al 1995).

Given that typically more men than women hold higher-level managerial roles (Ragins et al 1998; Schein 2007), networks composed of women only are less likely to be able to provide the same kind of access to opportunities for career advancement as those that include men. There are other difficulties associated with professional networking also: one study of U.S. workers found a positive relationship for men—but not for women—between engagement in professional activities and career outcomes. The authors of this study suggest that women's disproportionate share of household and family responsibilities made them more likely to find these activities burdensome (Forret and Dougherty 2004).

Few Opportunities for Effective Training

Despite evidence pointing to the importance of training in helping workers upgrade their skills and keep abreast of new technologies, the literature suggests that, for a host of reasons, women receive fewer training opportunities. Research conducted among 5,500 female engineers found that one of the main reasons they cited for leaving their work was the lack of training and development opportunities to help them advance in their careers (Corbett and Hill 2015).

In some cases, women may be deliberately excluded from training; for example, when employers do not offer them certain opportunities, assuming that they might have to interrupt their careers for childbearing or other care responsibilities (Turnbull 2013). In other cases, the exclusion may be unintentional, such as when training is scheduled at times or locations that are inconvenient for women who have care responsibilities (ILO 2019).

Exclusion from Opportunities for Advancement and Leadership

Some studies suggest that women in the infrastructure sectors are consistently excluded from leadership positions because of complex factors that are rooted in stereotypes and gender norms. Stereotypes about leadership are often embedded in people's mindsets, and translate into the systematic disadvantaging of potential female leaders.

Studies have also shown that the qualities implicitly associated with leadership are often also associated with men: for example, assertiveness, aggression, and ambition (Eagly and Carli 2007; Elmuti, Jia, and Davis 2009; Ibarra, Ely, and Kolb 2013). By contrast, women are more often associated with being helpful, nurturing, or modest. These are considered attractive

traits in women, but ineffective traits for leadership (Eagly and Carli 2007).

These prevailing stereotypes create a kind of double bind. It often means that women who exhibit the leadership styles traditionally attributed to men are seen in a negative light, or are disliked by their peers; while women who exhibit the traits traditionally attributed to women are not considered assertive enough to be considered for promotion. This also means that female leaders often deal with more resistance from their peers and supervisees than men do (Eagly and Carli 2007; Groysberg and Connolly 2013).

However, the research shows that as more women are promoted to leadership positions in engineering and other technical fields, more women move into them. One study found that an increase in the share of top female managers in an organization was associated with subsequent increases in that organization's share of women in mid-level management positions (Kurtulus and Tomaskovic-Devey 2012).

Recent studies have also shown that leadership norms are changing; and that workers are recognizing that management styles characterized by empathy, effective communication, and a generally more democratic, or team-style work environment, are also needed for success. And women are often cited as exercising more democratic and inspirational styles of leadership, as compared to the autocratic, task-oriented, and transactional tendencies of male leaders (Eagly and Carli 2003).

Similar results were found in a self-reported survey of 9,000 leaders and managers in the U.S., which showed that women exercise the leadership skills of talent development, role modeling, inspiration, and participative decision-making more often than men do (McKinsey 2008). This more democratic approach is a growing trend within businesses, and is characterized by a transformational⁹ leadership style, in which leaders encourage, inspire, and motivate employees to innovate, and to create change that will help grow and shape the future success of the company.

This type of leadership is increasingly important in industries that require adapting to rapidly changing technologies, in order to stay ahead of the curve and to remain competitive. And, as illustrated in the meta-analysis of Eagly and Carli, women are more likely to exhibit transformational leadership than men are (Eagly and Carli 2003). In a 2018 study that surveyed more than 5,000 workers across the United States in a range of industries and organizations, 72 percent of respondents said they believed that leadership needs to be redefined for today's world. They also said that leaders should balance "hard" and "soft power" traits (Deloitte 2018).

Today, the soft power traits of being communicative, flexible, and patient—traits that have been traditionally considered as "feminine"—have emerged as three of the five most important values for a good leader to have, along with the hard power traits of being hardworking and confident (Deloitte 2018).

9. In the business environment, there are two main types of leadership. Transactional leadership recognizes good work through pay increases and career advancement; and punishes poor performance (Bass et al 2003). In other words, it exchanges rewards for better performance, and recognizes achievement. Transformational leadership offers employees a shared vision and a sense of mission; helps to instill pride in a common goal; and works to gain employees' respect and trust (Bass 1990).



CHAPTER 3

LEVELING THE PATHWAY TO EMPLOYMENT

Increasing the employment and advancement of women in infrastructure organizations is a win-win proposition. For women, the infrastructure sectors offer the potential for generating substantial income, and designing the infrastructure that will spur socioeconomic development. These women also serve as role models for future generations of young women who are interested in STEM-related careers. Equally important, infrastructure organizations that foster women's STEM employment help to expand the talent pool, while also potentially strengthening their organizational performance metrics.

Leveling the employment pathway for women in infrastructure requires changes at all levels of engagement—in national policies, within the educational system, at the sector and industry levels, and within the workplace. Multisector efforts are needed in order to spotlight the structural and systemic constraints at all levels that are contributing to persistent gender gaps in STEM roles, and in other technical fields.

This section describes the types of interventions, and some of the promising practices that can help women overcome the key barriers and bottlenecks that they face at each stage of their careers (Table 4). Not all of these approaches are specific to STEM: many of them—particularly those focused on the labor market—are important for women's employment more broadly.

ATTRACTION

Removing Gender Biases in Educational Materials, Strengthening STEM Curricula, and Improving Teaching Practices

In order to attract more women to STEM careers, removing gender biases in learning materials and strengthening STEM curricula are of key importance, particularly at the primary and secondary levels of education. Mexico has undertaken an analysis of the textbooks they use in primary education; developed a manual to incorporate gender equality in curricular and teaching materials; and revised both the text and illustrations in its educational materials, in order to make it clear to students that men and women have similar capacities in STEM skills, and equal opportunities for STEM careers (Mexico Ministry of Public Education 2012).

Curriculum designers can also create resources that are suited to the learning styles and preferences of girls as well as boys. Research suggests that STEM curricula are more appealing to girls if they are relevant to real world situations (Baker 2013; IRIS 2012; Hulleman and Harackiewicz 2009). They are also more likely to interest girls if they integrate social and scientific issues, and provide opportunities for experimentation, practice, and reflection (Lysons 2006).

Table 4 Interventions to Overcome Barriers to Women's STEM Employment in Infrastructure, by Career Stage

	Interventions	Level of Engagement		
		Policy/Legal	Sectoral	Institutional
Attraction	Remove gender stereotypes and biases in educational materials, strengthen STEM curricula, and improve teaching practices.	X	X	X
	Facilitate early exposure to STEM careers for girls.		X	X
	Improve access to career information, and address information asymmetries.		X	X
	Connect students with female role models and mentors.		X	X
	Experiment with university admissions criteria and pedagogy.		X	X
	Improve women's self-efficacy and professional role confidence in STEM.			X
Recruitment	Remove legal restrictions on women's employment.	X		
	Promote inclusive policies and targets for women in STEM infrastructure jobs.	X	X	X
	Address gender biases in hiring.			X
	Create scholarships, and internship and apprenticeship programs.		X	X
	Develop job matching and placement programs.		X	X
	Reduce gender bias among managers and staff.			X
Retention	Create public parental leave benefits and flexible work policies.	X		X
	Implement flexible work arrangements within organizations.			X
	Promote the public and private provision of care services.	X		X
	Close gender wage gaps.	X		X
	Address sexual harassment in the workplace.	X		X

		Level of Engagement		
		Policy/Legal	Sectoral	Institutional
Retention	Adapt workplace facilities to address differential needs in occupational safety and health.			X
	Engage trade unions in collective bargaining agreements.		X	X
Advancement	Design mentoring and sponsorship programs in the workplace, and/or at the industry-wide level.		X	X
	Facilitate women's access to professional networks.		X	X
	Provide technical and leadership skills training.		X	X
	Counteract biases in the promotion processes.		X	X

Overall, such improvements in the educational system have been shown to positively impact the quality of STEM education for both girls and boys (Mullis et al 2016).

Curricula that integrate growth mindset theory is another possible strategy for supporting girls' interest and persistence in STEM subjects. This theory holds that intelligence is malleable; and that effort, practice, and persistence can enhance abilities over time (Dweck 2006, 2007). Studies have shown that young people with "growth mindsets" versus fixed ones have higher academic performance and completion rates in challenging math courses (Blackwell et al 2007; Yeager and Carol 2012). In one small experiment in the United States, when boys and girls received messages about cultivating a growth mindset from their teachers, their math test scores increased; but the effect was more pronounced for girls (Good et al 2003). And a recent meta-analysis of 129 studies that explored the link between mindset and academic achievement found that 37 percent of effect sizes showed a positive association; however, the average correlation was weak (Sisk et al 2018).

Improving teaching practices can also help to promote girls' motivation and engagement in STEM subjects. One meta-analysis identified five types of educational strategies that improve students' achievement, attitudes, and interest in STEM subjects and careers—context-based; inquiry-based; information and communication technology (ICT)-enriched; collaborative; and strategies that include the use of extracurricular activities (Savelsbergh et al 2016).

These general strategies can be combined with more targeted ones that have been found to work best for girls, such as building a "science identity" among girls by conveying messages that science is for everyone; using gender-neutral language; showcasing success stories of women in STEM; and facilitating direct interactions with them where possible (UNESCO 2017).

Other promising approaches include interactive, hands-on laboratory experience, and design-based learning, as well as extracurricular STEM activities. Group learning that incorporates individual accountability, proactive support and praise of other group members, has proved especially beneficial for girls' performance in mathematics (Hossain and Rohani 2012).

Facilitating Early Exposure to STEM for Girls

Increasing girls' exposure to STEM subjects, especially in practical ways that connect them to real-life phenomena, helps to increase their interest and confidence in STEM skills (Sikora and Pokropek 2012). These might include structured activities like competitions and clubs, as well as unstructured activities, such as encouraging them to tinker with objects or develop personal science-related hobbies (Dabney, Tai, and Almarode 2012). Safe spaces where girls are able to see how science can help solve everyday problems, and gain hands-on exposure are especially important (Riedinger and Taylor 2016; Watermeyer 2012; Lou et al 2011; Peterman et al 2016).

Hands-on opportunities in science for girls in primary and secondary school offered through partnerships with tertiary educational institutions and technical schools can also help. For example, the Women in Engineering program at the University of Maryland, College Park offers a STEM outreach program to girls in grades 4–12 during the academic year as well as the summer (Chatlani 2018).

Working in collaboration with local schools, infrastructure organizations can also help expose younger students to science, and capture their attention in diverse and creative ways. For example, the German utility E.ON engages children and youth from ages 5 to 18 in STEM-oriented thinking through its Energise Anything! Program,¹⁰ which offers inspiring interactive workshops. Another program designed to build interest in STEM is Technovation Girls—the

world's largest technology entrepreneurship program for girls aged 10-18 years (Box 3). Broader initiatives, such as the Bring-Your-Daughter-to-Work-Day can also be leveraged as a way of boosting girls' interest in STEM-related work (USAID 2016b).

Improving Access to Career Information, and Addressing Information Asymmetries

Schools can also facilitate access to career counseling for girls in STEM fields by addressing common perceptions among girls about a mismatch between their abilities and interests, and STEM career paths (Broadley 2015). For example, WomEng, a nonprofit organization in South Africa, has developed booklets aimed at secondary school girls with information about educational institutions that offer engineering programs and scholarship opportunities, and answers to frequently asked questions about careers in engineering.¹¹ UNESCO has also produced a training module on STEM career guidance and counseling for teacher trainers,¹² education and career advisors, and teachers (UNESCO 2007).



We want to show you in an interesting way what your parents do every day, so by the end of the day, maybe you'll have new ideas of what you want to be when you grow up.

— Harald Dammerer, Managing Director,
EVN Electricity Distribution



10. Detailed information is available at <https://www.eon.com/en.html>.

11. Women in Engineering. The GirlEng Guide to Becoming an Engineer. <http://www.womeng.org/> (Accessed March 2020.)

12. This module covers training and support for teachers, career guidance activities, and science and mathematics teacher training. It aims to help countries promote a positive image of women in science careers; provide girls with clear information about science careers; counter gender stereotypes; and ensure that teachers and career advisors have the tools required to meet the needs of female learners.

BOX 3 Technovation Girls: Working to Build the Pipeline of Women in Technology



Technovation Girls is the world's largest technology entrepreneurship program for girls aged 10-18 years. It operates in more than 100 countries, and is supported by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the Peace Corps, and UN Women. Through Technovation, girls work with women mentors to identify a problem in their community that could be addressed with technology; develop a mobile app; and launch a start-up to address the problem.

Developed in 2010 in response to the decrease in the number of women entering the field of computer science over the past 30 years, Technovation supports girls in learning how to create technological solutions to local problems.

In the first nine years of the program, about 23,000 girls in countries around the world have developed mobile apps and start-ups to solve diverse global challenges, including food waste, nutrition, and women's safety issues. After participating in the program, 78 percent of the girls reported being more interested in computer science; 70 percent were more interested in entrepreneurship; and 67 percent were more interested in business leadership. And 58 percent of the alumnae subsequently enrolled in computer science courses.

Source: <https://technovationchallenge.org>; Technovation. 2016. A Retrospective Survey of Five Technovation Cohorts (2010-2014). <https://iridescentlearning.org/wp-content/uploads/2014/01/TechnovationLookbackReport.pdf>

Schools and skills training programs can make information on the labor market returns of STEM careers available to girls and young women, which can influence their choices concerning STEM infrastructure careers. In Mexico, when girls were provided with information on labor market returns they showed a tendency to switch their study track to male-dominated fields, including toward STEM careers (Szekely, Bustelo, and Piras 2017).

Addressing information asymmetries about career paths and potential earnings is another promising approach for vocational training programs. In one experiment in Kenya, participants in a youth training program were invited to informational sessions where posters displayed the benefits of vocational education for women and men engaged in various fields of work. Young women who received information

about the potential for earning higher wages in male-dominated occupations were more likely to enroll in programs for male-dominated trades; this also led to an increase in their hourly wage earnings (Hicks et al 2011).

In the Republic of North Macedonia, Energieversorgung Niederösterreich (EVN) takes a comprehensive approach to building the pipeline. This company actively works to expose girls to STEM careers, and provides a range of opportunities for young women to gain professional experience, and eventually to join the company (Box 4).

Connecting Students to Female Role Models and Mentors

Female role models and mentors can help mitigate negative stereotypes about sex-based

BOX 4 Building the Pipeline in North Macedonia's Energy Utility

SPOTLIGHT ON GOOD PRACTICES

Privatized in 2006, with 10 percent of the company still under state ownership, in 2016-17, EVN Macedonia employed nearly 2,000 people and served 812,000 customers. Among its employees, women account for nearly 20 percent of the workforce, and 22.7 percent of top and mid-level management jobs. Recognizing the need to increase women's inclusion at various levels of the organization, the company engaged the technical assistance of the USAID-supported Engendering Utilities program to build their female talent pipeline.

WHAT WAS DONE

- **Exposure to STEM among younger girls.** EVN Macedonia promotes girls' interest in studying STEM subjects by hosting Bring-Your-Daughter-to-Work-Day events, where primary and secondary school students have the opportunity to learn about the energy sector through observing their parent's workplace, and engaging in hands-on experiments. Positive feedback from these events has led EVN to plan additional ones across its 19 branches and 3 headquarter locations.
- **Work-based learning opportunities for students in technical and vocational education.** Electrical fitters install, test, maintain, and repair electrical installations and wiring; and fit, assemble, install, test, commission, maintain, and repair electrical systems and equipment. Although electrical fitters represent more than 40 percent of the EVN Macedonia workforce, in 2018 only two of them were women. Through semiregular meetings with the leaders of technical high schools, EVN discovered that virtually no women were studying to become electrical fitters. In response, they launched Project 20-20-20, which provides work-based learning opportunities for students from technical high schools who are enrolled in electricity programs, during their final two years of study. This program offers young women the opportunity for on-the-job training, as well as a pathway to employment.
- **Internships:** EVN Macedonia has a one-month paid internship program that now attracts nearly equal numbers of women and men. Shortly after its launch, 44 percent of the internship students were women: during the course of the program, it has increased to more than 60 percent.
- **Engineering scholarships:** EVN Macedonia's goal is to reach 40 percent female engineers, compared to their current 20 percent. Since 2010, the company has partnered with university engineering faculties to award scholarships to those students who have the highest grade point average in electrical engineering, the majority of whom are female. The number of scholarships for women increased from 44 percent during the years 2010-2014 to 76 percent in the period 2015-2018.

Note: For detailed information on EVN's actions and resource mobilization efforts to increase equality and inclusion, along with lessons learned, see the case study Energizing Equity in Talent: The Case of Equal Opportunities in EVN Macedonia <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/442381594311389657/an-overview-of-promising-approaches-case-studies>.

abilities; enhance girls' self-perception, and attitudes toward STEM; and motivate them to pursue STEM careers (Hill and St. Rose 2010; Liu, Lou, and Shih 2014; Stout et al 2011). These role models and mentors are critically important at both the secondary and tertiary levels of education.

In the United States, female students at the Colorado School of Mines form a connection with girls who wish to attend the school through an outreach program called Discover, Encourage, Create Technology (DECTech), which includes hands-on sessions and the sharing of experiences (Berman 2016).

In Ghana, the Soronko Foundation's Tech Needs Girls program focuses on the importance of mentorship in encouraging girls to lead and innovate in the field of technology: this program has trained 4,500 girls by matching them with 200 mentors and role models in computer science and engineering.¹³

In New Zealand, the Ultimit Women in Infrastructure Network runs an annual Girls With Hi-Vis program to expose girls to women who are excelling in nontraditional roles (Connexis 2018). This initiative encourages infrastructure entities to inspire young women to join the sector by welcoming them to their worksites so they can explore firsthand what working there entails.

And in Chile, Catholic University launched their Women in Engineering program to increase women's enrollment in engineering programs through events that spotlight female role models, as well as through peer mentoring and networking opportunities such as "after office and after college" events, through which students meet female engineering alumni now in the workforce. (Pontifica Universidad Catolica de Chile 2017).

Mentoring has been shown to produce a wide range of positive outcomes for young people, including career and income satisfaction (Allen

et al 2004; Dubois and Karcher 2005). Female mentors can support women and girls, and help them become leaders in academia, research, and business. A 2017 study showed that women who were assigned a female mentor felt a greater sense of belonging in the field; were more motivated and confident; performed better in engineering and other sciences; and had higher career aspirations than women assigned a male mentor, or none at all (Dennehy 2017). When girls have the opportunity to observe and interact with people of diverse backgrounds engaged in creating STEM solutions, they develop their own STEM identities at an early age (The Women Foundation of Colorado 2017).

Organizations can also engage young women through mentorship programs offered in camps, high schools, and universities. For example, in Kenya, the Safaricom Women in Technology (WIT) program leads a campus outreach initiative to inspire university women who are studying engineering or information and communication technology (ICT) through coaching and mentorship. Through this program, WIT "champions" visit campuses to encourage female students to stay informed, networked, and ready for roles as professionals and leaders in the ICT sector. At these sessions, students learn about Safaricom's services and systems, and visit its power, transmission, and data centers. Academic, social, and professional development support is also provided to female engineering students; this includes helping them with developing their curriculum vitae, and preparing for interviews; and offering guidance in online branding (Box 5).

Experimenting with University Admissions Criteria and Pedagogy

Tertiary institutions and technical schools with STEM tracks can shift their practices to create more equitable outcomes for women, and increase their opportunities to participate in

13. Tech Needs Girls, Soronko Foundation, <http://www.soronkosolutions.com/tng.html> (accessed on March 2020).

STEM careers. An analysis by the Brookings Institution, using data from over 4,000 U.S. universities, identified a variety of both explicit and implicit tactics that have been used to increase women's participation in STEM (Berman 2016).

The schools studied find ways to make their introductory classes more accessible. Included in the study was Dartmouth University, where women comprise nearly 40 percent of engineering students. Dartmouth reduced the entry barrier for its introductory engineering course by only requiring a basic math course as a prerequisite. Instead, the initial focus in the Dartmouth curriculum is on tackling societal issues like energy efficiency, or quality of life for seniors. By integrating currently relevant problem-solving topics that affect society into the curriculum, female students become more motivated to develop the quantification skills needed to solve those problems.

Other Dartmouth programs are directed specifically at female students; for example, through its Women in Science Project, freshman women get the chance to work for professors in labs, an opportunity seldom afforded to first-year students at most other colleges (Berman 2016).

Improving Women's Self-Efficacy and Professional Role Confidence in STEM

Emerging research suggests that professional role confidence developed during university studies is associated with persistence in an engineering career (Buse et al 2013; Cech et al 2011). This can be divided into two discrete concepts: expertise confidence, that is, confidence that one possesses the requisite skills and knowledge to be a professional in a chosen field; and career-fit confidence, meaning confidence that a field is consistent with one's own personal interests, values, and identity (Corbett and Hill 2015).

BOX 5 Countering Negative Gender Stereotypes through Targeted Mentoring



Scientific Camps of Excellence for Mentoring Girls in STEM—organized by UNESCO's Nairobi Office, in partnership with Safaricom's Women in Technology (WIT); Kenya's National Commission for Science, Technology, and Innovation; Kenya's Ministry of Education; and local universities—was designed to reduce the STEM gender gap by guiding girls toward scientific careers. Since the program began in 2014, 971 girls in secondary school, from 32 of Kenya's 47 counties, have participated.

Through this program, students are mentored by specialists in mathematics, physics, agricultural sciences, and marine sciences, as well as in electronics, telecommunications, geospatial and aeronautical science, and space technology engineering. Through talks and laboratory demonstrations, mentors show students how scientific subjects are linked to STEM careers that have contemporary relevance. They are also exposed to related courses at TVET institutions, and empowered to consider solutions to various problems that Kenya is facing from scientific and engineering perspectives.

Source: "Scientific Camp of Excellence for Mentoring Girls in Science Technology, Engineering and Mathematics in Kenya." Accessed May 2020 at http://www.unesco.org/new/en/natural-sciences/science-technology/basic-sciences/single-view-basic/news/scientific_camp_of_excellence_for_mentoring_girls_in_science/

There are a number of steps STEM programs can take to help increase professional role confidence among female students. First of all, they can emphasize the breadth of the skillset needed to succeed as an engineer: an overly narrow focus on math and science can obscure the other areas of expertise needed, such as writing, communicating, organizing, and managing skills.

Highlighting the communal aspects of STEM is also important, along with providing opportunities for female undergraduates to do actual engineering and design work early on. This enables them to understand the differences between textbook problems, and the creativity and critical thinking needed for actual engineering problem solving. Recognizing that these areas of expertise are critical to engineering can also help shift the image of who is a good fit for engineering, and change attitudes toward competencies that are considered “female.”

Early contact between students and professionals can also be transformational. Meaningful contact with engineers in the field provides students with helpful role models and mentors, and can also help them understand the breadth of skills they will need to be successful in the field. It also helps them build professional role confidence through interactions with professionals with whom they can identify.

Finally, programs can clearly communicate the fact that engineering and technical skills and competencies are learned, not innate. The beliefs that some people’s brains are “hardwired” to do engineering work, and that men are better at math and science than women are contribute to a lack of professional role confidence, especially among women, by perpetuating the stereotype that some people are “natural” engineers, while others are a poor fit for engineering (Cech et al 2011; Corbett and Hill 2015).¹⁴

RECRUITMENT

Removing Legal Restrictions to Women’s Employment

Laws that prohibit gender discrimination in employment, and ensure equal wages and benefits for men and women, can help protect women from being disadvantaged when applying for certain jobs. But legislation must go beyond enabling women to simply be hired fairly. It must protect women’s full range of needs—from extending maternity leave, to including paternity and family leave, to stipulating the specific requirements for accessible restroom facilities, childcare options, and reporting mechanisms for sexual harassment.

Laws can influence women’s economic participation; in fact, the existence of more gender-equal laws is positively associated with women’s labor force participation, as well as women’s entrepreneurship, and narrower wage gaps between men and women (World Bank 2018; World Bank 2020).

Governments can also eliminate legal barriers that prevent women from working in specific sectors and occupations. In recent years, Bulgaria, Bosnia and Herzegovina, Kiribati, and Tajikistan, have all moved to reform their labor laws in order to eliminate certain restrictions on women’s employment, for example, in jobs that are deemed arduous or hazardous, such as underwater work. In Bulgaria, all restrictions on women’s employment have been removed, while Tajikistan has abolished a restriction on women working at night (World Bank 2018).

Even more recently, Jordan has removed restrictions on women’s ability to work at night, Nepal has prohibited gender discrimination in employment, and Niger has removed legal

14. This section draws on a comprehensive literature review focused on women and girls in STEM: Hammond, Alicia; Rubiano Matulevich, Eliana Carolina; Kumaraswamy, Sai Krishna. 2020. *Breaking Bias: Addressing Barriers to the Participation of Women and Girls in Science, Technology, Engineering and Mathematics*. Washington, D.C. : World Bank. For more information consult Hammond, A.

barriers to women's employment in the mining, construction, and manufacturing sectors (World Bank 2020).

Promoting Inclusive Policies and Targets for Women in STEM Infrastructure Jobs

National policies focused on infrastructure, or on STEM, typically do not take issues of gender equality into account. An analysis of 192 national energy frameworks reported by the International Union for the Conservation of Nature (IUCN) showed that only 10 percent of them recognize the need to increase women's participation in the energy sector (IUCN 2017).¹⁵ Interestingly, most of the frameworks studied (93 percent) that do address gaps between women and men are in low- and middle-income countries, particularly in Sub-Saharan Africa, where 56 percent of the frameworks considered this issue (IUCN 2017).

However, even when gender equality is introduced into energy policy frameworks, it typically pertains to women as clients of utility companies. Thus, there is a profound gap in the commitment to addressing women's technical employment in utilities, as well as in the equivalent policy documents in the water, transport, and ICT sectors (IUCN 2017). Without such higher-level policy commitment, infrastructure entities such as ministries, utilities, and state-owned enterprises (SOEs) lack the institutional direction needed to effectively address gaps in women's STEM employment within these sectors.

A recent report by the National Association of Regulatory Utility Commissioners (NARUC) financed by USAID provides guidance for energy regulators on strategies for promoting the equitable participation of women and men

in the energy workforce (The Cadmus Group 2018). For example, regulatory commissions can use their unique role as aggregators of information and policymaking to collect sex-disaggregated data, which can then be used to benchmark women's participation in various roles within infrastructure entities, and to link the energy sector to national gender equality policies and regulations (The Cadmus Group 2018). National policies and action plans that promote gender equality can also include specific clauses to promote women's participation in STEM jobs within the infrastructure sectors.

Governments, the private sector, and nonprofit organizations have implemented demand-side¹⁶ actions such as equal opportunity strategies, as well as the setting of gender targets and quotas for women's participation at all levels (Klettner, Clarke, and Boersma 2014; Meier and Lombardo 2013; Pande and Ford 2011). Other approaches include reporting requirements that involve disclosing the breakdown of senior leadership roles by sex in annual reports where relevant (for example, for SOEs, publicly listed companies, and political parties) (Sojo et al 2016). In some cases, organizations are also required to describe the strategies they have in place to increase women's representation within their leadership. In addition, in many countries, reporting requirements for gender equality have been introduced in order to incentivize organizations to increase female participation and representation in the workforce (Quota Project 2015).

Of course targets only set goals for the expected percentage or number of women to occupy or be nominated for leadership positions; but with minimal or no enforcement mechanisms or sanctions, organizations may fail to achieve

15. According to the International Union for the Conservation of Nature, energy frameworks are policies, plans, or strategies that outline plans of action to address national energy objectives, including access to and availability of energy resources; community participation strategies; and innovation and technology in energy.

16. Unlike demand-side strategies, supply-side strategies include mentoring, targeted development, and networking, among other things designed to increase the supply of women who are qualified or job-ready for senior leadership roles (Bobocel et al 1998; Gilbert and Stead 1999).

these goals (Whelan and Wood 2012). Quotas, on the other hand, are required government or industry-mandated percentages for the numbers of each sex in leadership positions, paired with clear enforcement mechanisms—for example, close monitoring, or financial or operational penalties for businesses or political parties who fail to comply with them.

Various studies have found that both quotas and targets can help to increase the share of women in leadership positions. Using annual data of female representation on the boards of Fortune 500 companies over a period of 18 years (from 1996 to 2015), one study found that regulatory actions that set clear goals (either targets or quotas) are more effective at increasing female representation on boards of directors than mere reporting requirements (Sojo et al 2016).

Not surprisingly, countries that have set higher targets have also achieved an increased representation of women on boards (Sojo et al 2016). In Norway, the introduction of a 40 percent target of women on corporate boards in 2003 did not achieve the expected results until after 2005, when the target was converted to a quota, through the introduction of stronger enforcement mechanisms (Teigen 2011). In Sweden, major increases in the percentages of female directors occurred with the introduction of target goals; but it has been argued that the increase actually resulted from the threat of stronger penalties if companies did not make efforts to achieve the targets (European Parliament 2012).

While approaches such as quotas and targets can be effective, and can change the numbers quickly, using a two-step method—selecting a pool of candidates based on merit and also considering diversity and inclusion goals—may help to prevent backlash and stigmatization (Bohnet 2016). However, opportunities to upskill should also be taken into account to help workplaces become more equitable.

Addressing Gender Biases in Hiring

A range of evidence-based inclusive measures can help infrastructure organizations counter gender discrimination and bias during the hiring process.

First of all, it is important to understand that language matters; therefore, removing language in job postings that perpetuates gender stereotyping is key (Box 6). For example, when all-female coding bootcamps in Mexico and Peru used counter-stereotypical language in their recruitment messages, and emphasized the capacity of women to succeed in STEM careers, their application rates doubled (Del Carpio and Guadeloupe 2019).

Another approach is to evaluate candidates jointly, or in groups, rather than individually. In one experiment, when candidates were evaluated individually, employers tended to choose men over equally qualified women; but in joint evaluations, their implicit bias was attenuated, and decisions were made based on the data (Bohnet, Van Geen, and Bazerman 2016).

When evaluating candidates individually, decision aids such as technical and cognitive tests, as well as structured interviews during which each candidate is asked the same questions in the same order, can help stem implicit bias. Developing a standardized scoring system, and deciding on the appropriate weighting for each of the interview questions is also helpful. During interviews, each member of the hiring committee should assign a score to each question immediately, without discussing the scores with the other members. Following the interviews, comparing the candidates' answers one question at a time, and submitting the scores to a lead evaluator can also help (Bohnet 2016).

The use of anonymous application materials that do not include demographic information can help to mitigate implicit bias; however, more research is needed in this area, as there is also



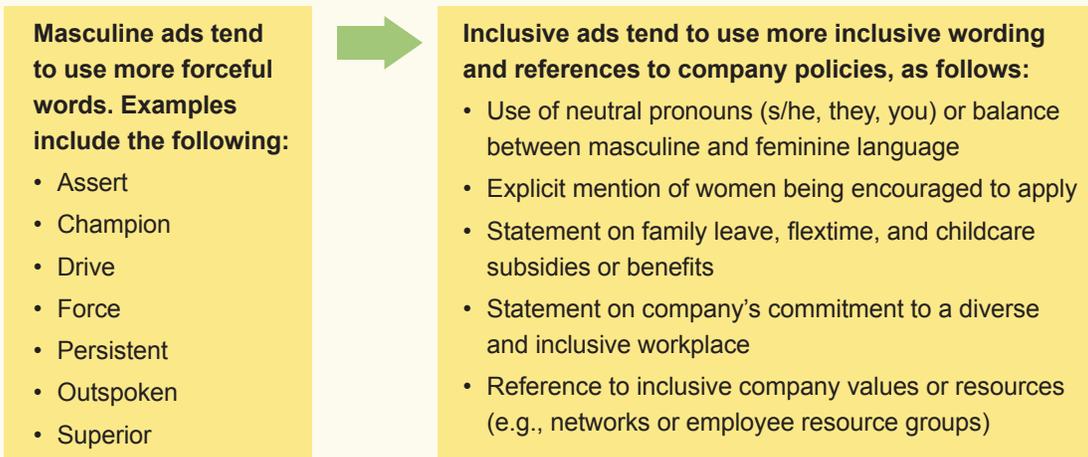
BOX 6 Modifying Language in Job Descriptions to Avoid Reinforcing Gender Stereotype

One study found that when a job was posted using more “masculine” language, with words like “competitive” or “dominant,” it was perceived by both women and men as being male-dominated. Although the wording did not affect women’s assessment of their ability to do the job, they rated the job as less appealing, and were less likely to believe they belonged in the role.

While ads that used “masculine” language often left women feeling that they would not belong in the position, when men viewed ads with “feminine,” or more inclusive, wording (such as “support” or “interpersonal”), they expressed no difference in their perception of belonging.

These findings suggest that “masculine” language used in a job posting can deter women from applying for the job; but more inclusive language does not deter men from applying for jobs.

Comparison of “Masculine” and Inclusive Language Used in Job Ads



Drawing on this research, in order to attract more female candidates and reduce gender stereotyping, organizations can use more inclusive language in their job postings and communications materials. In Uruguay, for example, as part of the Gender Equality Seal (GES) launched in 2009, the National Administration of Power Plants and Electrical Transmissions, known as UTE, has a specific resolution to use inclusive language and nonstereotypical images in its advertising and internal communications. UTE is also committed to showcasing both men and women in all of its newsletters (Administración Nacional de Usinas y Trasmisiones Eléctricas n.d.).

It is also important to ensure the use of gender-neutral job titles. For example, “flight attendant” rather than stewardess or steward; “police officer” instead of policeman; and “firefighter” rather than fireman. Limiting the number of qualifications in a job description is another important way to mitigate gender bias in job listings. Only the skills that are absolutely necessary for the role should be listed. Women tend to only apply for a job if they meet all or almost all of the listed requirements, while men tend to have a lower threshold for applying (Bohnet 2016).

Note: A full list of “masculine” and “feminine-coded” words is available at <http://gender-decoder.katmatfield.com/>

the risk that this might disadvantage traditionally marginalized groups (Behaghel, Crépon, and Le Barbanchon 2015).

Creating Scholarships, and Internship and Apprenticeship Programs

Organizations can also attract female talent by providing scholarships for STEM study, and by engaging students in internship and apprenticeship programs. SENTECH, a state-owned enterprise (SOE) responsible for providing broadcasting-signal distribution services in South Africa, has created strategic partnerships with the University of the Witwatersrand, the University of Pretoria, and the University of Cape Town to provide students from disadvantaged backgrounds, including young Black women, with scholarships. These scholarships provide tertiary-level education and offer mentoring in the field of electronics and information technology (IT) engineering, both of which are aligned with SENTECH's future workforce needs.

In the Lao People's Democratic Republic (Lao PDR), an Asian Development Bank (ADB) project with the provincial water utilities provides scholarships for women to study water-related STEM careers, and provides job opportunities to the women when they graduate (Box 7).

In Tanzania, the Structured Engineers Apprenticeship Program (SEAP) has supported 300 women in engineering apprenticeships by covering their living expenses and providing them with training and mentorship opportunities (Box 8).

There is some evidence that these kinds of financial incentives, particularly loan repayment assistance, have had a positive effect on the retention and completion of engineering degrees for female students (Yang and Grauer 2016). However, the evidence base is small, and more research across a variety of contexts is needed.

Developing Job Matching and Placement Programs

Job matching and placement programs that link job seekers with employers, and disseminate information about employment opportunities can help connect women to jobs, especially in traditionally male-dominated sectors, where they have fewer contacts and networks.

Data from emerging markets, though scant, show that job-matching services and online job-matching platforms have proven helpful to women by facilitating links between potential applicants and companies, and by providing essential knowledge on a variety of topics, ranging from better working conditions (for example, family-friendly policies) to appropriate wages (ADB 2015). A study of unemployment in France found that job-matching services increased the likelihood of employment by five percentage points when compared to personal job-search methods (Fougère, Pradel, and Roger 2005).

Providing technical skills training along with job placements in nontraditional sectors can also help women access job opportunities in the infrastructure sectors. In Nigeria, an impact evaluation of a World Bank project that provided ICT training to female university graduates found impressive results: participants were 26 percent more likely to work in the ICT sector after the training (Croke et al 2018). This suggests the potential for training to support the development of emerging sectors, and employment for women within these sectors, even if they have an initial lack of sector-relevant skills. Interestingly, the program's impact was strongest for women who initially held implicit biases about women occupying such roles. These women were more likely to switch into the ICT sector after the program than women who did not initially hold these biases. This seems to suggest that even without explicitly encouraging participants to defy social norms, training programs can help them overcome self-defeating biases (Croke et al 2018).

BOX 7 Lao People's Democratic Republic: Bridging the School-to-Work Transition through Targeted Scholarships in the Water Sector

SPOTLIGHT ON GOOD PRACTICES

In the Lao People's Democratic Republic (PDR), women's participation in the Department of Water Supply (DWS) within the Ministry of Public Works and Transport has been historically low, particularly in technical positions. In 2016, women represented just 11.7 percent of the DWS workforce. Recognizing the shortage of female technical staff in the water and sanitation sector, DWS, with a US\$500,000 grant from the Asian Development Bank (ADB)–supported Gender and Development Cooperation Fund (GDCF), developed a subcomponent under ADB's Small Towns Water Supply and Sanitation Sector Project, to improve female high-school graduates' access to educational opportunities in water supply and sanitation engineering. Through this program, the project achieved a 10 percent increase in the number of qualified women in technical and leadership positions in public water utilities, known as PNPs (provincial nam papas).

WHAT WAS DONE

- **Scholarships.** In 2011, a committee was established to build a strong cohort of scholars for a pilot program. Since the goal was to recruit women who could return to work in the provincial water utilities, the opportunity was announced through loudspeakers in 16 provinces, as well as in local PNP offices. The committee screened and interviewed applicants using predetermined criteria that included high-school graduation with a minimum grade of 70 percent, or successful completion of university entrance exams. Applicants were required to be from provincial areas, with priority given to those from minority ethnic groups. The program awarded 26 female students four-year scholarships to complete an undergraduate degree related to water-supply work in civil engineering, environmental engineering, or environmental science at the National University of Laos, or the Vocational Institution of Technology in Vientiane.
- **Mentorship.** After the first year, the project team realized that additional support would increase the students' likelihood of success. A counselor was hired to coach and support them, with weekly meetings scheduled to ensure that each student remained on track. The team also engaged women in leadership positions at the Ministry of Public Works and Transport, or other water-related enterprises, to facilitate discussions and monitor the students' academic and personal development.
- **Job placement:** About half of the graduates were hired within three months by PNPs or by related companies; the other half had difficulty finding jobs. To help this group of graduates identify and apply for positions, a targeted strategy was developed, including a concerted effort to link them with PNPs. The PNPs hired the graduates on a three-to-six-month trial basis, after which all stayed on as permanent hires. This very successful approach was suggested to the PNPs, who were apprehensive about hiring the graduates right away as full-time employees, by the project team. As a result, one year after graduation, more than 90 percent of the program participants had found jobs in PNPs, while the rest were hired to fill water-related positions in the private sector.

Note: For detailed information on DWS's actions and resource mobilization efforts to increase gender equality, along with lessons learned, see the case study Bridging the Skills Gap in the Water Sector: Women's Scholarship Pilot in Lao PDR <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/442381594311389657/an-overview-of-promising-approaches-case-studies>.

BOX 8 SEAP: Facilitating Apprenticeships in Tanzania

In 2009, Tanzania's historically male-dominated engineering field had only 96 registered women engineers. An assessment by the Norwegian Agency for Development Cooperation (NORAD) revealed that economic barriers were among the most difficult barriers for women in the pipeline to overcome. Female students often lacked the financial resources needed to complete the requisite unpaid apprenticeship; and without completing the apprenticeship, students who have completed their academic work are still ineligible for the professional registration that allows them to be employed. Furthermore, the apprenticeship, and the process of professional registration must be completed within three years, which presents additional challenges for promising female graduates, who could provide valuable talent for high-demand STEM positions.

With support from the Royal Norwegian Embassy and the government of Tanzania, NORAD's 2010–16 Structured Engineers Apprenticeship Program (SEAP) aimed to strengthen the capacity of 300 women in engineering programs, enabling them to fully register as professional engineers for engineering, construction, and related public-sector organizations. A simultaneous goal was to build the gender capacity of Tanzania's Engineers Registration Board (ERB), which managed the program. SEAP provided subsistence allowances and additional training so that women could complete their required apprenticeships. Importantly, mentors were also trained in how to supervise the apprentices at their places of assignment, and follow up with them after they had achieved professional registration.

While several participants were unable to complete the process within the three-year period, ERB records show that female apprentices with SEAP funding and support had a much higher completion rate (86 percent) than those who were self-supported (20 percent). SEAP also strengthened the connection between professional associations and apprentices by ensuring that all of the women who earned their registration joined the Institution of Engineers, Tanzania Women's Chapter, as well as by conducting sensitization workshops for the institution, and supporting an annual conference for the Women's Chapter.

With technical skills, practical knowledge, certification, and support networks in place, women participating in programs like SEAP are better equipped to respond to the engineering demands in countries where such professionals are in short supply.

Source: Moen and Vevatne 2015.

Similarly, in Nepal, a World Bank-supported pilot project provided nontraditional technical skills training to young women across a wide range of trades including carpentry, tailoring, welding, and masonry. The providers of the training also receive a higher outcome-based payment when trainees become employed in “gainful” employment (defined as earning a minimum of NPR 3,000 (US\$40 per month) in nontraditional sectors. An impact evaluation of the pilot project found that the project had positive impacts on labor market outcomes that are both statistically and economically significant: that is, on employment rates; finding employment related to the skills in which youth were trained; earnings; and the proportion of youth earning more than NPR 3,000 (US\$40) per month (World Bank 2015a).

Profiling Female Role Models During Recruitment

Inclusive communications materials and public relations campaigns can help send the message that employers are committed to gender equality. This approach also helps to profile female role models, and showcase real-life examples of women in infrastructure jobs that can help counter stereotypes.

Public sector entities are increasingly developing recruitment and other communications materials that showcase their commitment to gender equality and their desire to brand themselves as a diverse workforce. For example, on its career website, South African Airways (SAA) makes an explicit effort to showcase women, and to use inclusive language (for example, “qualified senior instructors like him or her”) (Figure 7). SAA also hosted an all-female flight from Johannesburg to Accra in August 2016 to commemorate the country's Women's Month, and to encourage women to join the airline industry as pilots, ground engi-

neers, load controllers, flight dispatchers, operations controllers, or ramp agents. They also used the occasion as a public-relations opportunity to highlight progress on the number of female technicians working for the airline, which had grown from just 4 in 1994 to 114 in 2016; as well as a corporate record of 70 women pilots at the time of the flight (SAA 2016).

Ethiopian Airlines also ran an all-female flight in 2017, to celebrate women in the industry. And General Electric's public relations campaign (“What if _____ were treated like a celebrity?”) examines the social status of prominent female scientists, and suggests what the world might look like if they were celebrated and renowned in the same way as media and entertainment stars. This campaign is aligned with General Electric's goal of having 20,000 women in technology roles by 2020 (Annunziata and Chase 2017).

Organizations of all varieties are increasingly recognizing the competitive edge that can be realized by positioning themselves as diverse and progressive workplaces. This not only improves the reputation of their brand; it also attracts the best talent, through forward-thinking policies and practices that benefit both men and women.

Reducing Gender Bias among Managers and Staff

Testing mechanisms to address unconscious bias¹⁷ among managers and staff can help expand the evidence base. Training programs designed to make people aware of their implicit biases can help provide the tools needed to adjust automatic patterns of thinking, and seek to eliminate discriminatory behaviors (Fiarman 2016).

According to a meta-analysis of 17 unconscious bias interventions, counter-stereotype training is the most effective way to reduce unconscious

17. The International Labour Organization defines unconscious gender bias as “unintentional and automatic mental associations based on gender, stemming from traditions, norms, values, culture and/or experience.” (ILO 2017a).

Figure 7 Tackling Stereotypes Through Corporate Recruitment Images

SAA Technical - Apprentice Training

Share: [!\[\]\(f0954db7a500118d074e2da7fda77094_img.jpg\)](#) [!\[\]\(56b39c4990320274fdabdf88e47b5586_img.jpg\)](#) [!\[\]\(fb48ca66c832fe16a5df11d95dec34d9_img.jpg\)](#)



Apprenticeship at South African Airways Technical

To operate a fully functional maintenance division requires highly skilled technicians. South African Airways Technical Training has recognised this need, and in order to meet the high and exacting standards, has established Apprentice training programmes for eleven trade disciplines. Qualified Senior Instructors, each a specialist in his/her field, facilitate and coach apprentices to ensure total mastery of skills

Apprentices are trained at South African Airways Technical which is located at ORT International Airport. This accredited training facility is one of the most respected in Africa.

SAA Technical

About Us

Maintenance

Special Services

Repair Capabilities

Facilities

Source: South African Airways. <https://www.flysaa.com/about-us/leading-carrier/saa-technical/training>. Accessed May 13, 2020.

bias (Lai 2014). Another meta-analysis of 260 studies of such training programs found small changes in behavior and attitudes (Bezrukova, Spell, and Perry 2016). Another study found that the positive effects of diversity training were greater when training was complemented by other diversity initiatives; targeted to both awareness and skills development; and conducted over an extended period of time (Bezrukova, Spell, and Perry 2016).

However, some studies have found that diversity training may have unintended consequences for the participants, the potential beneficiaries, and the organizations that sponsor them (Dobbin and Kalev 2016). For example, some trainees may resent being selected for diversity training, and may view it as punishment for insensitive behavior; this can result in backlash (Sanchez and Medkik 2004). And in some cases, attempts to increase awareness may even reinforce stereotype norms, with participants enacting even

more stereotypical behaviors and discrimination after training (Macrae et al 1994).

One often-cited study found that individuals who had taken counterstereotyping training expressed more stereotypes than those who received no training (Duguid and Thomas-Hunt 2015). Another study found that business students who participated in a diversity training program that required them to watch a video that instructed them to suppress negative stereotypes about the elderly subsequently evaluated older job applicants more negatively than they had before they had seen the video (Kulik, Perru, and Bourhis 2000).

Diversity training can also create the illusion that an organization has no problems of inequality. One study found that white male participants who were told that diversity training had occurred within their organization said that they felt that women were treated more fairly than men in the organization, even when

faced with evidence to the contrary (Kaiser et al 2013).

Some argue that in order to create a more inclusive workplace, the focus should be on reforming organizational processes and structures—reviewing hiring practices, skills-based assessments, and mentoring and sponsorship programs—rather than on changing minds through unconscious bias and diversity training (Colon 2018). One way of doing this is to focus on the impact of such biases rather than on the biases themselves, through data collection measures that show women's representation at all levels of the organization, as well as instituting

TAPPING INTO WOMEN'S NETWORKS TO SPREAD THE WORD ABOUT JOB OPPORTUNITIES

Tapping into existing women's networks to share information about job opportunities can increase the number of applicants reached during recruitment. Structural gender biases affect how and to whom information is transmitted; and dissemination through "word of mouth" tactics tend to favor men disproportionately. For example, a study in Malawi found that both men and women tend to refer male candidates for jobs when asked (Beaman, Keleher, and Magruder 2018). By diversifying the channels used to recruit new hires, and sharing job opportunities through multiple platforms, including social media and women's professional networks, infrastructure entities stand a greater chance of reaching a more diverse talent pool, including highly-qualified female candidates. While this is a promising approach, more research is needed.

pay transparency. However, more research is needed to determine the most effective measures in this area.

Some infrastructure organizations have started implementing unconscious bias training as part of their gender equality action plans. For example, Ooredoo, a Qatar-based telecommunications company, has launched unconscious bias and inclusive leadership training for their leaders and board executives, as well as internal communication exercises designed to raise awareness and promote gender equality among their employees (IFC 2016).

RETENTION

Creating Parental Leave Benefits and Flexible Work Policies

Laws and policies play an important role in women's ability to enter and stay in the labor market, particularly after starting a family. The ILO's Maternity Protection Convention recommends a minimum of 14 weeks of paid maternity leave, with at least two-thirds of wages paid, ideally through public funding or compulsory social insurance. Globally, the average time for paid maternity leave aligns with the Convention, with 25–100 percent of wages being paid. Only seven economies lack paid maternity leave: the Federated States of Micronesia, the Marshall Islands, Palau, Papua New Guinea, Suriname, Tonga, and the United States (World Bank 2020).

When governments cover the costs of maternity leave, it limits the private-sector disincentive against hiring women, especially when the disparity between maternity and paternity leave is large. In 97 economies, governments administer 100 percent of maternity benefits (World Bank 2020). Paternity-leave policies can also help to support women's participation in the labor force and career growth by facilitating the redistribution of care work within households (OECD 2017). In addition to the direct impacts of family-leave pol-

icies on women’s careers, paid maternity leave can also increase the length of breastfeeding, which numerous studies link to improved infant health (ADB 2015).

Some countries are shifting toward parental leave, to further redistribute this form of unpaid work more equitably between parents. A 2017 study found that the optimal length of paid leave to ensure child well-being and health is one year, split equally between the parents (Schulte et al 2017). Some countries are testing incentives to encourage fathers to take parental leave. In Portugal, parents who share the initial 120 days of parental leave receive an extra 30 days of leave. In Sweden, of the 480 days of total paid parental leave, 90 are reserved for each parent. And in Japan, parents receive an additional two months of leave if they share the initial 12 months (World Bank 2018).

Investing in paid family leave supports the retention of women in the workforce, and has positive benefits for businesses as well. Growing evidence points to the myriad benefits for businesses that invest in paid family leave options for their employees. For example, paid leave for parental or other caretaker needs can lead to a reduction in turnover, and thus increase overall retention of staff (Boushey, O’Leary, and Mitukiewicz 2013). And a 2012 survey of family and medical leave in the United States found that 94 percent of employees who took paid family leave returned to their jobs following their absence (Boushey, O’Leary, and Mitukiewicz 2013).

Laws that promote flexible work policies also help parents balance work and family responsibilities. These can take many forms, including variable working hours (flextime); telecommuting; and working reduced hours. However, of the economies covered by the World Bank’s Women, Business and the Law, only 33 explicitly note flexible work arrangements or rights in their legal frameworks (World Bank 2018).

Implementing Flexible Work Arrangements

Since globally, women remain the primary caregivers in the home, flexible work options and part-time employment options may help to increase the number of women entering and remaining in the workforce for the long term. Using job satisfaction as one measure of retention, literature from high-income countries indicates that women have higher levels of job satisfaction when they work part-time (Booth and van Ours 2013).

Other evidence points to countries like the Netherlands, where allowing new mothers to remain in their same work roles, but shift to part-time work, has reduced disruptions in women’s career growth while increasing their overall participation in the workforce (Booth and van Ours 2013). An apparent positive association has also been identified between women working a lower average number of hours per week, and the female employment rate, suggesting that working reduced hours, or part-time, enables mothers to better balance their work and parental responsibilities; and that more opportunities for part-time work could lead to increased retention of women in the workforce (Silim and Stirling 2014).

At the corporate level, one major global shipping company credited a 17 percent increase in productivity to having launched a telecommuting program at its corporate headquarters (Wlekinski and Jennings 2013). And when Google expanded its fully paid maternity leave from three to five months, company attrition decreased by half (IFC 2016).

However, there are remaining evidence gaps related to possible negative consequences of flexible or part-time work options for women. While flexibility can bring more women into the labor market, this may be more frequently available with entry-level positions. Additionally, when promotions are allocated to the “most committed”

employees, as measured by willingness to relocate, or work the greatest number of consecutive hours, women tend to be overlooked, given the care and household responsibilities that more often fall to them (Naff 1994). Further research is needed to assess these, as well as other potential challenges or limitations that women who are looking to work in a flexible arrangement are confronted with.

The growing number of dual-career couples is also making employers reassess their flexible working arrangements in order to be able to recruit top talent (Center for Equity, Gender and Leadership 2020). There are a wide array of flexible work arrangements that organizations

can offer, to help dual-career couples (Box 9). They can also offer flexible career development tracks so that their employees do not scale back their ambitions because they are concerned that a high-profile project or overseas assignment will not fit with their home responsibilities (Allocco et al 2018).

Promoting the Public and Private Provision of Childcare Services

Investing in care services can generate multiple benefits for individuals, communities, and societies. Investment in early childhood education, for example, contributes to economic

BOX 9 Flexible Work Arrangement Options



Flexible work arrangement options can include:

Geographic flexibility

- Telecommuting (or “flexplace”): Work performed remotely only part of the time. Workers can spend all or part of a day, a week, or a month working at home, or at an alternate work location.
- Remote working: Work performed entirely away from the office. Employees don’t have to come into the office, and can live and work from anywhere.

Flexibility of working hours

- Condensed work weeks: A traditional 35- to 40-hour work week is condensed into fewer than five days of work.
- Customized working hours (flextime): Flexibility in arrival and departure times; typically includes a designated core-time at mid-day, during which all staff are present.

Amount of time flexibility.

- Part-time positions: Less than “full-time” (usually defined as less than 30 hours per week).
- Job sharing: A form of regular part-time work in which two people share responsibility for one regular, full-time position (each position at an approximate 50% commitment).
- Leave flexibility (or “flexleave”): The opportunity to take time off during certain parts of the year.

Source: Center for Equity, Gender and Leadership. 2020. Supporting Dual Career Couples. Berkeley: Haas School of Business, University of California.

competitiveness and the overall prosperity of societies. Care services also enable women, who tend to spend more time on unpaid work than men, to participate more effectively in the labor market: without safe, reliable, accessible, and affordable care services, women may choose to reduce their working hours, or opt out of the labor market altogether, which can reduce earnings and income.

In Latin America, publicly-provided or subsidized daycare (for example, Estancias Infantiles in Mexico, and the Hogares Comunitarios in Argentina, Brazil, and Colombia) have contributed to an increase in both the formal employment of, and number of hours worked by, women (World Bank 2012a). In Brazil, childcare provided by the public sector increased maternal employment by 10 percentage points. And in Argentina, a large public preschool program increased the likelihood of maternal employment by up to 14 percentage points (Haddock 2019).

In rural Mozambique, the availability of preschool education enabled caregivers (primarily women) to save 15 hours a week on their care responsibilities. And in Togo, one study found that enrolling children 3–5 years of age in preschool resulted in women being 37 percent more likely to work outside the home (Haddock 2019).

Childcare solutions can take many forms, including on- and off-site daycare, and subsidized childcare services. Studies in Canada and Germany found that expanding subsidized childcare for parents with children under 4 years of age increases women’s labor force participation (Baker, Gruber, and Milligan 2008).

For large infrastructure entities with thousands of employees, providing childcare services and paid leave can contribute to lower stress levels, higher job satisfaction, and greater loyalty among employees, which, in turn, can translate into lower absenteeism and workplace turnover, as well as higher productivity (IFC 2017). This is relevant, since the cost of replacing a professional employee is in the range of 90–200 percent of annual salary (Allen 2008).

Technology-sector companies in the United States (Akamai) and in India (Mindtree) found that offering childcare services enabled them to recruit and retain highly-qualified software engineers. And providing childcare services helped a textile producer in Vietnam (Nalt Enterprise), and a car-component producer in Turkey (Martur) to reduce employee turnover by 33 percent and 15 percent, respectively (IFC 2017).

Organizations can more effectively retain female and male employees by supporting them in their parental roles. Research in Kenya has shown that implementing inclusive workplace strategies, including on-site childcare facilities, not only delivers economic and social benefits for employees; it also benefits businesses through improved employee loyalty and productivity, as well as enhanced reputation and brand equity. Savings and loan schemes for women employees; on-site childcare facilities for parents; and training in alternative income-generating activities for seasonal agricultural workers also generated both social and business impacts in rural Kenyan agribusinesses (Capital Value for Women Ltd. and Root 2018).

In Egypt, the majority of working women hold public sector jobs, which are considered to be more compatible with women’s “reproductive role” because they allow for shorter hours, greater access to childcare, and maternity leave (World Bank 2012b).

Closing Gender Wage Gaps

Attracting and retaining an equitable workforce requires that female job candidates are confident that they will be paid equally for their work. At the policy level, governments can mandate transparency regarding pay gaps. Australia, Austria, Belgium, Denmark, Germany, and Iceland have all passed laws requiring companies of a certain size to publish pay gap information. The United States adopted a similar law in 2016, and since 2018, the United Kingdom has required companies with more than 250 employees to publish their pay gap information

(IFC 2018). Evidence from Denmark shows that their 2006 pay transparency legislation narrowed the country's gender wage gap by 7 percent (Bennedsen et al 2019). And in Iceland, every company with 25 or more employees must gain certification from an accredited regulator proving that they pay their women and men employees equally across all sectors, including infrastructure sectors.¹⁸

At the institutional level, organizations can conduct pay gap assessments to identify differences in the ways men and women are being compensated for equivalent work at various job levels and functions. These reviews are critical in order for companies to gain insights into prevalent pay gaps, and to develop strategies for tackling pay inequities. Based on priority actions identified in an Economic Dividends for Gender Equality (EDGE) assessment,¹⁹ the Tirana Water Utility in Albania, and the Brasov Water Company in Romania decided to conduct yearly gender pay-gap assessments (World Bank 2019b).

They can also explore a wide range of gender equality certifications designed to create and raise awareness of gender equality and inclusion issues in the workplace and, most importantly, to provide a road map for action (See Box 10).

Addressing Sexual Harassment in the Workplace

At the institutional level, it is of critical importance to develop prevention and response strategies and accountability procedures, as well as training to eliminate sexual harassment. Organizations that seek to prevent sexual harassment at work must develop complaint and redress mechanisms, antiharassment and nondiscrimination policies, sanctions for those who breach policies, and the will and skill to enforce them. The Solomon Water Utility provides a good-practice example (Box 11).

Training sessions on eliminating sexual harassment do not work in isolation: such training has been proven to change knowledge, but not behaviors (Burke 2016). A broader, systematic review of violence against women has found that the most effective interventions address the underlying risk factors for violence, including gender norms, and the attitude that violence is acceptable (Arango et al 2014). Thus, an enforced sexual harassment policy, combined with anonymous, confidential, easy-to-use reporting mechanisms, is essential in order to effectively address sexual harassment, and other forms of violence, at work.

At the national level, governments can pass legislation on sexual harassment in the workplace. In fact, 140 out of 190 countries do have laws that address sexual harassment in the workplace (World Bank 2020). The World Bank Group has developed recommendations for addressing gender-based violence (GBV), including in sectors where men are overrepresented, such as the infrastructure sectors (Box 12). In Uruguay, for example, since 2014 the State Authority's Sanitation Works has required that all of its suppliers implement a policy to address sexual harassment and create concrete policies or actions to promote equality in employment opportunities for women and men.

The ILO Convention and Recommendation to combat violence and harassment in the workplace, adopted in 2019, also provides governments with guidance on measures to protect workers, especially women, from violence and harassment (Box 13).

Adapting Workplace Facilities to Address Women's Occupational Safety and Health Needs

Appropriate facilities for both men and women can foster a more inclusive work environment,

18. More information is available at <https://www.government.is/topics/human-rights-and-equality/equal-pay-certification/>

19. The EDGE Certification Foundation provides an international benchmark for gender equality, and enables companies to obtain global certification. Details are available at <http://edge-cert.org/>.

and translate into more women being retained in the workforce (Box 14). Infrastructure organizations should take into consideration women's preferences and needs when designing work and living spaces for women in the field; this

includes providing adequate lighting and toilets, appropriate uniforms, and on-site health facilities with at least one female staff member. These are fundamental elements of an inclusive workplace.

BOX 10 Gender Equality Certifications



Gender equality certification programs focus on a company's processes for selection and hiring, professional development, training, remuneration, work-life balance, and sexual harassment in the workplace. Latin America and the Caribbean (LAC) has been a pioneering region in designing and implementing certification programs for both public and private sector companies (UNDP 2016). A study conducted by the Inter-American Development Bank (IDB) and Economic Dividends for Gender Equality (EDGE), of companies that underwent a gender certification process—that is, an assessment methodology certifying that a company is complying with a series of gender equality standards—found that certified companies have better representation of women than those that simply report and collect sex-disaggregated data (Unguresan, Saúl, and Murphy 2018). This approach is considered to have a high potential for promoting the employment of women (Buvinic, Furst-Nichols, and Pryor 2013). However, the certifications do require an external audit process that may be too costly or onerous for smaller utilities and state-owned enterprises (SOEs).

The United Nations Development Programme (UNDP)-backed national certifications were developed with resource-constrained public sector entities in mind. The World Bank has also supported these efforts. The Gender Equality Seal (GES) spurs public and private organizations to promote, improve, and monitor women's positions in the workforce. It has five steps: (i) organizational public commitment to GES principles; (ii) management systems self-assessment; (iii) management systems independent evaluation; (iv) organizational commitment to seeking GES certification; and (v) completion of a performance audit (independent verification). GES programs have been developed by the governments of Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Mexico, and Uruguay (UNDP 2018). The program is now being introduced to regions beyond Latin America, and is also available to private sector companies.

EDGE certification is another widely-used international certification program to promote gender equality. Launched in 2009, its standardized methodology and global certification system can be applied across industries and regions to assess and track progress in closing the corporate gender gap. While EDGE certification was originally focused on multinational corporations like Technip, and Systems, Applications & Products in Data Processing (SAP), numerous national champions in traditionally male-dominated industries (for example, the Bank of Mexico) and multilateral development organizations like IFC and the World Bank have also been certified. As of 2019, the program was working with 200 organizations in 37 countries and 24 industries across the globe.

BOX 11 Solomon Islands: Addressing Domestic Violence in the Workplace to Improve Business Outcomes

SPOTLIGHT ON GOOD PRACTICES

In Solomon Islands, the state-owned urban water-and-sanitation utility, Solomon Islands Water Authority (SIWA), provides water and sewerage services to a primarily urban customer base in and around the capital city of Honiara. In 2017, Solomon Water joined the International Finance Corporation (IFC)–supported Respectful Workplace Program. Anecdotal results to date include a more active support system among female staff, who now can disclose instances of domestic violence to contact team members or other colleagues.

WHAT WAS DONE

- **Assessing workplace culture.** SIWA started their program with a workplace culture assessment to help them better understand women's and men's organizational roles; staff perceptions and experiences of workplace behavior; existing mechanisms for promoting an atmosphere of antibullying, antiharassment, and employee well-being; and opportunities for improvement. With technical assistance from IFC, the company analyzed its policies to ensure that new policies would complement existing practices, including those that address misconduct.
- **Adopting antiharassment and domestic violence policies.** With guidance from IFC, the utility has developed policies to prevent and counteract bullying and sexual harassment in the workplace as well as domestic violence. The domestic violence policy aims to create a safe environment for employees who experience domestic violence, and offers a pathway for survivors to seek support. It ensures that employees are provided with information and referrals to community support services, and offers work adjustments so that those who are suffering domestic violence can remain productively employed. It also outlines how the company intends to manage employees who may be perpetrating domestic violence. The IFC-supported policy is being implemented with the use of tools that record and monitor its application, and ensure that confidentiality is maintained.
- **Training line managers in the principles of establishing respectful workplaces.** In a one-day workshop, 11 utility managers were trained in the antibullying and anti-sexual harassment policy to ensure they had the skills to help identify, diffuse, and end harassment at work sites. Subsequently, 81 staff members participated in a two-hour training session on the Respectful Workplaces philosophy, including sensitization to the new policy and its implications at the utility.
- **Training a domestic violence contact team.** Eight staff members, including some nonmanagers, were trained as contacts for dealing with domestic violence issues. The training aimed to prepare them to:
 - Understand the cycle of domestic violence, and how it intersects with the workplace.
 - Raise awareness about domestic violence at work, and Solomon Water's response to it.

- Appropriately respond to disclosures of domestic violence.
- Assess the discloser’s immediate and longer-term safety needs, and determine how any responses provided by the company might influence these needs.
- Support and coordinate access to available support at Solomon Water as well as in the community for those suffering domestic abuse.
- Appropriately escalate allegations of employees who are perpetrating domestic violence.
- Implement Solomon Water’s model policy on domestic violence.
- **Establishing effective communication, and awareness raising.** The contact team has sensitized staff to the human and financial costs of domestic violence by addressing both female and male staff members, their spouses, and their families, and by informing them of ways to support survivors, and refer them to appropriate services. The program has also established partnerships with the police, community support services, and counseling centers, to ensure that effective external resources are available for staff who require referrals for services.
- **Developing complementary measures.** Other initiatives at the utility have included increasing opportunities for women in jobs traditionally held by men. For example, IFC and the Solomon Islands Chamber of Commerce and Industry (SICCI) have supported participating companies that are addressing gender-based job segregation, by facilitating driver’s license training for female employees.

Note: For detailed information on Solomon Water’s actions, and resource mobilization efforts to increase gender equality, along with lessons learned, see the case study Addressing Domestic Violence in the Workplace to Improve Business Outcomes: The Case of Solomon Water <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/442381594311389657/an-overview-of-promising-approaches-case-studies>.

“

Addressing sexual harassment is one of the most important interventions in male-dominated infrastructure worksites. If you are the only woman, or like three women - that feeling of being protected, the system is in place and there’s clarity around how to report, how to identify, how to mitigate sexual harassment and gender-based violence - that is a big driver [for women’s inclusion]. And safe transport as well - so that’s linked - safety, and protecting women from violence to and from work is also key.

—Rudaba Nasir, Global Lead for Tackling Childcare, Women’s Employment Specialist, International Finance Corporation

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BOX 12 Recommendations from the World Bank Group's Resources on Addressing Gender-Based Violence (GBV)



The World Bank's Violence Against Women Resource Guide and Good Practice Note On Addressing Gender Based Violence In Investment Projects Involving Major Civil Works offers recommendations for addressing GBV in multiple sectors.^{a, b}

Two key recommendations are:

Establish clear codes of conduct for employees and project staff on construction sites as well as in the workplace. Having staff sign and agree to uphold these codes of conduct can be an effective strategy across a broad range of sectors. The code of conduct should clearly outline what constitutes unacceptable behavior, and the consequences for harassment or any other type of GBV. Mechanisms should also be created for the community for reporting. The Inter-Agency Standing Committee's Codes of Conduct on Protection from Sexual Exploitation and Abuse in Humanitarian Crisis^c offers general guidance that may be useful when preparing institutional codes of conduct.

Build capacity on policies and recommendations in all sectors to prevent violence against women and girls (VAWG). For example, in 2010, the Vietnamese Ministry of Transport's Committee for the Advancement of Women and the World Bank Group conducted workshops on gender-related issues in transport in cities across the country. At the national level, participants included decision-making staff from the ministry, and at the provincial level from the Departments of Transport. Awareness of gender and transport issues was raised through participatory workshops conducted by transport specialists, to illustrate key entry points for addressing gender inequalities.

- a. See <https://www.vawgresourceguide.org/>
- b. See <http://pubdocs.worldbank.org/en/741681582580194727/ESF-Good-Practice-Note-on-GBV-in-Major-Civil-Works-v2.pdf>
- c. Sexual Exploitation and Abuse (SEA) is defined as any actual or attempted abuse of a position of vulnerability, differential power, or trust for sexual purposes, including, but not limited to, profiting monetarily, socially, or politically from the sexual exploitation of another. In the context of World Bank-supported projects, SEA can occur against any beneficiary or member of the community.

BOX 13 ILO's Violence and Harassment Convention, 2019 (No. 190) and Recommendation (No. 206)



In June 2019, ILO adopted a new Convention and accompanying Recommendation on violence and harassment in the world of work, at the 108th session of the International Labour Conference. The Convention provides a broad definition of what “violence and harassment in the world of work” means, and where it can take place, and says that everyone in the world of work has the right to be free from violence and harassment, including GBV. The standard covers violence and harassment that occurs in the workplace; in places where a worker is paid, takes a rest or meal break, or uses sanitary, washing, or changing facilities; during work-related trips, travel, training, events, or social activities; in work-related communications (including through ICT); in employer-provided accommodations; and when commuting to and from work. It also recognizes that violence and harassment may involve third parties.

The standard aims to protect all workers and employees irrespective of their contractual status, and includes persons in training, interns and apprentices, workers whose employment has been terminated, and volunteers, as well as job seekers and job applicants. It recognizes that “individuals exercising the authority, duties or responsibilities of an employer” can also be subjected to violence and harassment. It requires governments to take measures to protect workers, especially women, from violence and harassment. The recommendation includes specific advice for how governments can go about making these changes.

For more information see: https://www.ilo.org/global/publications/meeting-reports/WCMS_721160/lang--en/index.htm

Engaging Trade Unions in Collective Bargaining Agreements

Infrastructure entities can engage trade unions in developing strategies for promoting gender equality, as well as in enhancing women's participation in STEM roles and leadership (ILO 2016). Collective bargaining agreements aimed at reducing the gender gap have focused on recruitment practices and contractual arrangements; company-specific research on equal opportunities; pay equity through wage increases for female workers; and job evaluations that fairly

consider men's and women's job performance in review assessments.

Examples from high-income countries include requirements by the European Work Council that mandate unions to enforce its gender strategy. Électricité de France (EDF) and ENGIE have established collective agreements on gender-equality targeting by balancing the profile of women and men in management and technical positions; enhancing women's empowerment and agency; combating stereotypes and sexism; and reporting gender equality achievements (EDF 2012).²⁰ Other examples include the

20. EDF is a French transnational company regrouping 33 subsidiaries and associate companies throughout the world. ENGIE is a private sector group comprising international branches and associate companies involved in integrated activities within the energy sector.

BOX 14 Steps Facilities Can Take to Accommodate Female Workers' Needs



- Provide separate toilets and sanitation facilities for men and women.
- Ensure that toilet and sanitation facilities allow women to manage their menstrual hygiene needs safely and privately by providing sufficient lighting, handwashing facilities, and disposal bins.
- Provide women with amenities such as lactation rooms and breastmilk storage.
- Adopt occupational safety policies that address the needs of both men and women.
- Include health and safety protocols in descriptions of job duties and responsibilities.
- Provide women with equal access to personal protective equipment (PPE).
- Design and provide tools and equipment, safety devices, and required clothing that is appropriate for women.

Ethiopia Electric Utility (EEU), where the labor union offers protection for women's rights in the workplace, especially regarding maternity leave (See Box 15). As part of their effort to enhance women's employment in STEM, the union is also being engaged as part of the Gender Technical Committee, which steers the day-to-day institutional commitments being made.

ADVANCEMENT

Designing Mentoring Programs in the Workplace, or at the Industry Level

Mentoring and sponsorship programs are promising professional development strategies for women in STEM, and can be provided in the workplace as well as across industries. Among the few studies conducted on the impact of mentoring in the workplace, one study in the United States found that having a female peer mentor during the early years of college can enhance positive academic experiences, and increase the retention of women in engineering (Dennehy 2017).

Male mentors can also play an important role in women's career advancement. Female employees in male-dominated industries such as engineering can benefit from having a senior male mentor: they report higher satisfaction with their career progress, and are more likely to be partners or senior executives, than male employees with senior male mentors (Ramaswami 2010).

Male mentors can also be helpful to female entrepreneurs in nontraditional sectors. A recent study using the Future of Business survey in 97 countries suggests that women who own businesses in male-dominated sectors are younger, more likely to be married, and more likely to have inherited the business than women in traditionally female sectors. Male role models, particularly husbands, also appear to be important in the decision to enter, and remain, in the sector (World Bank 2019d).

Another study by the Hewlett Foundation found that women in the technology industry consider mentorship and sponsorship key factors for their successful retention and advancement in the field (Ashcraft and McLain 2016). Having a sponsor or advocate within an organization can help increase the visibility of women's professional

BOX 15 Advancing Women's Employment in Ethiopia's Energy Sector—A Comprehensive Approach

SPOTLIGHT ON GOOD PRACTICES

To support the implementation of the Ethiopian government's broader sectoral reform program in the energy sector, the World Bank–supported Ethiopia Electrification Program (ELEAP) includes a strong focus on promoting gender equality. Targets include increasing women's employment in the Ethiopian Electric Utility (EEU) from 20 to 30 percent by 2023, with a particular focus on STEM roles. Dedicated technical assistance, with a substantial budget allocation of US\$4.5 million through disbursement-linked funding, is focused on creating more equitable energy institutions. The Africa Gender and Energy Program, supported by the World Bank Group's Energy Sector Management Assistance Program (ESMAP), and the project team, have provided research and engagement to explore the drivers of gender gaps in the energy sector. This support is ongoing.

WHAT WAS DONE

- **Provision of childcare services.** EEU is actively working to establish childcare facilities at its head office in Addis Ababa, and in eleven regional offices in 2020. A childcare expert has been hired to outline best practices in childcare-service provision in Ethiopia and beyond; to list laws and policies that are relevant to the provision of childcare; to conduct a needs assessment in each potential childcare-service site, including details on standards and risk factors; to undertake a cost-benefit analysis for the operationalization of childcare services; to develop a childcare-service implementation plan; and to analyze decision-maker support. To date, the challenges have included limited expertise in professional caregiving, and in-country regulations.
- **Strengthened institutional response to sexual harassment in the workplace.** The prevalence and occurrence of sexual harassment in Ethiopia's energy sector was previously unacknowledged, and therefore unaddressed. Today, the evidence has confirmed that sexual harassment can negatively impact the participation of women in leadership and decision-making roles, and helps to explain why Ethiopia's energy-sector environment and industries remain male-dominated. With funding from a GBV grant under the State and Peacebuilding Fund, and with ELEAP preparation and implementation, an institutional assessment of sexual harassment was conducted in order to identify gaps to be addressed through policy formulation, the development of a legal framework, and capacity development of key EEU staff.
- **Identifying barriers to women's representation.** Women are underrepresented across EEU's workforce of 18,614 staff, and are especially underrepresented in decision-making positions. At the start of 2020 women comprised just 20 percent of the overall workforce (now 22.5 percent since June 2020) and 18.5 percent of senior-level managers (this is a meaningful increase from 5.8 percent female leadership in previous years). They also account for only 14.5 percent of technical employees. Extensive in-country engagement has revealed that female staff face a host of challenges. These include, among other

things, (i) gender stereotypes and norms; (ii) explicit or implicit biases in the workplace; (iii) lack of mentors; (iv) limited networks due to the small number of women working in the sector; (v) issues related to the maintenance of work-life balance and the care burden; and (vi) concerns about sexual harassment and safety.

- **Designing a road map to increase the number of women employed.** A road map has been designed to guide EEU's steps toward increasing the number of women employed from 2019 to 2022. Human resources data collection has been improved, with a focus on technical staff and professional grade levels, among other things.
- **Establishing a partnership for increasing women's energy-sector employment.** A unique partnership has been established between EEU, the Ministry of Science and Higher Education (MoSHE), and 12 Ethiopian universities that provide courses in STEM fields. A Memorandum of Understanding (MoU) between EEU and MoSHE was signed in August 2019 by the State Minister of MoSHE and the CEO of EEU. The MoU includes the following key elements:
 - Every year 40 female graduate students in STEM fields will participate in internship service in EEU regions; on completing their internship service, EEU will offer these students job opportunities.
 - To strengthen the knowledge and skills of EEU's current workforce, 44 women employees per year will be offered full scholarship opportunities to attend university courses. In addition, 55 women per year are expected to participate in short-term, on-the-job training.
- **Establishing a women's mentorship program.** Recognizing the value of role models and coaches in shaping career aspirations, EEU is also developing a one-year women's mentoring program to match mid-level managers with senior managers. Mentees will need to submit a formal application stating their motivation for participating in the program and their career goals. Partnership with the Ethiopian Women's Legal Association and Ethiopian Women in Energy Network is being explored.

Note: For detailed information on EEU's actions and resource mobilization efforts to increase gender equality, along with lessons learned, see the case study Institutionalizing Gender Equality in Project Design: The Case of Ethiopian Electric Utility <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/442381594311389657/an-overview-of-promising-approaches-case-studies>.

portfolios, their odds of advancement, and the retention rates of mothers (Ashcraft and McLain 2016) (Box 16).

A variety of mentoring programs across the infrastructure sectors focus on empowering and promoting women. Appendix A. Global Professional Networks For Women In Infrastructure provides a list of local and international women's professional networks that offer in-person or

virtual mentorship or coaching programs.

For example, the Global Women's Network for Energy Transition (GWNET) offers a well-structured, 12-month mentoring program especially targeted at emerging leaders in the Middle East and North Africa (MENA) and Sub-Saharan Africa (SSA) regions, as well as in China, the Americas, and Europe. This program brings together young energy industry professionals and connects

them virtually with experienced senior leaders in the renewable energy sector who advise and guide them through one-on-one remote working sessions. GWNET mentees benefit from the opportunity to advance their own career goals while acquiring the skills needed to bring greater momentum to the drive toward clean energy; and both mentors and mentees benefit from expanded access to networking opportunities at the global, regional, and country levels.

The U.S. State Department's TechWomen mentorship and exchange program focuses on empowering the next generation of women leaders working in STEM from Africa, Central and South Asia, and the Middle East (Box 17).

Developing Sponsorship Programs in the Workplace, or at the Industry Level

Sponsorship is the active support by someone appropriately placed within an organization who has considerable influence on decision-making processes or structures, and who is advocating for, protecting, and/or fighting for the career advancement of an individual. Sponsors also help hire, retain, and advance more diverse talent within the organization (Ibarra et al 2010; Cao and Yang 2013).

BOX 16 Tips for Developing Mentoring Programs at the Organizational Level



Mentoring women in STEM careers and leadership roles is not a one-size-fits-all proposition; however, the following insights may be helpful in developing a mentorship program.

Elicit buy-in from senior leadership, especially representatives of management who can allocate resources, become mentors, approve time off for women to participate in the program, and invest in women's careers.

Identify interested mentors in senior positions by clearly stating the requirements, particularly the time commitments involved, to avoid attrition and ensure that mentors will be able to fit the program into their schedules.

Match the interests of mentees with the mentors' positions and types of experience to facilitate the exchange of relevant information, where possible.

Facilitate a training workshop for mentors and mentees on a range of issues, including how to manage professional male-female relationships with clear expectations for appropriate interactions.

Monitor progress closely, to ensure that mentors are meeting with their mentees and that expectations are being met. If the match does not work, seek to redress any issues as soon as possible.

Nurture peer mentoring, and plan networking sessions that create a space for women's access to senior leaders.

Source: Investing in Women's Leadership in Male-Dominated Sectors: Panama's Emerging Women Leaders Program (Box 3.3) <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/442381594311389657/an-overview-of-promising-approaches-case-studies>.

Whereas mentors provide counseling, sponsors also leverage their own influence, and seek to provide leadership opportunities that can truly empower their protégés (Helms, Arfken, and Elwell 2016). Though formal definitions of mentorship and sponsorship vary (Friday, Friday,

and Green 2004), it is generally agreed that in a mentoring relationship, the onus is on mentees to take action to advance their own careers. By contrast, sponsors are more active in nominating their protégés for promotion, and in seeking prestigious roles for them within the institution.

BOX 17 TechWomen: Empowering Women Globally to Lead Local Change



TechWomen is a mentorship and exchange initiative of the United States Department of State's Bureau of Educational and Cultural Affairs. Based in San Francisco, and managed by the Institute of International Education, this program provides emerging leaders from developing regions access to new ideas, tools, knowledge, and networks to support high-performing women in their early 20s through their late 40s as they advance professionally, and to help them inspire women and girls in their communities of origin.

Since 2011, TechWomen has focused on connecting international groups of young women leaders in a five-week residential program, and helping them gain access to mentors who can serve as professional development resources and female role models. When the program first started, mentors and mentees were matched using an algorithm that only partially succeeded in ensuring compatibility. Subsequently, the program developed a system in which participants describe their learning objectives, ideal company, and preferred work culture before being matched with a mentor at one of 80 companies in the San Francisco Bay Area. These companies range from large tech corporations and well-known research groups to public utilities and niche firms. Although more labor-intensive, this process has resulted in 98 percent participant satisfaction.

Another factor contributing to the program's success is the meaningful investment it has made in mentorship training, including a robust orientation, and ongoing development of new content. With many different sectors and types of careers represented, participants are challenged to expand their professional capacities and their understanding of key networks in the broader STEM field. The infrastructure sectors, in particular, are well-represented, with emerging and seasoned leaders from the oil and gas, clean technology and energy, and water treatment sectors.

TechWomen measures its impact with the use of participant surveys that gauge how the program has helped young women leaders connect with other professionals in the field; sparked further interest and involvement in policy areas; and changed their perceptions of STEM careers. The program boasts impressive results, with 90–99 percent of mentees reporting that they have learned new skills to apply in their home contexts that they otherwise would not have acquired. To date, the program has involved 518 mentees, and more than 700 mentors.

Note: Details are available at <https://www.techwomen.org/>.

WOMEN IN STEM AWARDS

Recognizing women's contributions in STEM within a company or across an industry can help inspire other women in the workforce. Beyond individual ministry and company awards, governments, nongovernmental organizations (NGOs), and professional networks can host programs to recognize eminent women leaders in the infrastructure fields. For example, the International Water Association (IWA) hosts the Women in Water Awards; the Organization for Women in Science for the Developing World recognizes prestigious researchers; the Institute of Engineering and Technology (IETE) grants an annual award to the best young women engineers in the United Kingdom; the Sasol Inzalo Foundation supports the Business Woman of the Year Awards; and Western Australia's Chamber of Minerals and Energy recognizes trailblazers with its Women in Resource Awards. When women professionals are recognized on the national or international stage, a high bar is set for aspiring young women more broadly.

The Center for Talent Innovation found that men and women with sponsors are more likely to ask for pay raises (and get them); to join high-visibility teams; and to experience greater career satisfaction (Hewlett et al 2008). Having a sponsor or advocate within an organization can help women increase their visibility and their odds of advancement, and can help boost the retention rates of mothers (Ashcraft and McLain 2016). Organizations such as Citibank, Deutsche Bank, Unilever, Sodexo, and IBM Europe have established sponsorship programs to facilitate the promotion of high-potential women (Ibarra et al 2010).

Sponsors also realize benefits from developing protégés. The data has found that overall, sponsors are more satisfied with their careers; more likely to advance in their own careers; and that they even experience a slight monetary boost compared with leaders who do not sponsor protégés (Hewlett et al 2014).

Further research is needed to understand the specific kinds of mentorship that work best. More evidence is also needed on various approaches to sponsorship, and the related impacts on women's employment. Good practice guidance and lessons learned are provided by the Panama case study (Box 18).

Facilitating Access to Professional Networks

One of the key barriers to women's advancement within male-dominated workplaces is their exclusion from social networks (Faulkner 2009; Linehan et al 2001). The literature has identified some of the reasons women are unable to access networks of male entrepreneurs, including the exclusiveness of the so-called "old boys' network" and the fact that fraternity contacts, and other predominantly male social organizations, are not available to them (Gamba and Kleiner 2001; Knouse and Webb 2001; Linehan 2001).

Women also tend to lack senior female colleagues who can serve as role models and mentors, and they experience heightened cultural boundaries and exclusion from membership in elite groups of STEM scientists (Morimoto and Zajicek 2012). Their exclusion from informal, male-dominated networks also creates a situation of unequal access to tacit knowledge, or the "unwritten rules" of academia and science – knowledge that is implicitly understood only by "insiders" (Rankin et al 2007).

BOX 18 Leadership Development for Women in Male-Dominated, Public Sector Agencies in Panama

SPOTLIGHT ON GOOD PRACTICES

In October 2017, recognizing the dearth of female leadership in Panama's public sector, the country's vice president launched the Emerging Women Leaders (EWL) program. Developed by the Inter-American Development Bank (IDB), this program offers a combination of online learning; selected readings and classroom instruction; one-on-one coaching sessions; and assessment tools, as well as opportunities for mentoring, networking, and teamwork. The program's first cohort was comprised of 30 female public servants from five ministries: the Ministry of Agricultural Development, the Ministry of Economy and Finance, the Ministry of Foreign Affairs, the Ministry of Public Security, and the Ministry of Social Development.

WHAT WAS DONE

- **Training and leadership coaching.** From its inception, the EWL project team and partners set a high standard for both the caliber of participants and the leadership training, to ensure quality and to lend the program prestige. The Center for Collaborative Women's Leadership at the Costa Rica-based INCAE Business School, which had expertise in developing courses for women leaders in the Latin America and the Caribbean (LAC) region, was contracted to develop training and coaching. Over a six-month period, participants were taken through three modules: two face-to-face modules of one week each; a virtual module that included readings, case studies, discussions, webinars, and networking; and group work. Participants also had individual and group coaching sessions, conducted both in person and online. Buy-in from ministers was crucial for ensuring that participants could take time off from their daily work to attend these sessions.
- **Engaging men as mentors.** Since the ministries targeted by EWL are male-dominated in both labor force and leadership, the program team believed it was of critical importance for men to be engaged as mentors. In order to avoid amplifying power imbalances, the program took proactive steps to clearly define and shape mentor-mentee relationships. For example, a mentorship guide was developed, and discussions with mentors were held to illuminate issues of gender and power dynamics, and how to mitigate the risks of sexual harassment in order to protect both women and men from harm. Many senior managers, and even vice-ministers, participated as mentors. Participants learned about their mentors' professional experiences, and selected the ones they believed would be the best fit for them, either from within or outside of their ministries.
- **Engaging role models.** Special events and speaking engagements provided a platform for TED Talk-style presentations by women leaders from each ministry; regional leaders from the public sector; and IDB vice presidents. The presentations were followed by conversations with participants, and were video-recorded and disseminated via social media.

- **Developing high-visibility capstone projects and presentations.** To provide greater visibility and more opportunities for women to hone their communication skills, and make program gains sustainable, participants were required to form teams and develop capstone initiatives to present to IDB senior management, government representatives, and INCAE Business School leaders. Each initiative was required to have a social impact on the company or on society. Most of the project proposals presented in 2018 focused on promoting women's empowerment or gender equality.
- **Sharing lessons regionally.** The EWL program is linked to IDB's Program to Support the Leadership and Representation of Women (PROLEAD) network for women in the LAC region public sector. This network seeks to connect professional women, provide online tools, and facilitate peer mentoring. In addition to having a strong social media presence, the network offers an extensive resource library, including videos about female role models.
- **Building prestige for alumni through media exposure for the program.** Raising the profile of alumni has been accompanied by a media strategy that is tailored to both traditional and digital media, thus elevating EWL's visibility, the status of graduates, and creating broader awareness of employment and leadership gender gaps. The social media strategy invites partners and individuals to join the conversation online.

Note: For detailed information on the EWL program's actions and resource mobilization efforts to increase equality, along with lessons learned, see the case study Investing in Women's Leadership in Male-Dominated Sectors: Panama's Emerging Women Leaders Program <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/442381594311389657/an-overview-of-promising-approaches-case-studies>.

These inequalities can accumulate over the course of women's careers, and contribute to differences between women and men in material benefits, job satisfaction, and patterns of inclusion. Gaining meaningful access to such networks beyond mere tokenism poses real challenges for women (Shaw et al 2001).

A number of international networks focus on promoting female leadership within a specific sector (for example, Women in Geothermal (WING) and Women Professionals in Urban Water); some of them offer scholarships or fellowships.

Other networks are placed within wider professional networks, and offer members the opportunity to influence the agendas of larger organizations like the International Water Association and the Institute of Electrical and Electronics Engineers. The membership base of some of these networks is predominantly in high-income

countries. However, most international STEM-related women's networks report a substantial presence of members, and even advisors, in low- and middle-income countries as well (Appendix A. Professional Networks for Women in Infrastructure).

Fostering networks of female employee resource groups (ERGs) can enable women's retention and advancement in STEM roles within infrastructure organizations. ERGs can also accelerate women's professional development in the workplace by providing social support and information, and fostering relationships. They often provide essential support to staff at key exit and reentry points, for example when a woman is completing an advanced degree or taking parental leave. Such voluntary peer associations can provide a forum in which female colleagues can give and receive advice from each other when transitioning from one role to another, or

THE WOMEN IN POWER SECTOR NETWORK IN SOUTH ASIA (WEPOWER)

The Women in Power Sector Network in South Asia (WePOWER) is a World Bank and ESMAP-sponsored professional network and forum in the South Asia Region (SAR) power sector. WePOWER connects and builds the capacity of women engineers, and promotes their career advancement. The network also promotes changes in attitudes about women in STEM, specifically related to the power sector.

Prior to launching the initiative in 2019, a baseline study was conducted in the SAR countries—Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka—to better understand the complex, multidimensional problem of the underrepresentation of women engineers in the power sector. The study collected first-of-its-kind employment data, disaggregated by sex and grade, including insights from 524 female and male power-sector professionals and engineering students.

In February 2019, Nepal hosted the first WePOWER regional conference, which brought together more than 250 engineers and energy-sector professionals from around the region. A subsequent gathering of 80 WePOWER partners and stakeholders took place in Manila in November 2019. Building on the momentum in Manila, 21 current partners across the private sector, public entities, educational institutions and the professional networks have committed to tangible actions on women's employment in power sector.

making important career decisions. Intergenerational ERGs and professional networks can also provide opportunities for younger employees to learn from more seasoned colleagues; for example, they may gain insights on how to avoid the “motherhood penalty,” the career lag that many women experience after becoming a parent (however, the “motherhood” penalty reflects broader institutional biases therefore support from ERGs is insufficient to address these challenges) (Kahn, García-Manglano, and Bianchi 2014).

ERGs can also help to advance women's careers in underrepresented roles. For example, Petroliaam Nasional Berhad (PETRONAS), a Malaysian oil and gas company has established the Leading Women Network to support its female workforce, which is just 14 percent female in technical jobs, and 28 percent over-

all. PETRONAS supports women's leadership development, changes in organizational culture, and the promotion of female role model success stories (PETRONAS 2015).

To date, very few studies have investigated the existence or effectiveness of ERGs in infrastructure entities in low- and middle-income countries, and more research is essential; however, lessons learned from ERGs in large multinational companies can provide some insights (Box 19).

Despite the increasing use of women's networks within organizations and companies, relatively little research has examined their potential impact on women's career advancement: the few studies that have been completed have tended to focus on best practices for creating such networks (Singh et al 2006; Vinnicombe et al 2004; Catalyst 1999).

Those studies that have looked at the value of such networks have had contradictory findings. One study of 19 female mayors found that 11 of the women (58 percent) reported positive benefits, including the fostering of a collective identity, and their feeling less isolated (Pini et al 2004). Vinnicombe et al (2004) also described some of the organizational benefits accruing from these

networks, including the retention of qualified women, an enhanced corporate reputation, a better-equipped workforce, and organizational learning. Likewise, Catalyst (1999) reported that women's networks are associated with benefits such as positive changes in workplace culture and an increased talent pool for succession planning.

BOX 19 Lessons for Establishing and Supporting Women's Networks at the Organizational Level



The following guideposts may be useful in establishing and supporting women's networks that can become effective tools for both women and men in the workplace:

Align the mission with corporate priorities. A 2011 study by Mercer surveyed 64 companies in Australia, Japan, the United Kingdom, and the United States. As part of the study, ERG program managers in 10 of those organizations were interviewed. The study found that the programs with the highest rate of membership growth had aligned their missions with business operations such as marketing and sales, or talent acquisition. ERGs can also provide valuable feedback, and accountability for the implementation of corporate policies on diversity and inclusion.

Define and communicate the group's value proposition to both management and employees. It is important to clearly define the value proposition of the ERG by stating its specific goals, and providing measured results. When the value of such a group is communicated to senior management, additional resources may be dedicated to it, and employees too will understand its value. Nonfinancial public recognition, especially from senior management, can also be a powerful motivator for involvement in ERGs.

Encourage ERGs to embrace generational and cultural changes. The 2011 Mercer study found a resurgence of enthusiasm for ERGs—both those organized around traditional affinities such as race and gender, and intentionally inclusive multicultural and multigenerational networks. Infrastructure entities in low- and middle-income countries may want to consider developing inclusive groups that engage people on specific issues related to women in STEM, such as creating an ERG of women and men meeting as “engineers for diversity.”

Recognize that organizational and societal dynamics are context-specific. The willingness of employees to network and discuss shared interests in mixed groups may depend upon specific local, organizational, and societal dynamics. This helps to explain why the uptake of ERGs in some regions and cultural settings is still limited. Mercer has found that multinational corporations are more likely to host ERGs in their U.S. operations than in international offices. In any case, ERGs do offer one possible means for fostering diversity and growth within infrastructure workplaces.

Yet some studies have reported negative outcomes from the use of women's networks. And while the majority of the female mayors studied by Pini reported positive benefits, the other 42 percent were either critical or ambivalent. Those who were ambivalent expressed concerns about the network's lack of power, and wondered whether working toward the greater inclusion of women in the mainstream, male-dominated network would be a better strategy than creating a separate network.

At the organizational level, one study found that a 10-member women's network in a Fortune 500 company failed because it replicated the organization's patriarchal culture, the very culture that was already hindering women's career advancement (Bierema 2005). This study found that women had been assimilated into the organization's culture, making it extremely difficult for them to challenge that culture, and to create their own identities within the male-dominated environment; and that they lacked the power to make changes.

Similarly, Friedman (1996) reported that while such networks can enhance the social relationships of women and minorities disadvantaged by organizational structures and policies, they can also create a backlash by majority group members who are excluded from the benefits they offer. And O'Neil, Hopkins, and Sullivan (2011) found that firm leadership teams often do not recognize the possible positive effects of women's networks on their bottom line.

Providing Technical and Leadership Skills Training

As technologies change and companies modernize, they require a skilled workforce that stays abreast of the changes. Ensuring that female employees have equal access to training opportunities in technical, communication, and managerial skills allows companies to maximize the knowledge and skill sets of all of their employees,

enabling a higher level of performance. Moving beyond generic skills training to more robust, comprehensive, and evidence-based approaches is essential in order for employees to acquire the skills they need to advance in their careers.

One initiative promoting such objectives is the STEM Workforce Readiness and Development Program, supported by ILO. Implemented in Indonesia, the Philippines, and Thailand, this program helps those in low-skilled jobs transition to quality STEM-related employment with sustainable career and livelihood prospects. It also supports supervisors and other mid-level women in STEM fields to advance into leadership and management positions through a combination of mentorship opportunities and skills training. The program focuses on soft skills, such as problem solving, teamwork, public speaking, managing upwards, interpersonal communication, and reaching consensus.

Emerging evidence highlights the promise offered by soft skills training. For example, a 2019 World Bank study found that in Togo, training designed to encourage self-starting, future-oriented behavior and persistence helped to improve the sales and profits of firms led by both women and men. Business management training did not have nearly as great an impact: profits for women-owned firms increased by 40 percent after "personal initiative" training, compared to just 5 percent for traditional business management training. Similar results were also found in Uganda, and in Ethiopia, combining personal initiative training with traditional business training helped to increase the profits of women-owned firms by 30 percent more than those of the control group (World Bank 2019e).

There are several promising women's leadership programs in public sector infrastructure agencies and networks (Appendix A. Professional Networks for Women in Infrastructure). These programs generally focus on the professional development of women by offering them

training in key skills like negotiation; access to senior leadership through mentoring programs, networking events, or presentations of special projects; and by creating networks of emerging female leaders.

While this area is still nascent in public sector infrastructure entities, many holistic programs are being implemented by ministries, SOEs, and public utilities. South Africa's Eskom serves as one promising example (Box 20). Online and distance learning executive leadership and management courses offered by universities are another valuable resource.

Countering Biases During the Promotion Process

Tackling both implicit and explicit gender biases in the promotion process can help companies move toward eliminating discrimination against women. Generally speaking, people tend to seek out those who share their backgrounds, group memberships, or experiences, and they are likely to favor candidates that are like themselves (Moreno and Flowerday 2006). These kinds of biases are hard to change, especially through traditional training methods (Chang et al 2019). In male-dominated sectors, such biases may be especially detrimental to the women working there.

BOX 20 Advancing Women: Driving the Transformation of South Africa's Power Sector



In 2013, Eskom, South Africa's public sector electricity utility, established the Eskom Women's Advancement Program (EWAP). EWAP is organized around the following key priorities, which are embedded in the company's strategy:

- Increase women's representation in leadership positions;
- Build a cadre of women to fill critical roles in Eskom's nuclear programs;
- Develop a pipeline of women to occupy technical roles, and increase their representation in these roles;
- Facilitate an inclusive work environment, and influence a progressive, inclusive, and sustainable organizational culture;
- Ensure that human resource practices and policies are empowering women and supporting their professional advancement; and
- Partner with other institutions to develop women as global leaders.

In 2016, women accounted for 40 out of 100 of its young Black engineers and artisans, who took part in a nuclear-operator training program at the Koeberg Power Station. According to Eskom, this initiative is enabling the company "to continue to drive transformation and the advancement of women, while building a robust pipeline of local nuclear operators that will ensure sufficient local resources to service the country's future nuclear needs." By 2017, females still only represented 33 percent of Eskom's total staff, and the utility recognized that further efforts will need to be made to reach parity in employment.

See <http://www.eskom.co.za/Pages/EWAP.aspx>



Nobody was born knowing how to appear in public. That kind of confidence in itself is a muscle that is trained by doing it in practice. Our work is about creating opportunities for women to lead a project, empowering them to raise their hand and say, 'I'm willing, I want to take that position.'

—Claudia Bock-Valotta, Vice President for Finance and Administration, Inter-American Development Bank



Open-ended, ambiguous evaluations are particularly susceptible to bias. In fact, researchers found that women were more likely than men to be given performance reviews that lack specific feedback and advice. Standardizing job performance reviews and skills assessments might help reduce gender bias. For example, managers can develop a standard and detailed set of criteria to evaluate staff more equitably, create more specific prompts that call for specific and measurable outputs and behaviors, and ensure consistency by continually re-reading reviews to identify potential patterns of bias (MacKenzie, Wehrer, and Correll 2019).

Infrastructure entities are testing new approaches to reduce biases in promotion. In North Macedonia, the power utility, EVN Macedonia, developed a candidate assessment process that expands the responsibility for hiring from a technical hiring manager to a panel. Competency-based exercises have also been incorporated into the process, with the explicit goal of attracting more of North Macedonia's female workforce

to apply for its technical positions, with a similar model being developed for senior managers.

Companies can also introduce performance systems that facilitate the promotion of talented women. United Water Supply Company of Georgia, for instance, hired an HR firm to help them develop a performance system, and develop a system of incentives that would help talented women to be promoted (Abuladze 2014). Other measures to help increase the number of women in leadership positions include identifying targets for the inclusion of women in such positions, and creating incentives that will encourage them to aspire to a career in the organization (World Bank 2019c).

Infrastructure organizations can also use succession planning to boost gender equality in their top jobs. This begins by identifying the most promising female leaders, providing them with a clearer pathway to the top of the organization, and equipping them with the skills and knowledge they will need to pave the way.

Succession planning should start early: interns, new recruits, and younger employees should be mentored from the beginning of their careers. Organizations need to take a more strategic approach to identifying and supporting top female talent, or they could risk losing them. This means giving women the support they need to flourish in their careers at every level; giving female job candidates the opportunity to get to know the organization before they join it; giving women employees the support they need and ensuring that the organization's approach to helping women progress in their careers is the right one. This is an important area for further research.

A FOCUS ON WOMEN'S ENTREPRENEURSHIP: PROMOTING DIVERSITY AND INCLUSION IN PROCUREMENT

Women's access to STEM employment can also be fostered by promoting the inclusion of women-owned businesses across the supply chain; however, those that bid for public tenders face serious barriers (Harris 2017). The challenges they face include the high minimum capital required to register as a vendor; inadequate access to credit; high financing costs; fewer networking opportunities; inadequate technical and managerial skills; gender bias; limited information about upcoming tenders; and time constraints when it comes to preparing bids, due to domestic responsibilities.

At the sectoral level, line ministries can establish laws, regulations, and preferential public procurement policies specifically aimed at enterprises owned by women (Harris 2017). At the industry level, measures designed to open up opportunities for female contractors may include the following (ESMAP 2019; IFC 2011):

- Designing ads targeted at women-owned businesses.
 - Including prominently placed language on tender documents, stating that women-owned firms are encouraged to apply.
 - Supporting bid readiness for women-owned firms and small businesses. This can include providing general business development services (for example, training in accounting and invoicing systems); workshops on the mechanisms of finding, scoping, costing, and responding to tenders; and assistance in connecting with financial institutions that are capable of providing needed guarantees.
 - Hosting information sessions for women only, with advice on how the supply chain works; which goods and services are needed by companies; and how small and medium enterprises (SMEs) can register and compete for contracts.
 - Reviewing the bureaucratic requirements for smaller contracts (licenses, certifications, audited accounts, financial guarantees, and warrants) that may pose unnecessary barriers to businesses owned or operated by women.
 - Choosing times and locations for bid-related meetings that are designed to reduce bidders' travel costs and accommodate their schedules.
 - Launching challenges for innovation by women or women-owned firms.
 - Using preferential scoring systems that award extra points to firms that can demonstrate a greater focus on gender equality.
 - Hiring female staff to liaise with women-owned firms, and to serve as mentors to women entrepreneurs.
 - Establish targets for procurement from women-owned firms, and the number of women-owned firms in the supply chain.
 - Using existing databases to screen and certify firms that are at least 51 percent owned or operated by women.
 - Increasing transparency in the supplier selection process through the use of e-procurement.
-



CHAPTER 4

TAKING ACTION: THE PATH FORWARD

Studies from a broad range of primarily private sector companies have consistently shown that organizations that launch initiatives to attract, recruit, retain, and advance women outperform those with a more homogenous workforce.

So, while leveling the field for women's STEM employment in infrastructure can be challenging, the long-term benefits for companies and employees are proven.

What actions can infrastructure organizations take to promote women's employment in STEM fields? First of all, the policies, strategies, and action plans that are developed must be designed with a strong understanding of the local context. Legal, institutional, political, social, and cultural considerations vary across countries, and all of these affect the roles that women are expected to play both in general, and within the workplace.

This section provides practical steps that infrastructure organizations can take in order to begin the change process. Needless to say, concerted and sustained efforts, especially from leadership, are required to ensure that women are given genuine opportunities to enter the sector, and supported as they progress in their STEM careers.

STARTING A DIALOGUE ON STAFFING, AND BUILDING LEADERSHIP BUY-IN

Before starting a conversation about the status of female staffing in an organization, it is important to ascertain whether management is interested in and/or open to discussing human resource (HR) needs. While managers might be generally aware of the strengths and weaknesses of their workforce, the specific challenges that female staff typically face may not be their top priority.

A useful first step may be to start by asking questions about any institutional challenges the organization is facing, and allow that to lead into a discussion of how working on staffing issues might help to effectively address them. Determining whether the organization has sufficient technical staff with the skills needed to adequately operate and maintain facilities, for example, might help managers realize that providing opportunities for upskilling could be helpful in filling any gaps. Discussing ways to recruit talent, and minimize staff turnover or attrition can also be part of this conversation.

The next step is to determine whether the organization is collecting sex-disaggregated data. Sharing international experience from infrastructure entities that have faced similar challenges, and explaining how they overcame them by mak-

ing their workforce more equitable while staying competitive in the market could be helpful. For example, Ethiopian Electric Utility's experience has catalyzed further action in the sector, with Ethiopian Electric Power now moving forward on building a similar program (See Box 15). Other regional World Bank energy projects, such as Burundi Solar Energy in Local Communities, have also drawn lessons from this approach.

Buy-in by senior leadership is critical to any organizational change process. Leaders who demonstrate a genuine understanding of the importance of women's participation in the workforce can encourage others to take the goal of gender equality seriously. Transformational leaders can articulate clear and meaningful goals; urge employees to rise above their self-interest to support collective goals; and communicate this vision to a broad set of stakeholders (Paarlberg and Lavigna 2010). Buy-in by senior management can also help maintain momentum and commitment to change, and can help ensure that the necessary resources will be allocated to the effort (Fernandez and Rainey 2006) (See Box 21).

When engaging senior leadership, it is important for the HR and change management teams to ensure that decision makers and potential high-level champions are also engaged. Senior leaders may be able to make institutional commitments, but it is the departments and employees who will be crucial in actually driving the change process. Within the organization, the leaders of HR, institutional relations, governance, training and development, and corporate social responsibility (CSR) are all needed in order to enact relevant policies and implement institutional changes.

One way of motivating an organization's leadership and stakeholders to actively support inclusion of women in the STEM workforce is for the project team to point to national agendas and international agreements that aim to advance

gender equality. Explaining the links between skills development, or childcare services, and laws and policies at the national level can help lend credibility to these efforts. This approach can also help build buy-in and advance the adoption of strategies designed to support women in the workplace.

ASSESSING WOMEN'S EMPLOYMENT AND INCLUSION IN THE WORKPLACE

The next steps are to gather sex-disaggregated data, conduct analyses, and develop an evidence base. This data will provide helpful insight into the challenge areas, as well as the most promising areas for intervention.

Consider Hiring Experts

World Bank project teams may want to hire an expert with gender analysis experience related to female labor force participation, women's employment, and/or women's employment in STEM jobs, as well as rights-based approaches to focusing on disparities between women and men. Expertise in human resources, gender audits, and program design, as well as monitoring and evaluation (M&E), may also be helpful.

Gender experts can support a review of the evidence and the data-collection efforts, and can help link the data to specific recommended actions, targets, and relevant (M&E) indicators.

Use Secondary Data Sources to Better Understand Gender Equality Issues

Existing data and resources can help project teams better understand a given country's laws, regulations, and policies. At the country level, exploring sector-specific policies and ministry-led, as well as civil society efforts to achieve gender equality, can be helpful (Box 22).

BOX 21 Suggestions for Eliciting Buy-In from Senior Management



Human resources and change management teams aiming to elicit buy-in from senior management may want to consider adopting some of the following strategies.

Leverage CEO leadership. Leadership by the chief executive officer is needed in order to drive the development and adoption of equitable policies such as flextime and parental leave.

Devolve responsibility. Recommend that senior leaders assign responsibility to other entities (HR, institutional relations, governance, training and development), in order to maintain consistency in driving institutional changes.

Institutionalize actions. To ensure sustainability, it is important to translate commitments into actions that are rooted at the institutional level. One way to do this is by spelling out the specific concrete practices or initiatives that are to be instituted, and adopting an institutional strategy that clearly defines key targets and goals.

Create an implementing committee. Recommend the creation of a committee or council to help drive progress through monthly meetings, planning sessions, and roundtable discussions.

Communicate the importance of women's employment issues. Encourage senior management to communicate to staff, both in person and in writing, the importance of gender equality in STEM employment, and to repeat this message at key internal and external meetings and events. HR and change management teams can lead the way by placing this agenda on the table in key meetings with infrastructure counterparts.

Enhance understanding of gender equality in the workplace. Recommend that management clearly communicates the measures that need to be taken in order to support women in STEM workplaces. Ensure that staff understand the reasons why gender equality is a priority, remembering that messages that emphasize the benefits to companies and employees are more likely to be effective. In other words, go beyond simply messaging against discrimination.

Forge global partnerships. Consider ways that senior management can demonstrate its support for and commitment to the employment of women in STEM, through affiliations with global partnerships and initiatives.

BOX 22 Helpful Secondary Data Sources



Women, Business and the Law is a World Bank Group project that collects unique data on the laws and regulations that restrict women's economic opportunities in 190 economies. This resource covers such topics as accessing institutions, owning property, getting a job, providing incentives to work, going to court, building credit, and protecting women from violence.

The **Social Institutions & Gender Index (SIGI)** is an OECD-supported, cross-country measure of discrimination against women in social institutions through formal and informal laws, social norms, and practices, across 180 countries. SIGI covers four major dimensions of discriminatory social institutions that affect women's lives: (i) discrimination in the family; (ii) restricted physical integrity; (iii) restricted access to productive and financial resources; and (iv) restricted civil liberties.

The **Global Gender Gap Report**, supported by the World Economic Forum, benchmarks 153 countries on their progress toward gender parity across four dimensions: (i) economic participation and opportunity; (ii) educational attainment; (iii) health and survival; and (iv) political empowerment. The report also includes detailed country profiles and provides sex-disaggregated data across these domains.

The **World Bank Group's Gender Data Portal** is a comprehensive source of the latest sex-disaggregated data and gender statistics covering demography, education, health, economic opportunities, public life, decision making, and agency.

The **UNESCO Institute for Statistics (UIS)** is a comprehensive resource of statistics regarding education, science, technology and innovation, and culture.

The **OECD Gender Data Portal** includes specific indicators that shed light on gender inequalities in education, employment, entrepreneurship, health, and development, including data on female scientists and women's STEM education. The data sets cover OECD member countries, as well as partner economies in Brazil, China, India, Indonesia, and South Africa.

The **Global Women's Leadership Index** of the Wilson Center tracks women in governments around the world; describes how much power they hold; and explains how they progressed to their positions of leadership. The data is split into three pillars—pathways, positions, and power—to elucidate correlations between a variety of variables, decisions, and policies, and to show how they ultimately affect the degree of power held by women in public office.

Examine National Development Strategies

Evaluating national development strategies can also be helpful. For example, the Ethiopia Growth and Transformation Plan 2 contains baseline information and has set targets for the number of women that are benefitting from vocational adult education programs, and the percentage of government institutions that provide childcare services.²¹ These elements may help World Bank project teams work with relevant counterparts to push for reforms in national laws and policies, and to develop sector strategies for driving actions that will help close the gaps between women and men in STEM employment.

Collect Institutional Data to Understand Women's Participation Within the Organization

In addition to secondary data, collecting both quantitative and qualitative primary data from within the institution can help clients better understand the level and nature of women's participation across the institution. Developing an evidence base can shed light on the key challenges the organization is facing, and establish a baseline against which future success can be measured. Such data can provide helpful perspective on the relative participation of men and women within the workforce; highlight ways to achieve greater parity; and gather important information about perceptions and attitudes within the organization.

Teams can start by establishing the scope of the assessment; identifying any existing sex-disaggregated data that is already available through HR databases; and leveraging opportunities to incorporate relevant questions into broader assessment efforts, such as employee engagement surveys.



The other significant thing is evidence. If you don't measure gaps in leadership, pay, benefits, and evidence more widely on sexual harassment, and start a discussion from the perspective of data, you can't do anything. What gets measured, gets done.

—Ellen Maynes, Gender Operations Officer, IFC's Powered by Women



Of course, the scope of these activities depends upon available financial and human resources. Ideally, the data should provide an overall snapshot of how women are participating at various levels of the organization, as well as their educational backgrounds. Such data can help guide the development of interventions.

It is also important to examine the participation of women in various specific operational and technical areas, including engineering, as well as their entry and exit points throughout the pipeline. And it is important to remember that while HR databases can provide a quantitative picture of women's participation according to their roles or grades, they cannot assess the perceptions, needs, and challenges to career development that women are facing within the organization.

In order to gain a fuller picture of women's experiences within infrastructure entities, qualitative surveys and insights gathered during consultations or focus group discussions with employees is needed (Box 23). Holding some consultations for women only may help them feel more confident about speaking candidly about the challenges they face, and the opportunities they are seeking. These discussions can also help begin to build women's networks within the institution.

21. "Ethiopia Growth and Transformation Plan II" (GTP II). <https://www.greengrowthknowledge.org/national-documents/ethiopia-growth-and-transformation-plan-ii-gtp-ii>

BOX 23 Focus Group Discussions and Consultations on Women in STEM



Focus group discussions and consultations can provide women with an opportunity to discuss employment issues and challenges, and share their perspectives and experiences. Before beginning any such discussions, however, the first step is to ensure that all participants understand which jobs are STEM jobs within the organization.

Ideally, these kinds of discussions are guided by an experienced facilitator who can help ensure that everyone involved gets a fair chance to speak, and be heard. The teams can then draft post-session reports, summarizing the observations shared during the session, while maintaining confidentiality about the opinions or concerns of individual participants. Such discussions can also take place online.

Follow-up one-on-one conversations can complement group discussions, and may provide the opportunity for deeper discussion; or they can be used with employees who may feel uncomfortable sharing in a larger group.

Men could also be engaged in separate conversations as needed. Discussions with outside entities may also be helpful. For example, consultations with STEM faculty at universities, or with employees who have left the organization, may provide a more complete and frank picture of the existing barriers, challenges, and opportunities than information gathered from current employees.

Such discussions may include the following objectives, among others.

Understanding the experiences of female staff with a background in STEM, including a focus on work culture, norms, and institutional policies.

Gaining in-depth insights into institutional bottlenecks in recruitment, retention, or advancement that women are aware of, or may have experienced.

Assessing the level of awareness among management and staff, of key institutional policies and initiatives that are already in place to enhance women's employment in STEM jobs.

Gathering ideas from employees about changes the organization could make, or strategies it could adopt to further enhance women's participation in STEM roles or activities.

Sample Questions for Focus Groups with Women STEM Professionals:

General

- Do you feel there are enough women employees in your institution? What about in management? Please elaborate.
- Does this institution promote a positive working environment for women? What does this mean to you? What would make it better?
- Are you aware of any institutional policies that are designed to enhance women's employment (maternity leave, prevention of sexual harassment, flexible working hours, etc.)?

- What could your organization be doing to encourage women to work in STEM jobs? What would help the most?
- What type of programs could your institution introduce to address the bottlenecks to women's employment in STEM?

Recruitment

- Do you know what measures your institution uses to identify, attract, and recruit women?
- Are you aware of any recruitment strategies in place to enhance the female talent pool? For example, does your institution offer internships or scholarships, or targeted approaches for the hiring process (mixed interview panels, or a variety of candidate-assessment methods)?
- Do you feel that your institution has enough outreach to at least one educational institution with female STEM graduates? Please elaborate.

Retention and Advancement

- What are some of the challenges to women's full participation in and advancement within the organization?
- Are there gender stereotypes within your company's culture, or among coworkers, that could be harmful to the organization's ability to retain and advance women in STEM roles? Please elaborate.
- Have you experienced biases in the workplace? Are these biases also reflected in the company culture, or its business practices? Please elaborate.
- Are you able to effectively balance your personal life and family obligations? Are there workplace policies in place to help support work-life balance? If so, are you able to use them without negative consequences?
- What are the three main challenges that are affecting your career?
- Are women represented sufficiently in managerial positions in the organization? If not, why not?
- Which opportunities for professional development are available to you? If these are insufficient, what other programs would you like to see?
- Do you feel that these opportunities for professional development are available on an equitable basis for both male and female colleagues?

Assessments should include a general review of HR policies (Box 24), as well as a very careful review of recruitment and advancement practices. This can help to identify the specific ways that gender bias may be affecting women in the workplace. Reviewing collective bargaining agreements, identifying the prevalence of sexual harassment,²² and examining sexual harassment policies, as well as prevention and response mechanisms, should also be carried out.

DEVELOPING A STRATEGY, AND A CORRESPONDING ACTION PLAN

In order to ensure broad implementation of institutional initiatives for supporting women in the STEM workforce—and continuity of those initiatives in the event of staff or leadership changes—the commitment of senior leadership to these goals should be translated into very concrete and specific actions that are clearly spelled out in an institutional plan or strategy.

Developing a strategy that is supported by evidence helps make the case for necessary changes (Fernandez and Rainey 2006). A 2018 McKinsey study that researched diversity within the executive teams of 346 companies worldwide found that all of the companies that demonstrated improvements in the inclusion of women over a three-year period had done so with the support of specific diversity and inclusion strategies.

The companies that succeeded shared these traits: (i) senior leadership commitment that

cascades down; (ii) use of data as a means of linking the diversity and inclusion strategy to the business growth strategy; (iii) development of a portfolio of initiatives that promotes a culture of inclusion, and demonstrates commitment to increased diversity; and (iv) commitment to local buy-in through strategies tailored to the business area or geographic region (McKinsey & Company 2018a).

While empirical evidence is scant on the effectiveness of action plans at the ministry or local level, anecdotal evidence suggests that these plans can provide a helpful framework, and support for efforts to advance gender equality. A meta-evaluation of the Asian Development Bank (ADB)'s gender interventions over a period of 10 years with a focus on the infrastructure sectors found that when they were well aligned with the local context, gender action plans could provide good guidance, and elicit positive outcomes.²³ Such plans included details on the gender equality policies of partner governments and specified targets for each of the actions, some of which focused on aspects of women's employment (ADB 2017).

Closing large gender gaps takes time and requires substantial resources. For many organizations, focusing initial efforts on moderate, achievable gains that have a greater probability of enduring over time through changes in leadership may be the best strategy. For example, it may be better to initially focus the review of HR policies on salary equity rather than trying to move forward with a costly plan for on-site childcare facilities.

22. Those who wish to conduct a survey of sexual harassment in the workplace should follow the ethical and safety guidelines established by the World Health Organization (WHO 2005). Poorly conducted surveys are unethical, because responding to a poorly designed survey could needlessly retraumatize respondents. The WHO guideline outlines some of the methodological, ethical, and safety challenges of conducting research on violence against women and girls (VAWG), and describes a range of innovative techniques that have been used to sensitively, respectfully, and carefully address these challenges.
23. Across sectors and subsectors, the gender action plans funded by the Asian Development Bank (ADB) usually included a set of indicators that covered: (i) jobs and income generated, by project; (ii) participation of women in ADB-supported projects, and their representation in groups at the national and subnational levels; (iii) capacity building of women through livelihood training; and (iv) collection of sex-disaggregated data for project monitoring and reporting.

BOX 24 Sample Questions for Human-Resource Policies Review



Does your organization have a gender nondiscrimination policy?

Does your organization have a committee focused on gender equality?

- Is there an assigned gender focal point? Does the focal point have decision-making authority?
- What resources are allocated to this work?

Do you have any recruitment policies specifically focused on women?

- Do you have any quotas or targets regarding female employees in your organization? If so, what is the targeted percentage or number?
- Do you have job ads targeted at women?
- Do you have any outreach channels via women's professional networks?

Does your organization have recruitment relationships with any universities or trade schools?

Do you have any advancement policies focused on women?

- Do you have any quotas or targets for the number of women who reach management and/or leadership roles? If so, what is the targeted percentage or number?
- Do you have structured planning for career growth and advancement?

Do you offer any flexible working arrangements? For example:

- a. Part-time employment?
- b. Options for teleworking/telecommuting?
- c. A gradual phased-in schedule for mothers returning from maternity leave?
- d. Flexible core hours, or compressed work schedules?
- e. Other (please specify)?

Do you have any official policies for parental leave (both maternal and paternal)? If so, how much time is allowed? Does this differ according to whether this is the first or second child? Is parental leave paid?

Do you have official policies for staff regarding paid family and medical leave? If so, how long is the maximum paid leave allowed?

Do you have any rules, regulations, or policies to prevent sexual harassment in the workplace?

- Do you have formal grievance procedures in place?

Source: Adapted from the ESMAP-funded Women in Power Sector Network in South Asia (WePOWER), and the Africa Gender and Energy program available at <https://www.esmap.org/multimedia/power-sector-questionnaire-human-resources-training-and-gender-practices>

Note: For an expanded list of detailed questions, see Tool 1.1: Gender Audit (IFC 2018).

Specific local contexts must be understood, and carefully taken into consideration by the World Bank project teams. For example, changes that impact union contracts or collective agreements may take several years to implement: this underlines the need for any actions to be driven by current, on-the-ground realities.

Setting Specific Goals and Targets

Diversity initiatives within organizations often focus somewhat narrowly on promoting more women to leadership and professional roles, and tend to spend less time and thought on creating the types of programs that are needed in order to attract a larger number of qualified women candidates to the sector; for example, forming relationships with educational institutions that actively promote both male and female job candidates, and making STEM scholarships available for tertiary education.

Creating specific goals in each job category can enhance opportunities for women in roles that are traditionally male-dominated. These specific goals can then be embedded in an organization's overall strategy to address gaps in women's STEM employment (See Table 5).

The strategy should be very specific about the steps that will be taken to achieve targets set for the recruitment, retention, and advancement of women within the organization. Project teams should support the design; track progress toward project targets and initiatives in the identified focus areas; and help organizations revise and adopt changes in policies as needed.

Designating Champions at All Levels of the Organization, and Engaging Men

Designating champions at all levels within an organization can help sustain institutional commitment to change. Employees who are passionate about diversity, inclusion, and women's full participation in the workforce can be formally

assigned to take charge of key initiatives, such as mentorship programs (Box 26). They can also be tasked with presenting fresh perspectives, inspiring attitudinal shifts, and supporting the shift in norms needed in order for diversity and inclusion strategies to succeed. Project teams can also encourage relevant counterparts to create committees or councils to drive progress through monthly meetings, planning sessions, and roundtables.

Since men occupy the majority of STEM jobs and comprise most of the infrastructure workforce, engaging them as partners and supporters of gender equality initiatives is needed for success. Engaging men as mentors and implementers of inclusion strategies is one way to do this. One such example is the Emerging Women Leaders Program of the Inter-American Development Bank (IDB) in Panama (Box 18). However, any mentorship program should take care to mitigate the risks of sexual harassment by carefully vetting potential mentors, and letting mentees know about any antiharassment measures that are in place, as well as the mechanisms for reporting harassment.

Creating Strategic Messaging that Explains How an Inclusive Workforce is Good for Business

Highlighting the business benefits of promoting gender equality to both employers and employees can help gain broader support than tackling the issue from the perspective of antidiscrimination alone. In fact, messaging that portrays women as victims can even backfire, further disempowering female staff. On the other hand, positive messaging that communicates some of the ways that inclusion can help modernize the organization and increase its competitive edge can help to create a more constructive and welcoming workplace culture.

Failure to articulate these benefits to both workers and unions may derail efforts to achieve gender equality. In order to avoid alienating any

Table 5 Sample Framework for Setting Targets to Improve Women’s Representation in STEM Jobs

Target Area Focus	Possible Strategies for Tracking Progress
Identifying evidence-based strategies to enhance women in STEM within the sector or country context	<ul style="list-style-type: none"> • Undertake a review of best practices that is relevant to the general sector context and related policies, and share findings with the organization’s leadership representatives.
Establishing a corporate-level commitment to gender equality in STEM employment	<ul style="list-style-type: none"> • Adopt an institutional strategy and action plan focused on closing the gender gaps in STEM professions. • Sign up for a global reporting initiative to track performance on women’s employment (if resources are available). (See Box 25)
Recruiting and retaining an equitable workforce	<ul style="list-style-type: none"> • Undertake an in-depth review of institutional recruitment, retention, and advancement processes, and related policies. • Review all job description materials for potential biases, especially those for technical STEM roles. • Develop a retention strategy in response to issues identified during employee surveys and exit interviews, if available. • Embed key questions on workplace culture, parental leave, and sexual harassment in employee engagement surveys. Make sure the results of the survey are sex-disaggregated. • Ensure that basic facilities such as toilets and dorms are built and/or renovated in such a way that they can accommodate the safety and hygienic needs of both women and men.
Advancing women’s representation in senior STEM positions	<ul style="list-style-type: none"> • Establish and monitor targets for women’s representation in management and other leadership roles. • Provide progress reports to relevant stakeholders. • Increase the ratio of women to men in senior management within a specific timeline. • Increase the retention rates for midcareer women.
Developing overall approaches for enhancing equity in infrastructure entities	<ul style="list-style-type: none"> • Embed key questions on such issues as workplace culture, parental leave, and sexual harassment in employee engagement surveys. Make sure the results are sex-disaggregated. • Ensure basic facilities such as toilets and dorms can safely and comfortably accommodate both women and men.

Note: World Bank project teams or infrastructure institutions can incorporate intended targets in their respective strategies and action plans based on the ideas put forward in the above framework.

particular group, or unintentionally lead to misunderstandings, or backlash, it may be necessary to carefully frame internal communications, always keeping the focus on the benefits that can be realized through a more diverse and inclusive workforce. It may also be helpful to design and implement “soft-incentive” schemes that formally recognize teams who successfully adopt gender equality, and inclusive strategies.

Capturing Results through Reporting Mechanisms

Reporting on changes to the representation of women at all levels of the organization helps to promote institutional transparency and accountability (Box 25). Project teams can share information about progress achieved through project reports, action plans, and other mechanisms. They should also advise infrastructure entities to

announce progress toward their targets in quarterly reports and staff meetings, clearly stating the case for gender equality in STEM employment, and outlining the steps being undertaken by the organization to set and meet planned targets.

New M&E mechanisms may be needed in order to capture both qualitative and quantitative data on the effectiveness of the various approaches, strategies, and activities that have been implemented. Including relevant output and outcome indicators in the project design can help ensure that these indicators are reported on during implementation. Interventions designed to enhance the comprehensiveness of annual reporting ideally would include the proportion of women employees overall, as well as the number of female senior executives and board members. Encouraging infrastructure entities to

BOX 25 Global Reporting Initiatives and Tools



Women’s Empowerment Principles (WEPs). In 2016, the United Nations Global Compact, UN Women, Business for Social Responsibility (BSR), and the Inter-American Development Bank (IDB) launched the WEP Gender Gap Analysis Tool with support from the Coca-Cola Company, the governments of Germany and Japan, Klynveld Peat Marwick Goerdeler (KPMG), and Itaipu Binacional. Nearly 2,000 CEOs have signed a statement of support pledging to uphold the seven WEPs (see note).

Global Reporting Initiative (GRI). The GRI is an independent international organization that helps businesses, governments, and other organizations report on sustainability issues, such as climate change, human rights, governance and social well-being. GRI encourages organizations to report on sex-disaggregated indicators, such as recruitment and employee turnover by sex and age; the ratio of the basic salary and remuneration of women to men for each employee category; and the average number of hours of training for employees by sex and employee category.

Note: Details are available at <http://weprinciples.org/Site/Companies/1>.; The WEPs are: 1) Leadership: Establish high-level corporate leadership for gender equality; 2) Equality: Treat all women and men fairly at work— respect and support human rights and nondiscrimination; 3) Safety: Ensure the health, safety and well-being of all women and men workers; 4) Learning: Promote education, training and professional development for women; 5) Markets: Implement enterprise development, supply chain and marketing practices; 6) Community: Promote equality through community initiatives and advocacy; and 7) Transparency: Measure and publicly report on progress to achieve gender equality.

disaggregate their employee satisfaction survey by sex can help paint a clearer picture of the current situation as well as of any progress being made.

MOBILIZING FINANCIAL AND HUMAN RESOURCES

Linking Strategies with the Resources to Support the Implementation of Goals and Targets

The activities outlined in this chapter require substantial allocation of financial and human resources in order for effective and sustained implementation to occur. The costs incurred may include hiring consultants to deliver a baseline assessment; designing mentorship programs; earmarking funds for STEM scholarships; building or installing new facilities; and purchasing additional gear for women.

Costs vary from country to country, as well as by the type of initiative. Although there are variations depending on the specific context, initiatives for promoting women in STEM and professional roles generally cost more per person than training programs for women in low- and medium-skills jobs (for example, training women as bus drivers, or in the use of heavy machinery). Therefore, closing the gap between women and men in professional roles requires larger but worthwhile investments.

Estimates gathered from interviews with key experts and partners for this report suggest that project teams should set aside an initial annual budget of roughly US\$50,000–100,000 to cover staff time and project costs, and if possible, to enable teams to hire a gender expert to support in-country engagements. Ideally, these investments can be matched or complemented by resources that have been set aside to ensure

buy-in for more costly activities (for example, scholarships, or the establishment of childcare facilities). However, utilities and other entities may have extremely limited resources in terms of the budget and staff needed to implement interventions like new outreach programs, or new data and HR tracking systems.

Data on the specific costs of initiatives is scant, given issues of confidentiality and the lack of budgets specifically allocated for women's employment in international development projects. However, based on our interviews, anecdotal evidence suggests that high-quality leadership programs, including the coaching components, can cost about US\$2,000 per woman.²⁴ Teams can also identify the costs of four-year STEM university programs in the countries of interest in order to estimate the level of scholarship support that may be needed. Gender certification processes for infrastructure entities can cost \$30,000–100,000 (and upwards), and can take 1–3 months, depending on the scope and methods used for the assessment (Table 6).²⁵

ANTICIPATING CHALLENGES TO IMPLEMENTATION

When targeting women's STEM employment on infrastructure projects, project teams can work to mitigate potential difficulties. A holistic approach, and long-term commitment is required in order to achieve impact. This may deter short-term projects from focusing on increasing the share of women in technical positions in STEM employment. It might also lead to focusing on more immediate strategies, such as enacting an HR policy, rather than longer-term pipeline strategies.

While good practices from other countries can be used as a guide for project teams to take

24. In the United States, a day-long unconscious bias training for 50 people can cost US\$2,000–6,000 (Lublin 2014).

25. The scope refers to the number of focus groups, survey respondents involved, as well as the size of the organization.

Table 6 Indicative Time Allocation for Selected Activities

Type of Activity	In-Person	Overall Time Frame
Audits and Certifications		
EDGE Gender Certification	4–7 days for external audit; 2–3 days for inputting data in the assessment	2–3 months (minimum)
ILO Participatory Gender Audit	10 days; 3 days for workshops; 2–3 days for report	3 months (estimated)
UNDP Gender Equality Seal	3–4 days	1–2 months (estimated)
Data Collection Tools and Assessments		
WEP Gender Gap Analysis Tool	2–3 days for inputting data	2–3 days
Training		
Women's Leadership Training	4–10 days in-person, or combination of in-person and virtual, including coaching sessions	4–12 months
World Bank Sexual Harassment Prevention and Response Training	2–day operational workshop; 0.5 days for manager induction; 1–day worker induction; 1–day refresher once/monthly	2–3 months; ongoing refresher sessions

Note: EDGE = Economic Dividends for Gender Equality, GBV = Gender-Based Violence, ILO = International Labour Organization, UN = United Nations, UNDP = United Nations Development Programme, and WEPs = Women's Empowerment Principles.

into consideration, gender norms can be very context-specific: therefore, the solutions for overcoming barriers for women need to be context-specific as well. Examples from ministries in high-income nations like Australia or Germany may not be replicable in low- and middle-income countries, where the gender norms are more restrictive, or where specific local dynamics, such as hiring freezes, are affecting employment.

In other words, there is no one-size-fits-all

solution that can be applied across all country contexts. It should also be noted that many promising and innovative examples of initiatives for women in STEM are actually originating in low- and middle-income countries, and are providing a rich source of new ideas for clients to draw on.

Different organizations have different levels of sophistication in terms of their HR analytics; this may mean that some entities are unable to make

use of sex-disaggregated data. For example, some organizations may not have the sex-disaggregated indicators that are needed to establish a baseline for associated actions and targets, and may consequently not be able to use such data in their overall decision making. Some organizations do not periodically conduct salary data analysis and performance reviews; this makes it harder to get a full picture of inequalities at the institutional level. Furthermore, HR and other relevant departments may lack the motivation, or may not be held accountable, for reporting consistently on the relevant data, or producing annual reports.

Lack of senior management buy-in for women's employment initiatives can have far-reaching negative impacts, including hindering the formulation and adoption of nondiscriminatory policies. It can also lead to insufficient allocation of resources, persistent tolerance of gender bias in the workplace, and reinforcement of the perception that infrastructure institutions are places for only men to work.

The most promising institutional strategies, for example tuition reimbursement benefits, may be hard for some women to access given their unpaid care responsibilities. Initiatives that are not fully aligned with corporate strategy, or managers that are not adequately trained to have appropriate career development conversations with female employees are some of the other challenges to implementation. And even well-intentioned initiatives can go awry: for example, the formation of "wives clubs" designed to support families might inadvertently reinforce gender stereotypes, and exclude some professionals, for example male engineers who are not heterosexual.

Sexual harassment prevention and response actions that are poorly planned can actually put women at further risk. Employees may choose

not to report for fear of retaliation. Reported abuses may not be taken seriously by management, even when well-established sexual harassment policies and processes are in place. When implementing workplace interventions on sexual harassment, confidentiality and access to quality survivor-centered care are of the utmost importance in order to ensure a safe and ethical response to the problem. Finally, HR department heads and others charged with implementing organizational change should understand the sensitivity of undertaking corporate action with survivors of violence.

Many workplace inclusion initiatives—for example, the creation of new jobs, training programs, adaptation of workplace facilities, and child-care—require upfront investments. This can unintentionally subvert the business case for inclusion of women in the workforce, and reduce the project team's ability to advocate successfully for change. In addition, introducing new metrics and measurement systems designed to hold management accountable for promoting diversity could require increased spending and additional expertise.

Despite these challenges, it is clear that infrastructure organizations around the world are starting to recognize the importance of creating a more equal workplace that enables women and men at all levels to thrive. They are making commitments to gender equality and taking specific actions to increase the share of women in STEM roles within their ranks. As these demonstration cases expand and the evidence base grows, the hope is that women and men in infrastructure employment will finally be able to compete on an equal footing—bringing about widespread benefits for employers, employees, and society overall as well.





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WARNING
DANGER
ELECTRIC SHOCK
DEATH
AVOID CONTACT WITH ELECTRICAL
EQUIPMENT
DO NOT TOUCH THE EQUIPMENT
WHILE IT IS ON
DO NOT TOUCH THE EQUIPMENT
WHILE IT IS ON

CAUTION

ALWAYS LOWER THE LOWER ARM FIRST
BEFORE RETRYING THE UPPER ARM

BASE
ROCK
UPPER CONTROLS
LOWER CONTROLS

VE



LINE TEAM

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APPENDIX A.

PROFESSIONAL NETWORKS FOR WOMEN IN INFRASTRUCTURE SECTORS

Network	Geographic Focus	Services Offered	Membership Base
ENERGY & EXTRACTIVES			
Association for Women Geoscientists (AWG)	Global	<ul style="list-style-type: none"> • Mentorship • Networking 	1000+ members
Council on Women in Energy & Environmental Leadership (Division of the Association of Energy Engineers)	Global	<ul style="list-style-type: none"> • Career development • Events and networking • Online learning materials 	No data
GeoWomen	Canada	<ul style="list-style-type: none"> • Events and networking • Programs focused on recruitment, retention, and recognition • Scholarships 	No data
Global Women's Network for Energy Transition (GWNET)	Global	<ul style="list-style-type: none"> • Events and networking • Mentoring and coaching • Resources, online trainings, webinars 	1000+ members

International Women in Mining (IWIM)	Global	<ul style="list-style-type: none"> • Events and networking • Global mentoring program • Resources that share industry best practices • Training and career development resources • Women on Boards webinar program 	10,500+ members
POWERful Women (PFW)	United Kingdom	<ul style="list-style-type: none"> • Events and networking • Career development • Mentoring and coaching 	No data
Society of Women Engineers (SWE)	Global	<ul style="list-style-type: none"> • Awards • Events and networking • Learning resources • Outreach and advocacy activities • Scholarships • Training and professional development programs 	40,000+ members
The Hawthorn Club	Global	<ul style="list-style-type: none"> • Events and networking 	No data
Women's Energy Network (WEN)	United States, Mexico	<ul style="list-style-type: none"> • Events and networking • Job board • Mentoring program 	6,724 members
Women in Cleantech and Sustainability (WCS)	Global	<ul style="list-style-type: none"> • Events and networking • Mentoring program • Job board 	No data
Women in Geothermal (WING)	Global	<ul style="list-style-type: none"> • Advocacy • Awards • Networking • Research on barriers to women's advancement in the geothermal industry; monitoring of trends and outcomes. 	1500 members

Women in Nuclear Global (WiN Global)	Global	<ul style="list-style-type: none"> • Awards • Mentoring programs • Networking and special events 	35,000 members
Women in Power	Global	<ul style="list-style-type: none"> • Career advancement • Education and training programs • Events and networking • Mentoring programs • Online resources and webinars 	No data
Young Women in Energy (YWE)	Global	<ul style="list-style-type: none"> • Awards • Events and networking • Mentoring 	No data
TRANSPORT			
Women in Aviation International (WAI)	Global	<ul style="list-style-type: none"> • Career development resources • Educational outreach programs • Events and networking • Legal advisory program • Mentoring • Scholarships 	15,000 members
Women in Transport International (WTI)	Global	<ul style="list-style-type: none"> • Awards • Events and networking • Entrepreneurship program • Job matching • Knowledge Lab and online resources • Leadership development program • Mentoring program • Professional development workshops • Scholarships 	6,500 members

Women in Logistics and Transport (WiLAT)	Global	<ul style="list-style-type: none"> • Awards • Events and networking • Training and education programs • Professional development programs • Job board • Mentoring programs Scholarships	3,000+ members
Women's International Shipping & Trading Association (WISTA International)	Global	<ul style="list-style-type: none"> • Events and networking • Diversity and inclusion resources for companies • Scholarships • Training 	3,000 members
WATER			
Women for Water Partnership (WfWP)	Global	<ul style="list-style-type: none"> • Advocacy • Coaching and training • Knowledge exchange and learning platform • Regional workshops and peer-to-peer support • Programs to promote women in water governance 	28 member organizations
Women in Water and Sanitation Network	Global	<ul style="list-style-type: none"> • Events and networking • Capacity development for professional women • Mentorship • Online resources and information • Seminars and workshops 	No data
Women's International Network of Utility Professionals (WiNUP)	Global	<ul style="list-style-type: none"> • Awards • Events and networking • Mentoring • Scholarships and grants 	600 members

Women Professionals in Urban Water	Global	<ul style="list-style-type: none"> • Awards • Events and networking • Learning opportunities • Career development and industry-specific resources 	10,000+ members
DIGITAL DEVELOPMENT			
Anita Borg Institute	Global	<ul style="list-style-type: none"> • Scholarships • Networking and events • Profiling role models • Policy engagement and advocacy • Professional development • Resources for organizations 	15,000 members
Girls in Tech	Global	<ul style="list-style-type: none"> • Bootcamps • Networking and events • Professional development • Mentorship 	60,000 members
National Center for Women & Information Technology	United States	<ul style="list-style-type: none"> • Coordination of alliance groups of organizations focused on women and girls in STEM in schools and in the workplace • Free research-based resources • Education and corporate programs that address a range of issues, including skills building, scholarships, role models, professional development, and mentoring 	Community of over 1,240 universities, companies, non-profits, and government organizations
TechWomen	Global	<ul style="list-style-type: none"> • Mentorship and exchange program for women in STEM 	Over 700 women have participated since its launch in 2011

Women In Technology International	Global	<ul style="list-style-type: none"> • Networking and events • Career fairs and coaching • Job boards • Partnerships with businesses to identify role models, industry-specific best practices, building women's networks and support career development • Employee recruitment, training and retention services for businesses 	188,000+ registered users
Women Who Code	Global	<ul style="list-style-type: none"> • Professional development resources • Job board • Scholarships • Awards • Networking and events 	200,000 members
ACROSS INFRASTRUCTURE			
Association of Women in Water, Energy and Environment	United States	<ul style="list-style-type: none"> • Events and networking • Mentoring program 	2,000+ members
IEEE Women in Engineering (WIE)	Global	<ul style="list-style-type: none"> • Awards • Events and networking • Career advancement support • Learning network • Mentorship • Online resources • Scholarships and travel grants 	22,000 members
International Network of Women Engineers and Scientists (INWES)	Global	<ul style="list-style-type: none"> • Advocacy • Career development resources • Educational and research resources • Events and networking • Mentoring 	250,000+ members

The National Association of Women in Construction (NAWIC)	Canada, Australia, New Zealand, South Africa, United Kingdom	<ul style="list-style-type: none"> • Awards • Career resources • Events and networking • Mentoring • Training and leadership development 	No data
Women in the Built Environment (WiBE)	United Kingdom	<ul style="list-style-type: none"> • Events and networking 	No data
Women's Infrastructure Network (WIN)	Australia, Canada, United Kingdom, United States	<ul style="list-style-type: none"> • Events and networking • Mentoring program • Professional development program 	3,000+ members



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